

**Investigating the Relationship Between Self-Regulation, Mind-
Wandering, and Self-Other Aspects of Wellbeing**

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Abstract

Self-regulation (SR), and more recently mind-wandering (MW), are two of the main predictors of wellbeing across the lifespan. However, both of these constructs have been traditionally studied from a self-focused perspective, just like most current wellbeing frameworks. This thesis examined how self-other aspects of wellbeing have so far been considered and researched in relation to SR, MW and different types of wellbeing, and investigated if self-focused thoughts and other-focused thoughts can be differentially modified by brief meditation inductions in relation to MW frequency and affect.

A cross-sectional survey study recruited 380 Chinese students and found that SR was positively associated with psychological wellbeing (PWB) and negatively associated with MW. A hierarchical regression model where SR was combined with the humanity-oriented trait (a caring other-focused trait) predicted PWB better than SR alone. A mediation analysis showed the negative effects of more MW on PWB could be mitigated by greater scores on the humanity-oriented trait.

A randomized control study with 55 native English speakers was conducted to further investigate MW and affectivity changes by comparing the effects of a brief mindful self-focused meditation induction (MM) and a brief caring other-focused meditation induction (CM) to an attention control group (AC). The 3 (group: MM, CM, AC) by 2 (time: pre-test, post-test) mixed ANOVA results showed that both MM and CM altered other-focused habitual thoughts. Compared to MM, CM also resulted in increased other-caring thoughts, improved Spatial Frame of Reference Continuum, and decreased perceived body boundaries (PBB). No significant change was found in affect as impacted by CM or MM. The results suggest that caring-other thoughts and PBB could be the early precursors of positive changes in affect. Overall, this thesis introduced, both in theory and through empirical research, a new perspective on self-other aspects of wellbeing in relation to SR and MW.

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Dedication

This thesis is dedicated to my parents, Xiangdong Wang and Yuxin Shi, who made this research possible, for their unconditional love, generous support, patient guidance, and the belief that my PhD experience will be great.

Declaration

I declare that this thesis is a presentation of original work and I am the sole author.

This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as references.

List of Contents

ABSTRACT.....	2
ACKNOWLEDGEMENTS	3
DEDICATION	4
DECLARATION	5
LIST OF CONTENTS.....	6
LIST OF FIGURES	12
LIST OF TABLES	12
ABBREVIATIONS.....	14
CHAPTER 1 INTRODUCTION	15
1.1 RESEARCH CONTEXT AND KEY CONCEPTS.....	15
1.1.1 <i>Self-Regulation</i>	15
1.1.2 <i>Self-Other Aspect of Wellbeing</i>	16
1.1.3 <i>Humanity-Oriented Trait, Humanity-Oriented Thoughts, and Light Triad.</i>	17
1.1.4 <i>Mind-Wandering</i>	17
1.1.5 <i>Sense of Self-Boundaries</i>	18
1.1.6 <i>Summary</i>	19
1.2 RESEARCH AIMS AND RESEARCH QUESTIONS	20
1.3 SIGNIFICANCE AND CONTRIBUTION OF THE RESEARCH	21
1.3.1 <i>Theoretical Contribution</i>	21
1.3.2 <i>Empirical Contribution</i>	21
1.3.3 <i>Methodological Contribution</i>	22
1.4 THESIS STRUCTURE	23
CHAPTER 2 LITERATURE REVIEW.....	26
2.1 INTRODUCTION	26

2.2 THE WELLBEING CONSTRUCTS	27
2.2.1 Keyes' Model of Mental Health	27
2.2.2 Ryff's Psychological Wellbeing	28
2.2.3 A Comparison of Psychological and Emotional Wellbeing Using the Concepts of Eudaimonic and Hedonic Wellbeing	29
2.2.4 The Self-Other Aspect of Wellbeing.....	31
2.3 THE SELF-REGULATION CONSTRUCTS	32
2.3.1 Self-Regulation as a Key Indicator of Psychological Wellbeing: The Cyclical Phase Model of Self-Regulation.....	34
2.3.2 The Importance of Social Interaction Between Oneself and Others in Self-Regulated Learning	35
2.3.3 The Marshmallow Experiment: Immediate Smaller Rewards, Delayed Preferred Rewards, and Their Relationship with Affect.....	38
2.3.4 The Dual Processing Self-Regulation Model: How Emotions Affect Self-Regulation.....	40
2.3.5 Negative Affects Associated with Passive Feelings Hinder Self-Regulation	42
2.3.6 Proactive Self-Regulation Promotes Wellbeing.....	44
2.3.7 The Bottom-Up Processes of Self-Regulation in Promoting Wellbeing	45
2.3.8 Summary.....	48
2.4 MIND-WANDERING	48
2.4.1 Types of Mind-Wandering	49
2.4.2 The Heterogeneous Nature of Mind-Wandering in Relation to Affect	52
2.4.3 Mind-Wandering, Self-Other-Focused Contents, and Their Relations with Wellbeing	55
2.4.4 The Development of Studying Self-Other-Focused Thought-Contents of Mind-Wandering....	58
2.4.5 Introducing Mindful Self-Focused Meditation and Its Relationships with Mind-Wandering and Wellbeing	60
2.5 HUMANITY-ORIENTED TRAIT AND CARING OTHER-FOCUSED THOUGHTS	67
2.5.1 Humanity-Oriented Trait and the Light Triad	67
2.5.2 The Origins of the Humanity-Oriented Trait	68
2.5.3 Self-World Capacity and Worldview in the Humanity-Oriented Trait	72

2.5.4 How Overly Self-Focused Self-Regulation Can Sabotage Other's Wellbeing	75
2.5.5 Introducing Caring Other-Focused Meditation.....	78
2.6 THE SELF-OTHER FOCUSED MEDITATIONS, MIND-WANDERING, WELLBEING, AND SELF-BOUNDARIES	82
2.6.1 Comparison of Mindful Self-Focused Meditation and Caring Other-Focused Meditation in Self-Other Focused Mind-Wandering and Wellbeing.....	83
2.6.2 The Self-Other Distinction in Empathic Response: Compassion and Empathetic Distress	85
2.6.3 The Sense of Self-Boundaries and It's Relation to Wellbeing	88
2.6.4 Self-Boundaries in Self-Other Aspect of Wellbeing and Mind-Wandering.....	90
2.7 SUMMARY	93
CHAPTER 3 METHODOLOGY	95
3.1 METHODOLOGICAL CONSIDERATIONS AND RESEARCH DESIGN	96
3.1.1 The Positivism Approach of Empirical Research	96
3.1.2 Levels of Evidence Pyramid, Study Design and Measure Choices	96
3.1.3 Self-Report Questionnaire Vs. Psychophysiological Index	98
3.2 STUDY DESIGN, PARTICIPANTS RECRUITMENT, AND PROCEDURES	98
3.2.1 Study I.....	98
3.2.2 Study II.....	99
3.3 DEVELOPMENT AND PREPARATION OF STUDY MATERIALS	101
3.3.1 Translating the Chinese Light Triad Scale Using the Forward-Translation and Back-Translation Procedures.....	102
3.3.2 Development of the Guided Attention Induction Materials	103
3.4 DATA COLLECTION AND ANALYSIS METHODS.....	110
3.4.1 The Measuring Techniques to Capture Mind-Wandering Thoughts	110
3.4.2 Psychometric Scales	117
3.4.3 Summary.....	123
3.5 QUANTITATIVE DATA ANALYSIS METHODS.....	123
3.5.1 Factor Analysis.....	124
3.5.2 Pearson Correlation Matrix	126

3.5.3 Hierarchical Multiple Regression Model	127
3.5.4 The Indirect Associations between Mind-Wandering and Psychological Wellbeing	129
3.5.5 Repeated ANOVA	129
3.5.6 Summary.....	130
3.6 ETHICAL CONSIDERATIONS	131
Open Research and Pre-Registration	132
3.7 PSYCHOPHYSIOLOGICAL MEASURE OF HEART RATE VARIABILITY IN SELF-REGULATION AND MIND-WANDERING .	132
3.7.1 The Autonomic Nervous System and the Heart Rate	133
3.7.2 Electrocardiography Captures Heart Rate and Heart Rate Variability	135
3.7.3 Photoplethysmography Technique as an Alternative HRV Method	138
3.7.4 The Neurovisceral Integration Model Connects Self-Regulation Ability with Heart Rate Variability	140
3.7.5 Heart Rate Variability Measures and Calculations in Self-Regulation and Mind-Wandering.	141
3.7.6 Heart Rate Variability, Self-Regulation, and Mind-Wandering	145
3.7.7 Electrocardiography-based and Photoplethysmography-based Applications with Heart Rate Variability	147
3.8 SUMMARY	150
CHAPTER 4 HUMANITY-ORIENTED TRAIT AS A PREDICTOR OF PSYCHOLOGICAL WELLBEING, MIND- WANDERING, AND SELF-REGULATION	151
4.1 INTRODUCTION	152
4.2 METHOD	159
4.2.1 Participants	159
4.2.2 Measures	160
4.2.3 Statistical Analysis.....	162
4.3 RESULTS.....	163
4.3.1 Validation of the Chinese version of the Light Triad Scale.....	163
4.3.2 Relating Psychological Wellbeing, Self-Regulation, Mind-Wandering, and Humanity-Oriented Trait	170

4.3.3 Does Self-Regulation, Combined with Humanity-Oriented Trait, Predict Psychological Wellbeing Better than Self-Regulation Alone?	171
4.3.4 The Attenuating Role of the Humanity-Oriented Trait on Mind-Wandering	172
4.4 DISCUSSION	173
4.4.1 The Role of Humanity-Oriented Trait in Predicting Psychological Wellbeing	174
4.4.2 Validation of the Chinese Light Triad Scale.....	175
4.4.3 Limitations and Future Directions	175
4.4.4 Conclusion	177
CHAPTER 5 IMPACT OF BRIEF CARING OTHER-FOCUSED AND MINDFUL SELF-FOCUSED MEDITATION INDUCTION ON SELF-OTHER RELATED MIND-WANDERING AND AFFECT: A RANDOMIZED CONTROLLED STUDY.....	179
5.1 INTRODUCTION	180
5.2 METHODS.....	185
5.2.1 Ethics Approval	185
5.2.2 Participants	186
5.2.3 Procedure.....	188
5.2.4 Measures	189
5.2.5 Intervention	194
5.2.6 Statistical Analysis.....	194
5.3 RESULTS.....	197
5.3.1 Demographic Description and Group Equivalence.....	197
5.3.2 RQ1: Relationships between Trait Other-Caring Thoughts and Affect	198
5.3.3 RQ2: Self- or Other-Focused Thoughts in Predicting Affect	199
5.3.4 RQ3 and RQ4: Pre-Test and Post-Test of Three Groups.....	200
5.4 DISCUSSION	209
5.4.1 RQ1	211
5.4.2 RQ2	211
5.4.3 RQ3	212

5.4.4 RQ4	214
5.4.5 <i>Limitations and Future Research</i>	215
5.4.6 <i>Conclusion</i>	216
CHAPTER 6 DISCUSSION	218
6.1 RESEARCH AIM I.....	219
6.2 RESEARCH AIM II.....	220
6.3 RESEARCH AIM III.....	221
6.4 LIMITATIONS AND FUTURE RESEARCH	222
CHAPTER 7 CONCLUSION	224
APPENDIXES.....	226
APPENDIX 1: INFORMATION SHEET AND CONSENT FORM FOR STUDY I	226
APPENDIX 2: QUESTIONNAIRE FOR STUDY I (CHAPTER 4)	229
APPENDIX 3: INFORMATION SHEET AND CONSENT FORM FOR STUDY II	233
APPENDIX 4: QUESTIONNAIRE FOR STUDY II (CHAPTER 5)	236
REFERENCES	244

List of Figures

FIGURE 1 STRUCTURE OF THE THESIS.	25
FIGURE 2 CYCLICAL PHASE MODEL OF SELF-REGULATION	35
FIGURE 3 TRIADIC MODEL OF SELF-REGULATED LEARNING.....	36
FIGURE 4 DEVELOPMENTAL LEVELS OF REGULATORY SKILL MODEL	38
FIGURE 5 DUAL PROCESSING SELF-REGULATION MODEL.....	42
FIGURE 6 CONCEPTUAL SPACE RELATING DIFFERENT TYPES OF THOUGHTS	52
FIGURE 7 AN EXAMPLE OF DIFFERENCE BETWEEN HR AND HRV.....	137
FIGURE 8 PHOTOPLETHYSMOGRAPHY (PPG) PRINCIPLE BY SMARTPHONE	139
FIGURE 9 A LORENZ PLOT OF EACH IBI (X-AXIS) PLOTTED AGAINST THE SUBSEQUENT IBI (Y-AXIS) FOR A SINGLE PARTICIPANT	143
FIGURE 10 CONFIRMATORY FACTOR ANALYSIS WITH STRUCTURAL EQUATION MODEL. N = 380	169
FIGURE 11 CONCEPTUAL MODEL OF VARIABLES AND HYPOTHESES	171
FIGURE 12 INDIRECT ANALYSIS OF H3 TESTING HUMANITY-ORIENTED TRAIT WITH ITS ATTENUATING ROLE OF THE NEGATIVE EFFECT OF MIND-WANDERING ON PSYCHOLOGICAL WELLBEING	173
FIGURE 13 PARTICIPANT RECRUITMENT AND DATA COLLECTION FLOWCHART	188
FIGURE 14 CONCEPTUAL MODEL OF THE EXPERIMENT PROCEDURE.....	189
FIGURE 15 TIME BY GROUP INTERACTIONS FOR STATE MIND-WANDERING VARIABLES	202

List of Tables

TABLE 1 THE GOLDEN MEANS: DEEPENING WITHIN THE MEAN VERSUS BEYOND THE MEAN.....	70
TABLE 2 COMPARISON OF 15 GUIDED ATTENTION PRACTICES	107
TABLE 3 COMPARISONS OF SELF- AND OTHER-PERSPECTIVE AMONG FIVE SELECTED POTENTIAL INTERVENTIONS	109
TABLE 4 METRIX AND DESCRIPTION OF HRV PARAMETERS.....	144
TABLE 5 DEMOGRAPHIC TABLE OF SEX, EDUCATIONAL GRADE, HOMETOWN, AND AGE	160
TABLE 6 EXPLORATORY FACTOR ANALYSIS. FACTOR LOADINGS AND ITEM DESCRIPTIVE STATISTICS FOR THE MEASURES OF LIGHT TRIAD (PATTERN MATRIX) (N = 380)	167

TABLE 7 CORRELATION ANALYSIS OF VARIABLES (N = 380)	170
TABLE 8 HIERARCHICAL MULTIPLE REGRESSION ANALYSIS IN PREDICTING PSYCHOLOGICAL WELLBEING	172
TABLE 9 DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS (N = 55).	187
TABLE 10 ITEMS ON THE THOUGHT SAMPLING PARADIGM QUESTIONNAIRE	192
TABLE 11 RESEARCH QUESTIONS AND STATISTICAL ANALYSES FOR STUDY II	196
TABLE 12 BASELINE DIFFERENCES BETWEEN GROUPS F (P, H2). DF = 2, 52.	198
TABLE 13 CORRELATION MATRIX AMONG MEASURES AT PRE-TEST LEVEL (TRAIT LEVEL).....	199
TABLE 14 HIERARCHICAL MULTIPLE REGRESSION ANALYSIS IN PREDICTING POSITIVE AFFECT AND NEGATIVE AFFECT AT PRE- TEST.....	200
TABLE 15 DESCRIPTIVE STATISTICS, GROUP-BY-TIME INTERACTIONS, AND MAIN EFFECTS FOR STATE MIND-WANDERING AND AFFECT VARIABLES	204
TABLE 16 BETWEEN-GROUP INDEPENDENT SAMPLE T-TEST FOR VARIABLES OF PRE-POST CHANGE	204
TABLE 17 WITHIN-GROUP PAIRED SAMPLES TEST FOR VARIABLES OF PRE-POST CHANGE	205

Abbreviations

CM: Caring Other-Focused Meditation

MM: Mindful Self-Focused Meditation

AC: Attention Control

TSP: Thought Sampling Paradigm

ES: Experience Sampling

MDES: Multi-Dimensional Experience Sampling

LTS: Light Triad Scale

LTS-C: Light Triad Scale - Chinese Version

EFA: Exploratory Factor Analysis

CFA: Confirmatory Factor Analysis

SEM: Structural Equational Modelling

PBB: Perceived Body Boundaries

SFoRC: Spatial Frame of Reference Continuum

Chapter 1 Introduction

1.1 Research Context and Key Concepts

In response to the pressures of climate change (and other global crises) on the entire human family, there is a need to strengthen skills training in social interaction, trust-building and cooperative behaviors (Anderson & Jane-Llopis, 2011). International organizations studying climate change, including the World Economic Forum, have highlighted the need for action to link mental capacities and physical health. A number of interventions have been designed to effectively support mental health and eudaimonic wellbeing. These interventions need to be accompanied by action to build mental health capital and increase resilience to manage and respond to the global risks facing humanity in the coming years.

In response to global risks as well as life stressors, researchers have noted that individuals should develop better cognitive control mechanisms to cope with them (Anderson & Jane-Llopis, 2011). Although factors related to cognitive control mechanisms have been extensively studied in the fields of psychology, education, and health, recent crises, such as Covid-19 and wars, imply that interactions between beings are also critically important and interactive, although many of these hidden factors are invisible to people living in less-affected areas.

1.1.1 Self-Regulation

As a key psychological construct linked to cognitive control, self-regulation is a significant predictor of mental health and wellbeing in the future (Moffitt et al., 2011). The construct of self-regulation includes the ability to regulate one's emotions, interact with others, avoid conflict and aggressive situations, and implement independent learning strategies (Bronson, 2000; Pandey et al., 2018). Self-regulation has been long studied in all

ranges of ages and careers, with interventions applied and focused on children (Dignath et al., 2008), college students, and occupations such as teachers (Klusmann et al., 2008).

Self-regulation has been considered a positive concept with benefits to oneself, but scholars in recent years pointed out that it also can have negative impacts on the wellbeing of others, such as an overly self-focused trait self-regulation can be related to harmful incidents to others (Uziel, 2018). For example, trait self-regulation that focuses excessively on oneself may blind an individual to achieving their own goals while hurting others, or to do whatever it takes to achieve those goals but at the cost of the wellbeing of others. Such findings indicate the study of self-regulation might be neglecting an important aspect of self-regulation: high self-regulation has a negative side linked to a lack of consideration of other-focused aspects of wellbeing.

1.1.2 Self-Other Aspect of Wellbeing

The Self-Other Aspect of Wellbeing is an ethically grounded concept of relational wellbeing. It focuses on the wellbeing of both oneself and others, beyond the perspective of individualistic wellbeing. It focuses particularly on the interaction between oneself, others and the world. It is an innovative construct in the present study, and this concept is a key element of Study I and Study II.

Although the self-other aspect of wellbeing seems to have little connection with self-regulation, when self-regulation is used as a tool, it can impact others' wellbeing. Prior research has studied wellbeing from an emotional and social interaction perspective (Charles, 2010). While some constructs of wellbeing have focused on social interactions (i.e. social wellbeing), it has nonetheless approached wellbeing from the perspective of the self, studying individuals' relatively subjective wellbeing and individuals' responses to social interactions.

In contrast, the self-other aspect of wellbeing takes a more humanistic perspective, considering how one's behaviour affects others and the world.

1.1.3 Humanity-Oriented Trait, Humanity-Oriented Thoughts, and Light Triad.

Under the construct of the Self-Other Aspect of Wellbeing, the ‘other aspect’ of relational wellbeing has a humanistic aspect. For the purposes of this thesis, the humanistic factors of personality are defined as Humanity-Oriented Trait. In addition, when research reported in this thesis assesses a thought episode, particularly one that arises before it forms a personal habitual pattern or a personality trait, it is defined in this thesis as a humanity-oriented thought.

In psychological studies, humanity-oriented trait and thoughts can be assessed by the construct of the Light Triad Scale (Kaufman et al., 2019). The Light Triad assesses loving and beneficent orientation toward others, and it is positively related to flourishing mental wellbeing such as life satisfaction and self-transcendence.

1.1.4 Mind-Wandering

Although the construct of self-regulation is important in predicting mental health and wellbeing, it is a relatively traditional construct and has been long studied by researchers. Mind-wandering, as a psychological construct negatively associated with self-regulation, is an emerging concept in the field of psychology and can be used to explain the self-other aspect of wellbeing. Mind-wandering is defined as a spontaneous thought, in which the attention shifts away from the current task (Christoff et al., 2016; Smallwood & Schooler, 2015). Mind-wandering is often overly focused on oneself and is associated with more negative emotions, such as ruminating on unfulfilled goals or how to change past events

(Killingsworth & Gilbert, 2010). The construct of mind-wandering explains how excessive self-focus can also be detrimental to one's own wellbeing.

By evaluating mind-wandering episodes, the present thesis assessed its self-focused and other-focused thoughts and their associated affect in relation to mental health and wellbeing and self-regulation. In addition to the self-other perspective, mind-wandering contents can be used to examine many other dimensions of thoughts, such as their valence and frequency (Wang et al., 2018). Importantly, the self-other focused mind-wandering thoughts can be modified by practising meditations (Kok & Singer, 2016; Lusnig et al., 2021), such as fostering self-focused nonjudgmental thoughts by practising mindful self-focused meditation and other-focused thoughts by practising caring other-focused meditation. These features of mind-wandering make it a suitable concept for studying the self-other aspect of wellbeing, including ways mind-wandering thoughts can be modified through the practice of mindful self-focused or caring other-focused meditations, particularly with respect to their self-focused or other-focused contents.

1.1.5 Sense of Self-Boundaries

One of the key variables in studying mind-wandering is the sense of self-boundaries. The sense of self-boundaries in the thesis is defined as an individual perceived distance from others and the world (Ataria et al., 2015). The theoretical sense of boundaries is related to post-humanism, which emphasizes the interconnectedness of organisms and complex systems and aims to break down hierarchies and boundaries between humans and other entities (Wolfe, 2010). This is beyond the traditional human-centred perspectives and allows for further study of social crises and climate change from a strategically oriented perspective. The sense of self-boundaries has been studied in prior research (Hanley et al., 2020) and found a self-focused attention practice can alter one's perceived sense of self-boundaries.

However, under the construct of other-focused aspect of wellbeing, a sense of self-boundaries may serve as a protective factor when thinking of others. This is because other-focused thoughts, or compassion-based thoughts, sometimes generate empathic distress when thinking about the suffering of others (Singer & Klimecki, 2014). When a person's sense of self-boundaries is low, negative emotions are more likely to occur. This increased negativity can overwhelm the self, thus eliminating the other-focused compassionate thoughts that are supposed to bring about positive emotions.

1.1.6 Summary

In summary, the self-focused aspect of self-regulation and mind-wandering has implications for how we approach fostering wellbeing in educational and mental health practice. This can be exemplified by the effects of secular meditation-based strategies aiming to enhance wellbeing. For example, mindfulness-based strategies are primarily self-focused whereas caring other-focused meditation cultivates other-focused qualities, yet the differential effects of these two types of strategies on self-regulation, mind-wandering and wellbeing have not been examined so far. Therefore, this thesis aimed to examine both in theory and empirically the implications of self- vs other-focus in self-regulation, mind-wandering in relation to psychological and affective wellbeing. The empirical aspects of the thesis first used a cross-sectional design to understand the relationship between self-other focus in self-regulation, mind-wandering and wellbeing (Study 1) and then examined changes in the same variables in a randomised controlled pre-post design using brief mindful self-focused and caring other-focused inductions (Study 2).

1.2 Research Aims and Research Questions

In a broad context, my research is located at the intersection of three scholarly domains: self-regulation, mind-wandering, and wellbeing. My approach seeks to understand how the self-other aspect of wellbeing affects self-regulation, mind-wandering, and the wellbeing of oneself and others. Research to date has underestimated the significance of the self-other aspect of wellbeing and focused much on self-focused wellbeing. This thesis provides the first extensive exploration and theoretical evaluation of the self-other-focused relational wellbeing construct.

The overarching research aims and research questions in this thesis are:

Research Aim I: To understand how self-other aspects of wellbeing have so far been considered and researched in relation to self-regulation, mind-wandering and different types of wellbeing.

Research question of the thesis (RQ I; theoretical investigation): Based on existing research, how does the self-other aspect of wellbeing relate to one's self-regulation, mind-wandering, and wellbeing?

Research Aim II: To explore the relationship between self-regulation and mind-wandering in relation to a broader construct of self- and other-related wellbeing.

Research question of the thesis (RQ II; study I): What is the relationship between self-regulation, mind-wandering, humanity-oriented trait, and psychological wellbeing?

Research Aim III: To understand if self-focused thoughts and other-focused thoughts can be differentially modified by brief mindful self-focused and caring other-focused meditation inductions and ways such changes relate to mind-wandering frequency and affect.

Research question of the thesis (RQ III; study II): Do brief mindful self-focused and caring other-focused meditation inductions impact self-focused thoughts and other-focused thoughts

differently and if so how do such differences relate to changes in mind-wandering frequency and affect?

1.3 Significance and Contribution of The Research

In examining the self-other-focused aspects of self-regulation, mind-wandering and wellbeing, this thesis aimed to make original theoretical, empirical and methodological contributions to research in this area.

1.3.1 Theoretical Contribution

This thesis highlighted the importance of developing the self-other aspect of relational wellbeing in the literature. By doing so, this thesis first presented the widely used theories and models of self-regulation and their relationship to wellbeing, considered the understudied side of trait self-regulation which could have negative impacts on other people, and elaborated on the importance of fostering other-focused humanity-oriented trait/thoughts while developing the ability to self-regulate to benefit both oneself and others. This thesis also proposed to apply the self-other aspect of relational wellbeing in studying mind-wandering, as mind-wandering is often focused on self-related thoughts and is associated with negative affect. This thesis contributes to the theory by proposing the humanity-oriented trait, as it elaborates on the trait of other-focused benevolence, which can enhance one's own wellbeing.

1.3.2 Empirical Contribution

First, the present thesis contributes new understandings to the literature on the relationship between self-regulation, mind-wandering, and self-other aspect of wellbeing. Study I was the first to investigate the relationships of self-regulation and mind-wandering

and their association with the other-focused humanity-oriented trait in predicting one's own wellbeing. Study II was the first to empirically examine the differential effects of brief mindful self-focused meditation and caring other-focused meditation inductions on self-focused and other-focused thoughts in relation to mind-wandering frequency and affect changes.

Second, both empirical studies contribute to the wellbeing literature. The empirical evidence in Study I demonstrated that an other-focused humanity-oriented trait has a positive association with one's own wellbeing. It mitigated the negative impacts of overly self-focused self-regulation and mind-wandering associated with negative affect. The empirical evidence in Study II suggested both other-focused and self-focused thoughts improve affect but through different mechanisms, and a sense of self-boundaries is important in fostering other-focused thoughts to improve affect.

1.3.3 Methodological Contribution

The present thesis adopted and validated three psychological scales and methods and proposed an innovative method for recording the psychophysiological index of self-regulation and mind-wandering. First, the thesis contributes to the validation of the Light Triad Scale to measure other-focused humanity-oriented trait among Chinese participants. Second, I adopted the Thought Sampling Paradigm method in studying mind-wandering in a lab environment, which set a foundation to use it for future daily-life outside of lab environment. Third, the present thesis validated the scale of the Perceived Body Boundary and Spatial Frame of Reference Continuum with native English speakers in the UK in comparing self-focused and other-focused thoughts. Fourth, this thesis proposed an innovative approach to using a Photoplethysmography-based smartphone application for the

psychophysiological measure of Heart Rate Variability with non-linear domain calculation in assessing self-regulation and mind-wandering.

1.4 Thesis Structure

The thesis contains the following main chapters apart from the Introduction. This section provides an overview of each chapter. The structure flow of the thesis is presented in Figure 1.

Chapter 2: Literature Review. This chapter reviews existing literature on self-regulation and mind-wandering in relation to wellbeing. This chapter addresses the Research Aim I. The chapter provides an overview of the most common models of wellbeing and considers them with regard to their self-other-focus. This chapter also describes the key models of self-regulation and the related concepts of mind-wandering. It further explains the relationship between self-regulation and mind-wandering and the importance of other-focus in the wellbeing constructs. To this aim the chapter introduces the construct of the humanity-oriented trait. Chapter 2 further discusses the inconsistent findings of mind-wandering in relation to affect, and the different mechanisms of self-focused and other-focused thoughts' impact on mind-wandering and affect.

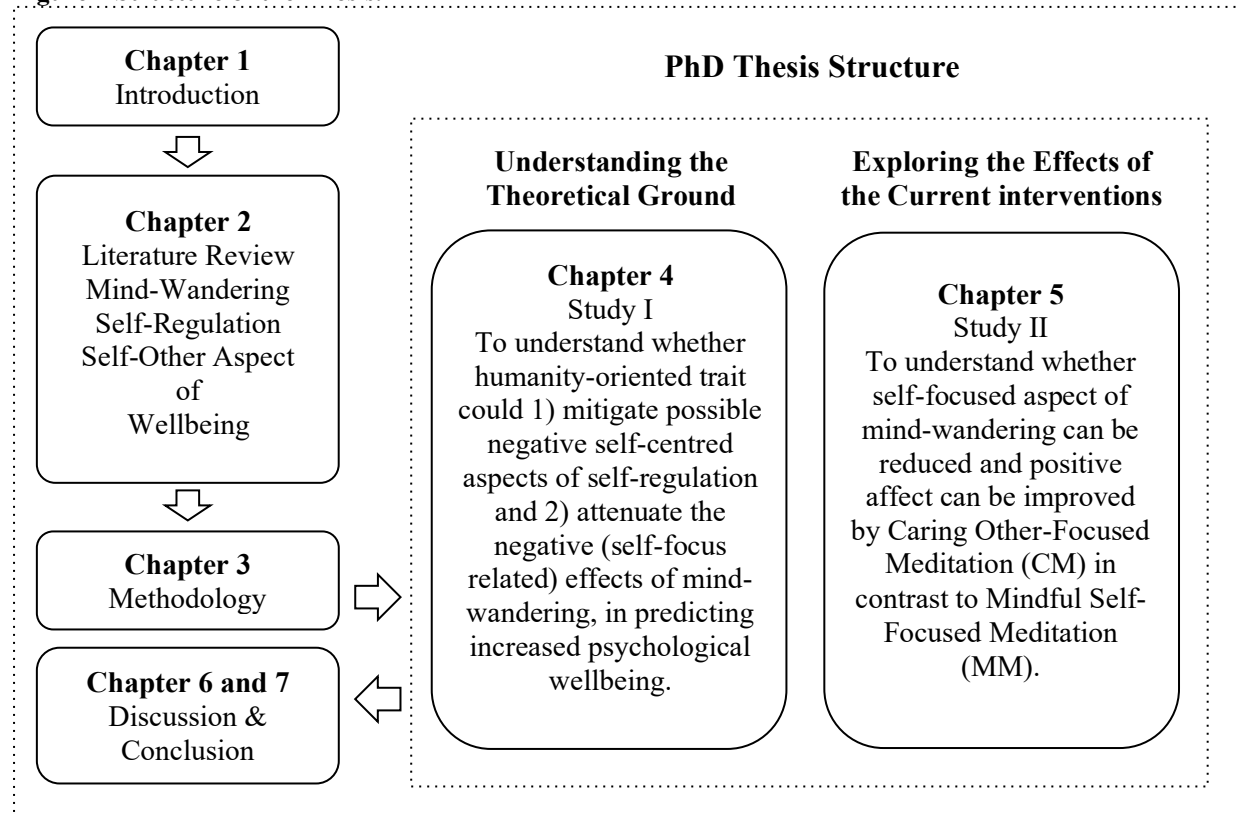
Chapter 3: Methodology. Chapter 3 specifies the research methods and methodologies used in this thesis to answer the research questions. The rationale for conducting a cross-section study in Chapter 4 and a randomized-controlled study in Chapter 5 and the statistical approaches towards such study designs are explained. The chapter also introduces the research measures and meditation-induction materials used in this thesis. Finally, psychophysiological measures of heart rate variability are introduced in relation to self-regulation and mind-wandering, as these were intended for use in an experiment which was not possible to execute due to the Covid-19 restrictions.

Chapter 4: Humanity-Oriented Trait as a Predictor of Psychological Wellbeing, Mind-Wandering, and Self-Regulation. Chapter 4 presents a cross-sectional study, conducted to understand the relationship of self-regulation, mind-wandering, and humanity-oriented trait in relation to psychological wellbeing. This chapter addresses the research aim II. Chapter 4 contains a Structure Equation Model validating the Light Triad Scale in Chinese, a correlation matrix indicating the relationships among key variables, a hierarchical multiple regression model assessing the role of humanity-oriented trait in the relationship of self-regulation and wellbeing, and a mediation analysis addressing the contribution of humanity-oriented trait in the relationship of mind-wandering and wellbeing.

Chapter 5: Impact of Mindfulness and Compassion Induction on Self-Other Related Mind-Wandering and Wellbeing: a Randomized Controlled Study. Chapter 5 presents findings from a randomized controlled study, which aimed to understand the effects of brief mindful self-focused and caring other-focused meditations on self-focused and other-focused mind-wandering thoughts in relation to one's wellbeing compared to the attention control group. This chapter addresses the research aim III. Chapter 5 contains a mixed-design ANOVA, comparing changes in mind-wandering and affect after a brief mindful self-focused meditation, caring other-focused meditation, and attention control inductions.

Chapter 6 and Chapter 7: Discussion and Conclusion. Chapter 6 and 7 highlight the significance of the findings. It discusses the research contribution and innovation added to the current literature on self-regulation, mind-wandering and wellbeing. Chapter 6 also presents the limitations, provides future research focuses, and discusses educational implications.

Figure 1 Structure of the Thesis.



Chapter 2 Literature Review

2.1 Introduction

The first overarching research aim (discussed in Chapter 1 Section 1.2) of this thesis is to understand how self-other aspect of wellbeing have so far been considered and researched in relation to self-regulation, mind-wandering and different types of wellbeing. This aim was developed in order to understand existing theories, particularly to identify gaps in the light of the current social crisis, and to provide a theoretical basis for further research to test the theories with empirical studies. Therefore, the first overarching research question developed based on this aim will be answered in this chapter from a theoretical investigation perspective (i.e., RQ I: based on existing research, how does the self-other aspect of wellbeing relate to one's self-regulation, mind-wandering, and wellbeing?)

This chapter introduces the research backgrounds of the important concepts and discusses their relationships in this thesis. This introduction (Section 2.1) first presents the structure of this chapter. After that, second (Section 2.2), I introduce four wellbeing conceptualizations and demonstrate the importance of self-other aspect of wellbeing. Third (section 2.3), I introduce the research models of self-regulation, a self-focused trait that is closely related to wellbeing and affect. Fourth (section 2.4), I introduce mind-wandering, a concept typically negatively associated with self-regulation, and present the types of mind-wandering and the heterogeneity of mind-wandering. I also introduce mindful self-focused meditation and explain its relationships with mind-wandering and wellbeing.

Fifth (Section 2.5), I introduce the humanity-oriented trait, a caring other-focused trait which might reduce the overly self-focused self-regulation and negative affect associated with more mind-wandering. I consider the Western and Eastern ancient philosophical origins of the humanity-oriented trait and related concepts of self-world capacity and worldview. I also explain that an overly self-focused self-regulation could harm other's wellbeing, and I

introduce the caring other-focused meditation cultivating humanity-oriented thoughts that could attenuate such negative impacts. Sixth (section 2.6), I compare mindful self-focused meditation with caring other-focused meditation in the self-other aspect of mind-wandering and affect. I discuss the self-other distinction in empathic responses. I also consider the role of self-boundaries as a protective factor when cultivating caring other-focused thoughts.

2.2 The Wellbeing Constructs

This section introduces four wellbeing constructs that are closely related to the present study. Although there is no established scientific definition of wellbeing that is widely applied, this study presents three wellbeing constructs that have been used frequently and demonstrate the importance of developing the fourth self-other aspect of wellbeing construct. Specifically, I first introduce Keyes' structure of mental health, providing a broader context to explain the wellbeing construct of psychological, emotional, and social wellbeing and demonstrate that wellbeing is closely related to social interactions. Second, I specifically introduce psychological wellbeing, focusing on wellbeing to improve life meaningfulness. Third, I compare psychological wellbeing with emotional wellbeing using the construct of eudaimonic and hedonic wellbeing from a philosophical standpoint, to demonstrate the difference between life meaningfulness and happiness. Based on the above constructs, fourth, I introduce the self-other focused wellbeing, focusing on the wellbeing in terms of the connection between oneself, others, and the world.

2.2.1 Keyes' Model of Mental Health

Keyes' Model of Mental Health is often used in research to study the structure of wellbeing (e.g., Stewart-Brown, 1998; Surtaeva, 2017). This model encompasses three forms of wellbeing: psychological, emotional, and social wellbeing (Keyes et al., 2010). Social

wellbeing is defined as building and maintaining a healthy relationship between oneself and others, which is also dynamically affected by local or broader communities (e.g. family and community cohesion, ethnic, and social support) (Robitschek & Keyes, 2009). Emotional wellbeing is defined as the ability to manage emotions and adapt to changes, it has a positive impact on improving the quality of life (e.g. happiness, life satisfaction; Robitschek & Keyes, 2009; Stewart-Brown, 1998). Psychological wellbeing is thriving in people's personal life and approaching their expected value potential (Robitschek & Keyes, 2009).

This model provided a comprehensive understanding of the types of wellbeing with specific consideration of the genetic and environmental influencers (Keyes et al., 2010). Keyes's model demonstrated that emotional, social, and psychological wellbeing predict human flourishing (Keyes, 2022). All three wellbeing types constitute a solid structure of mental health. However, as a broader concept, Mental Health encompasses more than just the wellbeing perspective. The World Health Organization defines mental health as an integral component of wellbeing and health (World Health Organization, 2022). Mental health is a complex state that emphasises the ability to simultaneously be concerned with and care for the individual (e.g. coping with stress) and the collective (e.g. contributing to the environment) (World Health Organization, 2022). As both Keyes and WHO define mental health in terms of a broader perspective that encompasses wellbeing, this thesis uses the structure of mental health in line with them to present a broader perspective.

2.2.2 Ryff's Psychological Wellbeing

Keyes' model of mental health presented an overarching construct of mental health in relation to wellbeing. Interestingly, both Ryff and Keyes specifically investigated the concept of psychological wellbeing (Keyes, 2005, 2007; Keyes et al., 2002; Ryff, 1989; Ryff & Keyes, 1995; Ryff et al., 2004; Tangney et al., 2004). In Ryff's theory, psychological

wellbeing refers to the mental capacity to stimulate human potential and achieve life meaningfulness (e.g., Brown & Ryan, 2003; Chan et al., 2019; Durand-Bush et al., 2015; Huppert, 2009). It comprises six factors: self-acceptance (possessing a positive attitude towards self and past life experiences with both good and bad qualities), environmental mastery (controlling and managing complex surrounding context and external activities), positive relationships (trusting relationships with others and consideration of others), personal growth (self-development to improve and be open to new knowledge and experience), purpose in life (sense of direction, goals, and meaning of past and present life experiences), and autonomy (independence and self-governance to make informed and uncoerced decisions) (Ryff, 1989; Ryff & Keyes, 1995). Psychological studies have widely revealed that psychological wellbeing is positively associated with a series of positive personality traits, such as self-regulation, self-efficacy, emotional intelligence, and gratitude (e.g., Fritz & Gallagher, 2020; Salami, 2010; Van Gordon et al., 2014; Wood et al., 2009).

2.2.3 A Comparison of Psychological and Emotional Wellbeing Using the Concepts of Eudaimonic and Hedonic Wellbeing

The study of psychological wellbeing can be traced back to the Western historic philosophies, especially in comparison with emotional wellbeing (e.g., Baumeister et al., 2013), using the concepts of hedonic wellbeing and eudaimonic wellbeing. Hedonic wellbeing refers to subjective feelings of happiness, positive emotion, and satisfaction with life (Ryan & Deci, 2001). The notion of emotional wellbeing links to the early hedonism philosophy in the fourth century B.C. by the Greek philosopher Aristippus of Cyrene (Ryan & Deci, 2001). This philosophy suggests that people should experience maximum happiness and highlights the meaning and pursuit of emotional wellbeing, the ability to approach life

satisfaction and balance positive and negative emotions (Keyes, 2005, 2007; Tangney et al., 2004).

Hedonic wellbeing is often measured as subjective wellbeing in scientific research (Ryan & Deci, 2001), where subjective wellbeing refers to how people evaluate their activities and experiences connecting to social contexts (Clark et al., 2019). For example, when children take the immediate rewards and stop self-regulating themselves to delay their preferred rewards (i.e., the Marshmallow experiment; see section 2.3.3 for detailed discussion), hedonic wellbeing is promoted (immediate smaller rewards vs. delayed preferred rewards). Hedonic wellbeing considers that people approach the fulfilment of their greatest desire and reach the maximum of happiness when they receive the reward.

In contrast with Hedonic wellbeing, Eudaimonic wellbeing describes the actualization of human potential and the achievement of one's true potential. In psychological studies, Eudaimonic wellbeing can be measured by the Psychological Wellbeing Scale (Ryff, 1989), in which psychological wellbeing entails the "perception of engagement with existential challenges of life" (Keyes et al., 2002, p. 1007), which is closely relevant to Eudaimonic wellbeing. Eudaimonic wellbeing can be traced back to the fourth century B.C. when Aristotle described the eudaimonia philosophy as a rational activity of self-actualization.

Comparison of Hedonic/Emotional Wellbeing and Eudaimonic/Psychological Wellbeing can be used to describe many psychological phenomena. For example, in the case of the Marshmallow experiment (see section 2.3.3 for detailed discussion), eudaimonic wellbeing was promoted when children made an effort and actualised their potential to exercise self-regulation. Psychological wellbeing may take a longer time to achieve. People feel the greatest joy when they get the delayed preferred meaningful rewards (more than the immediate smaller rewards), because their psychological wellbeing (from having successfully performed delayed gratification) and subjective wellbeing (from being rewarded) were both

improved at the same time. In another example, students feel happy when they get an offer from an average-level university, but students feel happier when they get an offer from a prestigious university. The latter happiness contains both the joy of receiving a preferred reward (assuming an offer from a prestigious university is the preferred outcome) and the personal growth that rewards their long-term hard work and progress towards career/life goals.

Both psychological wellbeing and emotional wellbeing demonstrated a strong positive association with self-regulation (Fritz & Gallagher, 2020; Hofmann et al., 2014) which will be discussed in the next section (Section 2.3). However, psychological wellbeing appears to be even more important when studying social interactions, as achieving social acceptance and realizing meaning in life encompasses the potentially critical element of interacting with others and the world. This is why this thesis further develops the concept of psychological wellbeing and makes it central to its considerations.

2.2.4 The Self-Other Aspect of Wellbeing

Although some of the psychological wellbeing dimensions (Ryff, 1989) emphasize the relationship with others and the environment, the concept of psychological wellbeing is still predominantly self-focused. For example, the ‘positive relationships with others’ dimension emphasizes one's subjective feelings about one's interactions with others and lacks a sense of how others' feelings are affected by one's own development. This thesis introduces an innovative wellbeing construct that focuses on both oneself and others' wellbeing, i.e., the Self-Other Aspect of Wellbeing.

The self-other aspect of wellbeing emphasizes the relationship between oneself and others, such as whether enhancing one's own wellbeing has an impact on others and the broader environment. Theoretically, this association can be explained by applying

Bronfenbrenner's ecological systems approach. Bronfenbrenner's ecological systems theory captured a complex system in that individuals are influenced by five levels of the surrounding environment. These levels were categorized into the Individual (i.e., sex, age, health, etc.), Microsystem (i.e., family, school, neighbourhoods, etc.), Mesosystem (i.e., etc.), Exosystem (i.e., Friends of family, community, legal services, mass media, etc.), and Macrosystem (i.e., attitudes and ideologies of culture, etc.) (Bronfenbrenner, 1974, 1977; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Evans, 2000). From the vertical perspective of this system, the five systems are also influencing in a time-series manner in the Chronosystem. In the present thesis, as I discussed the importance and the focus of psychological wellbeing, the self-other aspect of wellbeing construct also has a wider inclusion of different influences of wellbeing both towards oneself and others, providing a more complete understanding of psychological studies.

The essential point of the self-other aspect of wellbeing when interacting with others and the world is to emphasize both one's own wellbeing and attention to the wellbeing of others. This section presents this construct from a broader perspective, and this construct will be applied later to explain other theories.

2.3 The Self-Regulation Constructs

A key concept related to wellbeing is self-regulation. Self-regulation refers to the ability that one's self-generated thoughts, feelings, and behaviour can be managed to achieve one's goal accordingly (Boekaerts, 2000; Inzlicht et al., 2021; Kelley et al., 2015). "Self-Regulation", akin to the colloquial notion of "willpower" or "perseverance", is also often used interchangeably with "self-control" (Denise de Ridder et al., 2018; Inzlicht et al., 2021; Uziel, 2018). Self-regulation promotes mental health in many ways. Previous research has largely analysed the association between self-regulation and wellbeing from a wide range of

perspectives (Briki, 2017; Buyukcan-Tetik et al., 2018; Orúzar et al., 2019). For example, higher self-regulation at a young age could predict health and wellbeing in later life (Moffitt et al., 2011). Self-regulation is an important concept and is positively associated with psychological wellbeing, especially in the context of learning (Pandey et al., 2018).

This section discusses self-regulation models that are related to wellbeing. First, I introduce the Cyclical Phase Model of Self-Regulation, illustrating three phases to exerting self-regulation in relation to psychological wellbeing. Second, I extend the Cyclical Phase Model of Self-Regulation and further discuss the Triadic Model of Self-Regulated Learning and the Social Cognitive Theory, identifying the importance of social interactions between oneself and others in exerting self-regulation. Third, I introduce the Marshmallow experiment, a classic experiment in psychology, illustrating that self-regulation could help to achieve delayed preferred awards associated with a sense of meaningfulness and self-achievement (i.e., psychological wellbeing) while immediate rewards are associated with instant positive emotions (i.e., emotional wellbeing). Fourth, I introduce the Dual Processing Self-Regulation Model, discussing the relationship between self-regulating and wellbeing, in which positive affect triggers self-regulation and negative affect impedes self-regulation. Fifth, I further explain that negative emotions associated with passive feelings hinder self-regulation. Sixth, to reduce the passive feelings and increase self-regulation, I explain the importance of using strategies to achieve proactive self-regulation and promote wellbeing. Seventh, I consider the top-down and bottom-up process of self-regulation, discuss how the bottom-up process of self-regulation promotes better wellbeing than the top-down process of self-regulation. These self-regulation constructs will lay a solid foundation for the later sections to discuss the relationship of self-regulation and affective wellbeing from a self-other focused perspective.

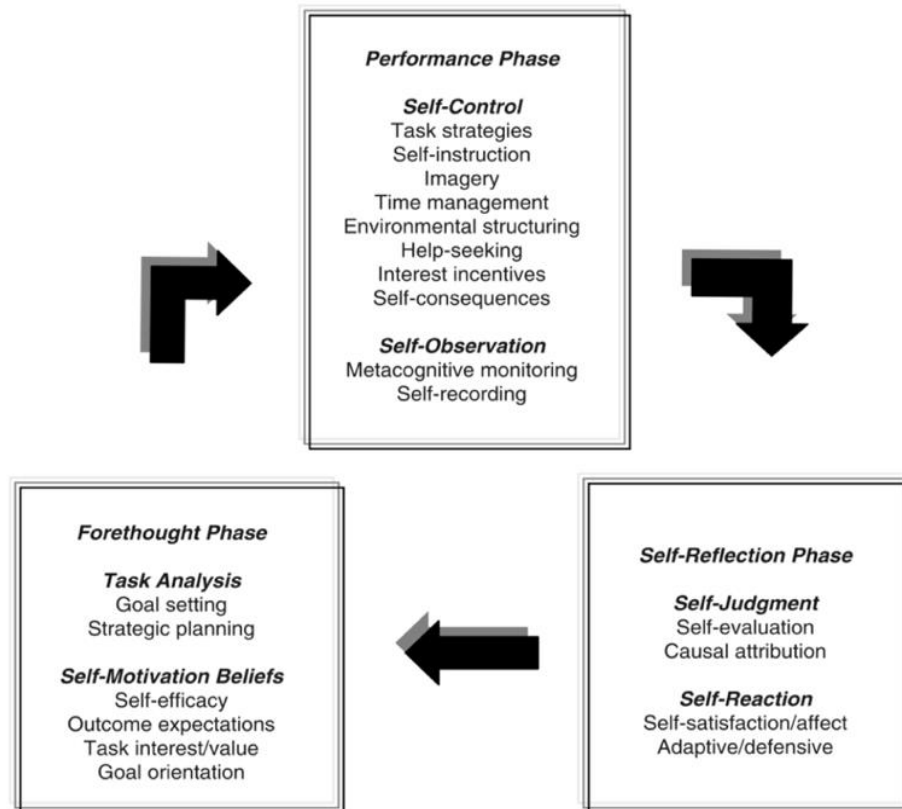
2.3.1 Self-Regulation as a Key Indicator of Psychological Wellbeing: The Cyclical Phase Model of Self-Regulation

As one of the earliest researchers who studied self-regulation, Zimmerman defined a self-regulated learner as someone who metacognitively, motivationally and behaviourally engaged in their cognitive processes in learning (Zimmerman, 1989). Zimmerman specifically investigated the process of self-regulation based on his Cyclical Phase Model of Self-Regulation (Figure 2) formulated in 2009. In this model, he stated that self-regulation is a personal feedback loop with three cyclical phases. First, the forethought phase, the preparation process of willingness where motivation precedes efforts, which includes task analysis and self-motivation beliefs. Second, the performance phase, the process of using strategies to perform tasks while tracking one's performance. Third, the self-reflection phase, the process involves self-judgements and self-reactions after the learning efforts, and it influences a learner's responses feedback back the forethought phase (Zimmerman & Moylan, 2009).

Self-regulation is positively associated with psychological wellbeing (Demir & Çelikkaleli, 2023). Especially, the Cyclical Phase Model of Self-Regulation suggests that as a goal-directed process, many sub-processes are important for implementing self-regulation, such as self-evaluation and the use of strategies (Maes & Karoly, 2005). It is noted that other studies also defined self-regulation in a loop and in relation to enhancing wellbeing. For example, self-regulation can be defined in the “operate” phase in a feedback loop including the four phases including test, “operate”, test, and exit (Tangney et al., 2004), through which the self operates to change itself so that it can break habits, resist temptations, and develop positive habits with self-regulation. These in turn can support wellbeing. The Cyclical Phase Model of Self-Regulation provides a clear understanding of its different phases to enhance

psychological wellbeing from an internal perspective, describing the mechanisms of what's happening inside the mind.

Figure 2 Cyclical Phase Model of Self-Regulation



Note. Figure from Zimmerman, 2009.

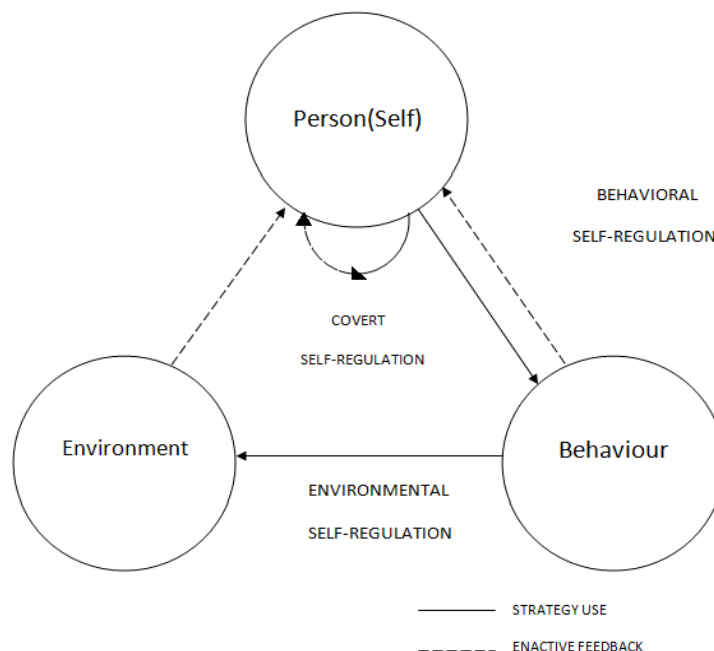
2.3.2 The Importance of Social Interaction Between Oneself and Others in Self-Regulated Learning

While Zimmerman's Cyclical Phase Model of Self-Regulation (Figure 2) focuses on describing internal mental functioning, self-regulation especially in learning is not determined merely by personal processes (Zimmerman, 1989), and the Triadic Model of Self-Regulated Learning (Figure 3) provides an explanation this aspect of self-regulation beyond oneself. The Triadic Model of Self-Regulated Learning explains that human knowledge is acquired as a direct result of observing and interacting with others, and that based on the

outcome of rewards or punishments, the observer will replicate the modelled behaviour (Zimmerman, 1989).

The Triadic Model of Self-Regulated Learning is based on Albert Bandura's Social Cognitive Theory (Bandura, 1991, 1999; Cleary et al., 2012), which provides a broader perspective of social interaction. According to Bandura's Social Cognitive Theory, information acquisition occurs in a social environment where people, behaviour, and environment interact dynamically and form a triadic reciprocal relationship. Human functioning works as a result of the triadic reciprocal interactions among personal (cognitive/affective), behavioural, and environmental factors (Bandura, 1991, 1999; Cleary et al., 2012). Based on the Social Cognitive Theory, Zimmerman developed the Triadic Model of Self-Regulated Learning (Figure 3) from a broader perspective. It represented the interaction of self-regulation in three forms: environment, behaviour and people (Zimmerman, 2000).

Figure 3 Triadic Model of Self-Regulated Learning



Note. Figure 3 from Zimmerman, 1989.

The Social Cognitive Theory is also set in the cognitive process of decision-making. The social cognitive approach of self-regulation was developed through observation and imitation (Zimmerman, 2000, p. 29; Figure 4). First, people observe, learn, and store new modelled knowledge. Second, people imitate the model's strategic performance stored from the first stage. Third, people practice and perform it in a self-regulated manner in the cognitive process. The first two steps only require individual reaction towards self, but the third step requires a further and higher cognitive process towards structured conditions. In the third stage, people process their prior information and make decisions, and self-regulation enables people to perform towards their preferred choices in the cognitive process. This process requires selections of actions or thoughts among many alternative options. Each selection may contain one or more factors with preferred or not preferred choices. People choose a synthesis package solution with a trade-off in a structured circumstance in this decision-making process.

Even though self-regulation was developed based on Social Cognitive Theory from a learning perspective, the Triadic Model of Self-Regulated Learning is not limited to the learning perspective. Learning is the foundation of human behaviour and social interaction because Social Cognitive Theory defines information acquisition (or learning) as the initial step of the social cognitive process (e.g. emotion expression, decision making, behaviour management, interpersonal relationships, etc.). These social cognitive process is operated based on the information accumulated by learning, and then people generate other behavioural and social responses (e.g. emotion management, consumer spending decisions, interpersonal relationships, health behaviours, etc.). These social cognitive processes and responses are important factors in developing social cognitive skills both in learning and in enhancing wellbeing (Kar & Kar, 2017; Santamaría-García et al., 2020).

Figure 4 Developmental Levels of Regulatory Skill Model

Level	Name	Description
1	Observation	Vicarious induction of a skill from a proficient model
2	Emulation ^a	Imitative performance of the general pattern or style of a model's skill with social assistance
3	Self-control	Independent display of the model's skill under structured conditions
4	Self-regulation	Adaptive use of skill across changing personal and environmental conditions

^aThis level was referred to as imitation in prior descriptions.

Note. Adapted from “Attaining Self-Regulation,” (Zimmerman, 2000).

2.3.3 The Marshmallow Experiment: Immediate Smaller Rewards, Delayed Preferred Rewards, and Their Relationship with Affect

The above two sections provided a fundamental understanding of the important factors and processes of self-regulation to enhance wellbeing, this section further discusses the role of self-regulation in a classic psychological experiment, the Marshmallow Experiment, to demonstrate its relationship with both psychological and emotional wellbeing. The Marshmallow Experiment studies the delay of gratification, conducted by Walter Mischel in 1970. In the study, children were told to delay consuming a less preferred reward immediately, so they could receive a preferred reward after waiting for some time (Mischel & Ebbesen, 1970; Mischel et al., 1972). It is a personal preference between choosing an immediate but smaller reward or a delayed but preferred reward. Many scientific studies use the concept of self-regulation in explaining such situations (e.g., Boureau et al., 2015).

Although the Marshmallow Experiment explained that individuals who were able to wait for the preferred reward had better academic and social outcomes in later life (e.g. coping with stress, verbal fluency, social adjustment; Casey et al., 2011; Mischel et al., 1988; Shoda et al., 1990), many people choose immediate smaller rewards to receive the immediate

positive emotions. This might be because the decision-making process includes many factors other than the item of the reward itself, such as the size of the rewards, the time of waiting, and the trade-off between the psychological and emotional change during the wait time of the delay.

On the one hand, getting smaller rewards immediately means getting the pleasure of the moment to promote positive emotional wellbeing, which refers to direct happiness, positive emotion, and satisfaction in life. Many studies demonstrated that emotions are the dominant drive in the decision-making process (e.g., Carver & Scheier, 1982; Wills & Dishion, 2004). People may pursue the fastest and maximum happiness in a decision-making process, although in this case, it comes with the loss of the preferred rewards. It is because in practice, the delay means preferred rewards cannot be guaranteed, and the wait time is indefinite. It is impossible to predict how long the delay will be, whether the reward will be given and the value of the actual preferred reward.

Accordingly, one of the critical determinants of choice preference for delayed rewards is the individual trusting that they will get the delayed outcome that they preferred (Mischel & Ebbesen, 1970). Other studies also discussed the trust and uncertainty about getting future rewards in the rational decision-making process (e.g. the wait time is unclear; the future value is unclear) (Kidd et al., 2013). For example, in the Marshmallow experiment, children trusted that they could get the treats if they waited, even though they were unaware of the duration of the waiting time. Absence of such trust together with the other factors of uncertainty increase the possibility of people choosing an immediate smaller reward rather than a delayed preferred reward in the decision-making process.

On the other hand, although people choosing the preferred delayed reward seem to give up the pleasure at the moment, their wellbeing can be promoted when they get the preferred reward at a later time, especially, when they realize their potential to achieve their

preferred rewards through a series of efforts or waiting. Accomplishing the objective (e.g., getting the preferred delayed rewards, being able to exercise self-regulation) helps people achieve a sense of fulfilment that also promotes their positive wellbeing.

However, if people always give up immediate smaller rewards and exercise self-regulation to wait for the preferred but delayed rewards, they may not be happy until they have acquired the preferred rewards. This is the Puritan Hypothesis (Hofmann et al., 2012), it illustrates that no immediate gratification at all would not contribute to better wellbeing. For example, people eating on a diet does not guarantee that they will lose weight, so they may eat junk food for quick happiness and comfort during the diet process. Thus, this dilemma explains that both the pleasure at the moment (with smaller rewards) and the joy at a later time (with preferred rewards) promote wellbeing, but these represent different categories of wellbeing. The Marshmallow Experiment illustrated the difference between emotional wellbeing and psychological wellbeing and their relationships with self-regulation, which helps to understand that psychological wellbeing is strongly and positively associated with a sense of self-accomplishment and life meaningfulness of expanding the human potential (Baumeister et al., 2013).

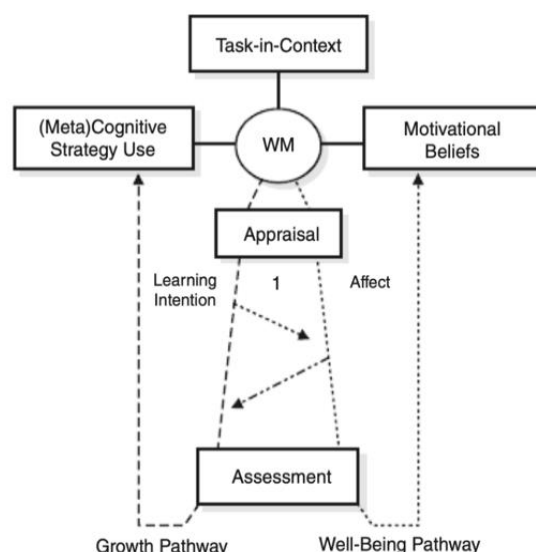
2.3.4 The Dual Processing Self-Regulation Model: How Emotions Affect Self-Regulation

The Marshmallow Experiment implies that exerting self-regulation to promote psychological and emotional wellbeing is a complicated process, and this process can be further discussed using the Dual Processing Self-Regulation Model. Boekaerts developed the Dual Processing Self-Regulation Model in late 1980, based on clinical psychology and emotion regulation (Boekaerts, 2013; Boekaerts & Corno, 2005; Boekaerts & Niemivirta, 2000), and it is one of the earliest self-regulation models (Panadero, 2017).

The Dual Processing Self-Regulation Model is from a psychological perspective associated with many factors (e.g., motivation, emotion, metacognition, self-concept, etc.). Self-regulation is a dynamic and interacting process that compasses two parallel pathways: the Growth Pathway and the Wellbeing Pathway (Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005; Boekaerts & Niemivirta, 2000). The Growth Pathway focused on acquiring knowledge and skills, and the Wellbeing Pathway focused on managing negative emotions and protecting self-esteem during learning (Boekaerts & Corno, 2005).

The Growth Pathway follows a positive emotional cycle. Specifically, people develop positive cognition and emotion if their task goals are consistent with their personal goals and needs (Boekaerts, 2013). This pathway triggers trust, confidence, and commitment to the tasks, and it promotes positive emotions to finish the tasks (Boekaerts, 2013). For example, when students consider a task to be easy, they are moving to the growth pathway, which promotes positive emotion and helps them complete the task. The Wellbeing Pathway, on the contrary, protects the positive emotions during the learning process from being disrupted. Specifically, during the learning process, people prevent themselves when they sense a threat or loss to their ego and harm to their wellbeing (e.g. ego damage, protect one's commitment; (Boekaerts, 2013)). For example, when students detect a cue that a task is difficult or complex that could generate negative feelings, they move to the wellbeing pathway to protect themselves from the negative feelings, because potential failure in the task may hurt their self-confidence and subjective wellbeing.

Figure 5 Dual Processing Self-Regulation Model



Note. Figure 5 from Boekaerts, 2011.

As Figure 5 presented, in this process, an appraisal is firstly made to determine the activation of which pathway, and reappraisal occurs at any time to switch from one pathway to another. More recently, Baumeister and De Ridder stated that trait self-regulation is positively associated with wellbeing. Trait self-regulation helps people support virtues and avoid conflict, thus increasing happiness and promoting wellbeing (Hofmann et al., 2014). This is because the trait self-regulation involves an "active self" with a dispositional characteristic, and it enables control and prioritizes long-term and short-term goals (Baumeister et al., 1998; De Ridder & Gillebaart, 2017). Thus, trait self-regulation predicts wellbeing and enhances wellbeing by promoting goal achievement via inhibiting temptations and fostering a balanced lifestyle and positive emotions (De Ridder & Gillebaart, 2017). The Dual Processing of Self-Regulation suggests that self-regulation is closely linked to affect: positive affect enhances self-regulation, while negative affect impedes self-regulation and prioritises the enhancement of positive affect.

2.3.5 Negative Affects Associated with Passive Feelings Hinder Self-Regulation

Much scientific research revealed that negative affect associated with passive response is negatively related to wellbeing, and this reversely affects their cognition and decision-making process though people initially use it for relaxing (e.g. green space, Facebook; (Holt et al., 2019; Verduyn et al., 2015)). Baumeister explained that passive response impacts people in the decision-making process: people hesitate to make a decision when they have passive feeling associated with negative affect. Baumeister provided evidence to support this. He measured the duration of people who watched a boring movie. He found those people who showed passive response watched it longer if stopping required an active response, and vice versa (Baumeister et al., 1998).

The active response managed/directed by self-regulation draws on an inner source, which Baumeister et al. (1998) call the Ego Depletion Effect. The Ego Depletion Effect describes that self-regulation ability may temporarily be dysfunctional due to previous efforts at control (Baumeister et al., 1994; Inzlicht et al., 2014; Mark Muraven et al., 1998). Experiments have shown that people who resist the temptation of chocolate perform worse when completing difficult puzzle tasks (Baumeister et al., 1998). This means that successfully exercising self-regulation depends on whether one has enough mental resources (or strength, energy).

Therefore, passive responses may stem from people over-regulating themselves beyond their ability to self-regulate (it is different from high self-regulation; Baumeister et al., 1998). For example, in order to achieve the delayed and preferred rewards, some people actively force themselves to resist temptation, and control impulses effortfully. This passive response is acting negatively in self-regulation and decision-making processes. Therefore, under the condition of experiencing passive moods, people need to make an effort and energy to force themselves to do tasks that they currently dislike. This strenuous inhibitory control

requires effort and consumes energy, which further reduces the ability to further exercise self-regulation.

2.3.6 Proactive Self-Regulation Promotes Wellbeing

Baumeister's Ego-Depletion Effect illustrated that effortful and deliberate inhibition control consumes mental resources and leads to a decline in exercising self-regulation, however, using proactive (or effortless) strategies can promote self-regulation without costing mental resources. A proactive strategy uses established models to exercise self-regulation, and it demonstrates stronger effects of self-regulation than deliberate, effortful behaviours (de Ridder et al., 2012). Specifically, the proactive strategy to exercise self-regulation describes an effortless way to enhance self-regulation (Mischel & Ebbesen, 1970; Nielsen et al., 2019; Zimmerman & Moylan, 2009) and improve wellbeing.

Both effortful control and effortless control are active ways of control associated with positive affects (rather than passive moods). Effortful control refers to executive efficiency, such as following commands or regulating attention or behaviour (Eisenberg et al., 2004; Rothbart & Bates, 2006). Effortful control is associated with the development of moral, awareness, empathy responses, and prosocial behaviour, especially in children's early years (Eisenberg et al., 2004), which suggests its positive association to improve wellbeing. Effortless control refers to exercise self-regulation employing strategies (Gillebaart & de Ridder, 2015). For example, creating better environments to avoid temptations (e.g., hiding distractions when studying helps one to focus) is an effortless strategy, because there is no obvious temptation to resist. This effortless control is associated with fewer experiences of temptation, impulse, and hesitation in the decision-making process (Gillebaart & Ridder, 2015; Hofmann et al., 2012).

Many psychological functions and personality traits help to exercise effortless self-regulation, and one of the most important traits in this context is Metacognition.

Metacognition often refers to the thinking about one's own thoughts and includes knowledge, awareness, and regulation of one's own thinking (Zimmerman & Moylan, 2009). Research on self-regulated learning focused heavily on metacognitive processes of self-regulation (Bransford et al., 1983; Davis, 2000; Kizilcec et al., 2017). Flavell first described the concept of metacognition in 1976 as manipulation of one's own thinking to control strategies to achieve goals, and knowing where, why, which, and how to use a particular strategy in a specific task (Flavell, 1979). According to Flavell, the metacognitive process is one of the key determinants of self-regulation (Flavell, 1979). It is a higher level of the cognitive process with the ability to choose the most appropriate strategy during the mental process and apply it to a situation.

In 1999, Boekaerts stated that controlling (or regulating) one's learning process relies on metacognitive knowledge and skills to direct one's learning work (Boekaerts, 1999). Boekaerts described in her Dual Processing Self-Regulation Model that metacognitive knowledge is important to steer one's own learning process when people lack processing capacity (Boekaerts, 2013). She also explained that using a metacognitive strategy in the growth pathway is crucial to expanding one's knowledge and skills in self-regulation (Boekaerts, 2013). In metacognitive processes, self-regulation is both a general and task-specific strategy (Zimmerman & Moylan, 2009). The role of metacognition in self-regulation is to understand the reasons for choices, the process of using them, and where to apply strategies in the decision-making process. Metacognition contributes to self-regulation and improves wellbeing in the process.

2.3.7 The Bottom-Up Processes of Self-Regulation in Promoting Wellbeing

To explain why using strategies can achieve proactive self-regulation, many studies employed the comparison of top-down and bottom-up processes (e.g., Cohen, 2017; Fujita, 2011; Hofmann et al., 2009; Metcalfe & Mischel, 1999; Thaler & Shefrin, 1981). The top-down process, also known as a deliberate system or control system, is a calculated, skill-driven, and effortful mental process. In contrast, the bottom-up system, also known as an impulsive system or automatic system, is a reflexive, instinctive, knowledge-driven, and habitual response (Inzlicht et al., 2021).

For example, the top-down and bottom-up systems can be applied to describe the immediate smaller award and the delayed and preferred award in the Marshmallow Experiment (Mischel & Ebbesen, 1970; Mischel et al., 1972). The bottom-up system is more related to the immediate temptation without further thinking or involvement of a more complex decision-making process, and people can in this way behave in a habitual pattern. Specifically, participants may choose to have immediate happiness by eating treats when researchers ask them to wait for a while, and this immediate and habitual response is supported by the bottom-up system. In contrast, participants in the same experiment who delayed gratification and successfully self-regulated were relying on the top-down system.

However, there are many perspectives from which the top-down and bottom-up processes of self-regulation can be studied. In another example, Bekaerts used top-down and bottom-up processes to describe effortful and effortless control in her Dual Processing Self-Regulation Model (Figure 5; Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005; Boekaerts & Niemivirta, 2000). In this model, Boekaerts defined the growth pathway as a top-down process, in which people proactively realize their value and accomplish goals. In this pathway, knowledge acquisition and task completion are the primary focuses. In memory or goal-driven processes, the top-down process is deliberate.

On the contrary, she defined the wellbeing pathway as a bottom-up process, in which people experience incongruity between their personal goals and the task goals (Boekaerts, 2013; Boekaerts & Corno, 2005). In this pathway, self-protection is the primary focus. Bottom-up processes are reactive, automatic, and rapid in a stimulus-driven process, and they require less mental processing (De Ridder & Gillebaart, 2017; Duckworth & Kern, 2011; Fujita, 2011; Nigg, 2017). For example, infants cry when they are hungry which can be in part the result of a habit formation including the bottom-up mental processes, and it does not require decision-making or resisting of temptation process (Nigg, 2017).

Many researchers believe that self-regulation involves a top-down aspect (proactive process) exclusively (e.g., Duckworth & Kern, 2011; Fujita, 2011), while other researchers study self-regulation and insist that self-regulation should include both proactive (or top-down) and reactive (or bottom-up) processes (Denise de Ridder et al., 2018; Nigg, 2017). For example, Zimmerman's Cyclical Phase Model of Self-Regulation (Figure 2) demonstrated self-regulation can be both proactive and reactive. The proactive self-regulation occurs in the forethought phases, such as using time management strategy to exercise self-regulation, and reactive self-regulation occurs in the self-reflection phase, such as to actively judge and evaluate oneself and perform effortful self-regulation (Zimmerman & Moylan, 2009).

Specifically, in the performance phase, self-regulation and self-observation serve to integrate into performing actions with modelled strategies, including task strategies (e.g. developing a systematic structure with specific components of a task), self-instruction, imagery, time management, environmental structuring, help-seeking, interest incentives, and self-consequences, and self-observation strategies including metacognitive monitoring and self-recording (Zimmerman & Moylan, 2009). Proactively using such strategies to exercise self-regulation has also been scientifically studied with regards to its effectiveness (Mischel & Ebbsen, 1970). The findings showed that children who used strategies to avoid thinking

about or looking at the delayed but preferred rewards successfully delayed their gratification and got the preferred delayed reward.

2.3.8 Summary

The research presented in this section examined the self-regulatory frameworks and their relationship to wellbeing. Although research into self-regulation can be traced back to the last century, and theories and models of self-regulation have also been widely studied, a recent study suggests that the diverse frameworks of self-regulation share an important component of affect and wellbeing (Tinajero et al., 2024). There is no doubt that self-regulation is related to positive wellbeing, as the marshmallow experiment shows that it has an impact on both emotional and psychological wellbeing. Tinajero et al. (2024) highlighted the importance of more positive wellbeing to enhance self-regulation. This section constructed the knowledge base of self-regulation theories and built a bridge linking self-regulation models to wellbeing.

2.4 Mind-Wandering

While self-regulation has been investigated extensively in both theoretical and empirical research, a new and related concept, ‘mind wandering,’ has been noted to be negatively related to self-regulation, particularly in relation to thoughts and experiences that are more closely related to the self and other aspects of wellbeing. Mind-wandering, such as daydreaming and spontaneous thoughts, is a process of thinking that drifts from an ongoing task to thoughts about previously stored information in the brain. Mind-wandering often refers to ‘task-unrelated,’ ‘stimulus-independent,’ and ‘spontaneous’ thoughts in the cognitive psychology literature (Christoff et al., 2016). Mind-wandering has been widely shown to have a negative association with positive affect (e.g., Killingsworth & Gilbert,

2010). More recent studies suggested that mind-wandering content was associated with events that happened in the past or future, to oneself or others (Smallwood, 2013; Wang et al., 2018).

Mind-wandering has been studied in relation to other psychological factors, such as wellbeing (e.g., Mrazek, Phillips, et al., 2013), depression and anxiety (e.g., Christoff et al., 2016), mindfulness and compassion (Allen et al., 2021), meta-cognition (Alkoby et al., 2019; Kok & Singer, 2016), and interceptive awareness which also improves attentional control (Mirams et al., 2013). In this section, I first introduce the classification of mind-wandering, including perceptually guided and self-generated mind-wandering, and deliberately constrained and automatically constrained mind-wandering. Second, I introduce the heterogeneity of mind-wandering, with the time focus and self-other focus in studying mind-wandering. Third, I discuss the self-other focused mind-wandering contents and their relations with wellbeing. Fourth, I introduce the development of the self-other focused mind-wandering in literature. Fifth, I introduce mindful self-focused meditation and consider its relations with mind-wandering and wellbeing.

2.4.1 Types of Mind-Wandering

Mind-wandering has been studied and classified into many different types. For example, many researchers study mind-wandering in a non-intervened and task-free environment, such as daydreaming and creative thinking in daily life (e.g., Christoff et al., 2016; Kucyi & Davis, 2014), and other researchers study mind-wandering using tasks, including assessment of generation of task-unrelated thoughts (Smallwood & Schooler, 2015). The latter studies typically also evaluate whether a task-unrelated mind-wandering is internally or externally oriented and how it relates to cognitive control (Christoff et al., 2016).

This subsection describes two mind-wandering categorizations. I first introduce the categorization of perceptually guided and self-generated mind-wandering. Second, I introduce another categorization of deliberately constrained and automatically constrained mind-wandering. These categorizations are closely related to self-regulation mechanisms and are associated with personal experiences, especially with affective wellbeing. A clear understanding of the evolution of mind-wandering categorization in psychological research helps to contextualize the study and relate it to the personal experiences and emotions of the mind-wandering studied.

Perceptually Guided Mind-Wandering vs. Self-Generated Mind-Wandering

Smallwood and Schooler (2015) suggested that mind-wandering could be divided into different types based on two questions. First, the focus of cognition, whether the wandering thoughts are task-related or task-unrelated. Second, the focus on spontaneity, whether the wandering thoughts are self-generated without prompting from the external environment or the thoughts are perceptually guided by the external environment. These distinctions help examine mind-wandering from a cognitive perspective and understand if the thoughts were generated automatically or probed by distractions.

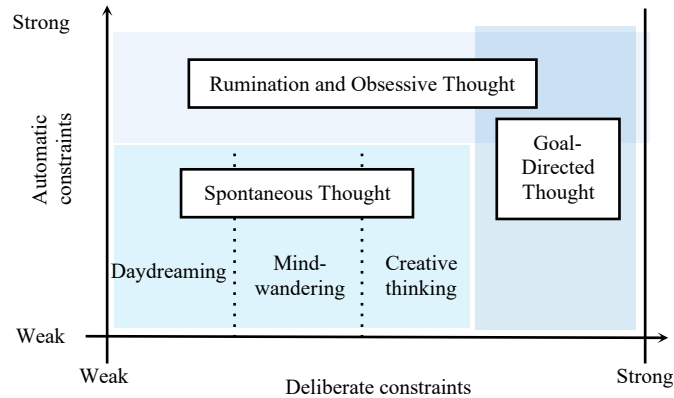
Specifically, under these two distinctions, thoughts can be mapped into a 2 by 2 table that Smallwood and Schooler further defined and provided four scenarios to represent each one of the four thought types (the Figure 1 in Smallwood & Schooler, 2015, p. 491): task-focused thoughts (e.g., focus on the current task), distracted thoughts (e.g., overhearing a phone ringing during a task), self-generated and task-related thoughts (e.g., complaining about a current task), and self-generated but task-unrelated thoughts (e.g., thinking of going on vacation). Under this categorization, mind-wandering can be described as self-generated thoughts that can be either task-related or task-irrelevant. This categorization provides an

initial and clear explanation to understand and locate mind-wandering among the various kinds of thoughts from the perspectives of task-related and self-generated angles.

Deliberately Constrained Mind-Wandering vs. Automatically Constrained Mind-Wandering

Specifically, the self-generated and task-unrelated thoughts (e.g., thinking of a grocery list while working) can be further explained from the perspective of cognitive control (Miller, 2000; Miller & Cohen, 2001), an intentional process of thoughts, emotions, and behaviours to suppress inappropriate habitual actions (Dixon, 2015; Miller & Cohen, 2001) which is sculptured by experience (Miller, 2000). Indeed, Christoff et al. (2016) explained mind-wandering and its relationship to Deliberate Constraints and Automatic Constraints (see Figure 6, adapted from Figure 1 in Christoff et al., 2016). Strong deliberate constraints refer to thoughts generated actively through cognitive control, such as deliberate thinking that brings back the thoughts in a meeting whenever the mind begins to wander. Weak deliberate constraints refer to more flexible generated thoughts, such as dreaming. Deliberate constraints are regulated by cognitive control, whereas the other axis, Automatic Constraints, outlines mental processes which are automatic in nature. Automatic constraints are thoughts generated involuntarily, and people are unable to control them, such as affective salience (i.e., an emotional significance of thoughts, precepts, and mental experience that is generated without cognitive control) (Christoff et al., 2016), see Figure 6 for details.

Figure 6 Conceptual Space Relating Different Types of Thoughts



Note. Adjusted from Christoff et al., 2016.

Specifically, when defining mind-wandering in terms of the level of cognitive control, Christoff et al. (2016) suggested that mind-wandering (e.g., thinking of a grocery shopping list while driving) is less deliberate than “goal-directed thought” (i.e., a reality-oriented thought in a logical sequence, e.g., practising a speech secretly while listening to other competitors’ speeches) and “creative thinking” (e.g., developing innovative solutions to problems), but more deliberate than “daydreaming” (i.e., occurrences of thinking with low levels of awareness and control). Mind-wandering is also less automatic than “rumination and obsessive thought” (e.g., repeated thinking with negative affect).

Importantly, fewer automatic constraints seem to be associated with more wellbeing. Thoughts can be strongly automatically constrained, such as “rumination and obsessive thought”, which are commonly related to depression and negative affect (Chaieb et al., 2022). Thoughts that are strongly deliberately constrained, such as “goal-directed thoughts”, are mostly considered positive because they indicate that the individual is able to focus on the current task deliberately, which is positively related to higher self-regulation and better wellbeing (Cheung et al., 2014).

2.4.2 The Heterogeneous Nature of Mind-Wandering in Relation to Affect

The Heterogeneity of Mind-Wandering

The categorization of mind-wandering helps to understand the context of mind-wandering, especially from a cognitive and affective perspective, especially in relation to personal experience. In mind-wandering studies, more mind-wandering was often considered to relate to more negative affect (Poerio et al., 2013). However, there were also studies which suggested that more mind-wandering was related to better affect (e.g., Franklin et al., 2013) that allows awareness freedom (Smallwood & Andrews-Hanna, 2013). This can be explained by the heterogeneous nature of mind-wandering, with multiple states of different content and underlying cognitive structures (Smallwood & Andrews-Hanna, 2013).

Previous research has found that more mind-wandering was related to more negative affect (e.g., Andrews-Hanna et al., 2013; Killingsworth & Gilbert, 2010; Poerio et al., 2013; Smallwood & Andrews-Hanna, 2013; Smallwood & Schooler, 2006; Tusche et al., 2014). For example, Poerio et al. (2013) found that mind-wandering was associated with negative affect, and the affective content of mind-wandering was both predicted by prior sadness and predicting later mood. Prior sadness also exacerbated the instance of mind-wandering (Poerio et al., 2013; Seibert & Ellis, 1991; Smallwood, Fitzgerald, et al., 2009). In another example, positive and negative affect were mediating factors between mind-wandering and happiness (Salavera & Usán, 2020). However, a growing number of studies suggested mind-wandering was related to positive affect when mind-wandering applies to creativity (e.g., Franklin et al., 2013; Xie et al., 2023) and depending on the wandering contents. For example, mind-wandering has been associated with constructive consequences such as recovery from upsetting and depression (Watkins, 2008).

Time Focus and Self-Other Focus in Studying Mind-Wandering and Affect

The study of mind-wandering content has also explored past- and future-related thoughts (i.e., the time focus) (e.g., Linz et al., 2018; Smallwood, 2013; Smallwood &

O'Connor, 2011; Wang et al., 2018) and self- and other-related thoughts (i.e., self-other focused orientation) in relation to affect (Jazaieri et al., 2015; Kanske, Schulze, et al., 2016; Philipp et al., 2017; Ruby et al., 2013).

Specifically, mind-wandering studies with the time focus suggest lower affect is associated with mind-wandering events about what happened in the past. For example, Smallwood and O'Connor (2011) first investigated the retrospective focus of mind-wandering and its relationship with affects from a specific time range - earlier today, distant past, recent past and future - in lab settings. They found unhappy moods were specifically associated with increased past-related mind-wandering (Smallwood & O'Connor, 2011). In addition, to reduce negative affect, Poerio et al. (2013) suggested distinguishing depression (i.e., rumination) and anxiety disorders (i.e., worry). Depression and anxiety disorders are associated with negative affects and involve repetitive thoughts, they are also co-morbid (Mineka et al., 1998), but in regard to the time focus, depression is more past-oriented while anxiety disorders are more future-oriented (Klinger, 1996; Papageorgiou & Wells, 1999; Watkins et al., 2005). This evidence suggests that not all negative affects associated with mind-wandering are generated from past events (Poerio et al., 2013).

Apart from the time focus, other studies suggest that more negative mind-wandering thoughts were associated with past as well as other-related events (e.g., Ruby et al., 2013), indicating that the affect of mind-wandering thoughts is also related to self and other focused thoughts. Research evidence suggests that caring thoughts about oneself and others reduce wandering thoughts and lower negative affect. Especially, in relation to the self-other focus of mind-wandering, Jazaieri et al. (2015) proposed a new perspective in the study of mind-wandering and found that compassion-based thoughts both towards oneself and others cultivated by meditation training could reduce the frequency of mind-wandering to negative thoughts and increase positive affect. This caring other-focused aspect of wellbeing is an

important component in the self-other aspect of wellbeing and will be further introduced and discussed in the next section (Section 2.5).

2.4.3 Mind-Wandering, Self-Other-Focused Contents, and Their Relations with Wellbeing

Mind-wandering has been systematically studied for nearly two decades (Smallwood & Schooler, 2006), with the concept derived from the study of the mind's capacity for daydreaming (Klinger, 1966). In this subsection, first, I introduce the two areas of research focus in studying mind-wandering: trait mind-wandering and state mind-wandering. Second, I describe the inconsistent findings of trait-state mind-wandering discrepancies in predicting wellbeing in literature, and third, I explain the possibility that trait-state mind-wandering discrepancies and associated affect may be the cause of the inconsistent findings. Fourth, I explain that previous studies have shown that trait-state mind-wandering discrepancies are due to differences in laboratory and everyday life research settings. Fifth, I propose an alternative explanation for the failure to adequately capture the content of mind-wandering due to limited measurement techniques, which may explain the inconsistent results of state-trait mind-wandering discrepancies.

There are two basic types of mind-wandering: trait mind-wandering and state mind-wandering. Trait mind-wandering reflects the habitual experience and thinking patterns in daily life, while state mind-wandering is situation-driven with temporary fluctuations (Rummel et al., 2022). Since trait mind-wandering contents reflect one's habitual thoughts and emotions, it can also be considered an indicator of a person's cognitive flexibility in response to changing circumstances (Mulholland et al., 2023). Cognitive flexibility (also called adaptability or mental shifting) refers to the ability to adapt the thoughts and behaviours to new situations and overcome habitual responses, and it is a core component of

executive control (Diamond, 2013). Trait mind-wandering is linked with better cognitive flexibility, which is also linked to better creative thinking ‘jumps out of the box’ and seeing things from different perspectives (Diamond, 2013). For example, one can step outside of one's self-focused ‘box’ and view things from the perspective of caring for others. However, mind-wandering has been studied from many different perspectives (Smallwood & Schooler, 2015), and is particularly noted for its negative effects on cognitive functioning and mental health and wellbeing.

However, mind-wandering in literature sometimes produces inconsistent results in predicting affect. For example, more mind-wandering is associated with lower executive function (Kane et al., 2017; Keulers & Jonkman, 2019; Moon et al., 2020), decreased psychological wellbeing (Borella et al., 2022; Gaynor & Fitzgerald, 2023), and negative affectivity (Killingsworth & Gilbert, 2010). However, growing numbers of studies suggest mind-wandering also generates positive affect, depending on the thought contents (Ruby et al., 2013; Wang et al., 2018). Some studies indicated the inconsistent findings could be due to the different experimental settings (Borella et al., 2022; Maillet & Schacter, 2016), such as using self-report questionnaires, experience sampling methods, daily life measures or lab-based tasks, and psychophysiological measures.

Specifically, an explanation for these inconsistent findings could involve the varying facets of studying mind-wandering (e.g., state or trait mind-wandering). Different study settings capture different nature of mind-wandering. Trait mind-wandering might be related to the task-unrelated thoughts which arise from intrinsic changes within an individual; while state mind-wandering might be related to the individual's recent experiences that are stimulus-dependent (e.g., Seli et al., 2018). Thus, mind-wandering could be occasion-consistent and also task-specific (Rummel et al., 2022), which leads to different or even opposite results, depending on how the trait or state mind-wandering was captured. These

inconsistent findings were often related to affect. For example, many studies found more mind-wandering is related to a lower positive mood (McVay & Kane, 2009; Poerio et al., 2013; Ruby et al., 2013; Song & Wang, 2012), while other researchers found the opposite (e.g., Franklin et al., 2013; Philipp et al., 2017).

The state-trait discrepancies have been discussed from the perspective of the difference between the lab setting and daily life setting (e.g., Kane et al., 2017; Linz et al., 2019). Specifically, trait mind-wandering has been considered a person-consistent mind-wandering behaviour; state mind-wandering, especially when assessed in labs, has been considered a situation-driven fluctuation in mind-wandering behaviour, and it is unclear whether the observed mind-wandering state reflects the stable mind-wandering in daily life (Rummel et al., 2022). At first, the lab-daily life discrepancies were questioned to cause the state-trait discrepancies (e.g., Kane et al., 2017; Kuehner et al., 2017; Linz et al., 2019; McVay et al., 2009), because the lab environment or the task from the lab computer may impact on participants' thought. However, Rummel et al. (2022) found that lab-related situational factors had little impact on mind-wandering than often assumed. Cantone et al. (2021) also included the types of thoughts that relate to the lab setting to avoid the possible bias that participants got distracted by the lab settings, such as whether the type of thought was triggered by the environment or physical stimuli such as the room temperature.

Another explanation of the inconsistent findings could be due to the limitation of current mind-wandering measure techniques, especially, since data collected in lab settings could not capture sufficient or accurate mind-wandering content in daily life. This is because a key difference between the trait and state mind-wandering is that state mind-wandering could function in a flexible and adaptive manner (Smallwood & Andrews-Hanna, 2013). It is flexible to reflect personal experiences and the thought content changes depending on the task. Due to its adaptive manner, affective wellbeing can be enhanced when the content of the

mind wandering changes, and the content of the mind can be guided by tasks such as meditations. For example, state mind-wandering can be used as a function of generating enjoyable topics of thought that improve positive mood (e.g., Welz et al., 2017).

Theoretically, the concept of the *Content Regulation Hypothesis* (Andrews-Hanna et al., 2013; Andrews-Hanna et al., 2014) demonstrates how mind-wandering content impacts affective wellbeing, suggesting that affect can be shaped by the content of the mind-wandering thoughts.

2.4.4 The Development of Studying Self-Other-Focused Thought-Contents of Mind-Wandering

A clear understanding of the techniques used to capture mind-wandering helps in interpreting the results of mind-wandering studies and the development of the studies. Recent studies of how state mind-wandering content impacts affect have been focused on past or future, self or other, positive or negative, concrete or abstract (e.g., Medea et al., 2018; Ruby et al., 2013). Among these dimensions, two perspectives seem to be key factors in relation to affect: the temporal focus and the self-other focus (Ruby et al., 2013). In this subsection, I introduce the two main research focuses of mind-wandering thought contents. I first introduce the temporal focus in the thought contents of state mind-wandering. I second discuss the research shifts from a temporal focus to a self-other focus. Third, I explain the importance of self-other focus of mind-wandering thoughts accounts for a large portion of the wandering thoughts.

Many studies have used the temporal focus in studying thought contents of state mind-wandering. At first, research on state mind-wandering thought has been focused on the temporal focus, which refers to the time span of wandering episodes appearing from the past or in the future (Smallwood et al., 2009). For example, being unable to focus on a task could

be due to the reason of more focus on unachieved goals from the past (Marchetti et al., 2016), when people ruminate about a situation and how they should have changed it. This could explain findings from previous empirical studies which found a positive association between mind-wandering and negative affect (Killingsworth & Gilbert, 2010; Ruby et al., 2013; Smallwood, Nind, et al., 2009; Smallwood & O'Connor, 2011; Stawarczyk et al., 2013).

The research of mind-wandering in predicting affect also shifts from the perspective of temporal focus to a self-other focus, such as from the perspectives of both temporal and self-other focus (e.g., Ruby et al., 2013) or as a single perspective of the self-other focus (Jazaieri et al., 2015). For example, Ruby et al. (2013) found that other-related thought in combination with past-focused thought generated negative affect in mind-wandering. More recent studies further distinguished the temporal focus perspective and self-other regarding perspective. For example, in a study of highly self-focused narcissistic mind wanders, more mind-wandering was related to more positive valence and more future-oriented thoughts (Kanske et al., 2017). These studies employed a method to assess different kinds of thought perspectives while doing experiments in lab settings (e.g., Christoff et al., 2009).

The self-other focus has been considered a key perspective in studying mind-wandering (Simola et al., 2023; Smallwood et al., 2016). Principle components analysis found nearly half of the mind-wandering thoughts were related to self-focus or the social relation of self and others. Specifically, prior research found Future- and Self-Focused Thoughts (i.e., mindful self-focused thoughts with future-oriented thoughts) account for the highest weighting in mind-wandering thoughts (29% of the observed variance), where Past-Focused Social Thoughts (i.e., thoughts about self and others in the past) accounts for the second highest weighting (19% of the variance) (Smallwood et al., 2016). In addition, when assessing self-other focused mind-wandering thoughts with affect, Ruby et al. (2013) found mindful self-focused and future-oriented thoughts improved positive feelings, even when

current thoughts were negative, while other-focused and past-oriented thoughts generated negative mood, even if current thought content was positive.

The term ‘self-focused thoughts’ discussed in the previous sections refers to mindful self-focused thoughts, because ‘self-focus’ seems to have a negative connotation of selfishness, as opposed to ‘other-focused thoughts.’ Therefore, this thesis uses the term ‘mindful self-focus thoughts’ (or ‘mindfulness self-focus meditation’ in the next section) to indicate the impartial and non-judgmental content of self-focus.

2.4.5 Introducing Mindful Self-Focused Meditation and Its Relationships with Mind-Wandering and Wellbeing

Introducing Mindful Self-Focused Meditation

One of the most common ways to cultivate mindful self-focused thoughts is to practice mindful self-focused meditation (Baer, 2009; Hölzel et al., 2011). Mindful self-focused meditation refers to a guided attention practice to cultivate mindfulness and positive self-focused thinking patterns, which originated in traditional Buddhist meditation. Mindful self-focused meditation originated from Buddhist practices (Monteiro et al., 2015) and is in the secular context commonly referred to as a practice to bring one’s attention to the present moment from a non-judgmental and accepting perspective (Kabat-Zinn, 2003). There are two commonly used mindful self-focused meditation therapies: Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn & Hanh, 2009) and its adjusted version, Mindfulness-Based Cognitive Therapy (MBCT) (Segal et al., 2002). MBCT was developed to treat people with depressive thoughts (Lykins & Baer, 2009). MBCT, on top of MBSR, with an explicit focus on recognizing the symptoms and preventing people with a history of recurrent depression from having another episode (Williams et al., 2008).

However, in Western scientific contexts, the term ‘mindfulness’ is often used interchangeably with the term ‘meditation’. This is due to popularisation of the concept of mindfulness and associated practices in Western mental health and wellbeing research. Different meditations can be applied to different populations and contexts in improving wellbeing (e.g., Godara et al., 2021; Kariyawasam et al., 2023). For example, many meditations aim to help one to calm down and focus on the present, while others aim to cultivate wholesome qualities, such as compassion and caring. These meditations are usually guided, asking the audience to think about certain things, such as focusing on their breath, thinking of someone, or thinking back to a moment that makes them happy.

To better understand the meditations' function and related psychological outcomes, I employ the Mindfulness Map, a meditation classification developed by Levit-Binnun et al. (2021). Although there were other classifications of meditation proposed (e.g., Monteiro et al., 2015), this classification provides a comprehensive perspective on the different uses of the term ‘mindfulness’ describing the most common type of meditation in the current Western psychological context. It classified mindfulness meditation practices into four groups (Neff & Dahm, 2015) that cultivate different psychological outcomes.

Specifically, entry-level meditation practices (M1), such as breath-focused meditation or body-scan meditation, emphasize the cultivation of calmness and concentration on the present moment. As individuals progress in their meditation journey, they may engage in guided meditation techniques of increasing complexity. The second level (M2) emphasizes the cultivation of a neutral and non-judgmental trait. The third level (M3) strives to develop pro-social traits directed towards others. The fourth level (M4) aims to foster deep understanding and recognition of phenomena, including the ability to deconstruct the boundary between reality and mental constructs. These advanced practices involve more specific and nuanced cognitive processes, such as producing blessings or recalling positive

memories, which further enhance one's overall sense of wellbeing. In comparison to entry-level meditations, the more intricate meditations hold the potential to effectively foster long-term personality trait development, which can be used to cultivate trait shifts towards self-other-focused thoughts.

Many meditation practices are described as mindfulness meditation, such as the body scan meditation (e.g., Dambrun, 2016), the breathing meditation (e.g., Cho et al., 2016), and mindful yoga, but they may cultivate different traits with underpinning mechanisms being unclear. For example, a simple guidance for mindful self-focused meditation will ask to “focus on your breathing, feeling your breath in the area of either the abdomen, chest, or nostrils”, which is based on M1 (cultivating to focus on the present moment) but with an added non-judgemental sense from M2 (cultivating towards a non-judgmental and non-criticized sensation). Specifically, most mindful self-focused meditations normally fit into the M1 group and M2 group (Alkoby et al., 2019). This type of meditation improves wellbeing by stabilizing the mental state and reducing mind-wandering (Levit-Binnun et al., 2021) with healthy distancing from the mental contents including affect and grounding of attention on a neutral sensation.

Compared to other meditations, mindful self-focused meditation has an advantage in cultivating the mindful self-focused thoughts, because empirical evidence suggests it increases attention and body awareness (Godara et al., 2021; Kok & Singer, 2016), enhances inhibitory control (Malinowski et al., 2017; Malinowski & Shalamanova, 2017), decreases irrelevant thought content (Kok & Singer, 2016), and reduces probe-caught mind-wandering and response time variability on sustained attention tasks (Turkelson & Mano, 2022). Thus, mindfulness can be considered to cultivate more accepting self-related focus.

Mindful Self-Focused Meditation Increases Positive Affect and Lowers Mind-Wandering

As one of the key meditation types, mindful self-focused meditation has been shown effective in decreasing mind-wandering and increasing wellbeing (Turkelson & Mano, 2022). As introduced previously, mindfulness is a mental capacity to be aware and pay attention to the present with a non-judgmental attitude (Kabat-Zinn, 2003), and higher mindfulness is associated with greater psychological wellbeing (Allen et al., 2021; Bortolla et al., 2021).

The goal of mindful self-focused meditation is “refinement of attentional control to the point where it can be effortlessly used in the cultivation of wholesome emotions and investigation of the nature of consciousness - processes involving voluntarily directed elaborate thought” (Dorjee, 2010, p. 154). There are two types of mindful self-focused meditation used in mind-wandering studies: short-term and long-term mindful self-focused meditations. Short-term mindful self-focused meditation is a similar induced practice that people practice only once for a few minutes (e.g., an 8-min practice; Mrazek et al., 2012), while long-term mindful self-focused meditation is a guided attentional training that people practice daily for several weeks (e.g., 7 weeks; Lusnig et al., 2021).

Both short-term and long-term mindful self-focused meditations have been studied widely and demonstrated its effect in improving positive affect and working performance. Specifically, for long-term meditation, practising mindfulness meditation for weeks helps reduce mind-wandering (Cantone et al., 2021; Lusnig et al., 2021; Morrison et al., 2014), increase positive feelings (Lusnig et al., 2021), and improve working memory (Morrison et al., 2014), especially repetitive thoughts (Cantone et al., 2021). For short-term mindfulness induction, practising it for a few minutes helps reduce state mind-wandering (Bortolla et al., 2021; Mrazek, Franklin, et al., 2013; Mrazek et al., 2012), improve positive feelings (Mrazek et al., 2012), and working memory capacity (Mrazek, Franklin, et al., 2013).

As an entry-level meditation practice, mindful self-focused meditation helps to concentrate on one's awareness of the present and to notice the sensory experience that comes along with the present awareness (Levit-Binnun et al., 2021). Mindful self-focused meditation is considered the foundation for other meditation practices such as those cultivating wholesome emotions, however, the label of mindfulness training has been used in many different ways (Levit-Binnun et al., 2021; Dorjee, 2010). Many studies aim to improve wellbeing by developing certain traits through mindful self-focused meditation, such as improving self-esteem and psychological inflexibility (Tan & Martin, 2015), but the intervention itself has not yet been possible to prove their long-term effects of mindfulness among healthy participants empirically and theoretically (see Dorjee, 2010 for details).

Mindful self-focused meditation is used in a complex way as a non-clinical intervention to enhance wellbeing. For example, Banks et al. (2019) found a short mindful induction reduces negative valenced mind-wandering. Other studies also showed evidence that continuously increasing the state of mindfulness during repeated meditations helps to alter and increase trait mindfulness and reduce suffering (Kiken et al., 2015). Specifically, long-term meditation related to fewer episodes of mind-wandering (Brewer et al., 2011), which also elicited activity in neural networks in several brain regions associated with positive affect (Klimecki et al., 2013; Shen et al., 2020).

It is noted that there is no clear line between what is considered a long-term and short-term mindful self-focused meditation. There may be a difference between several weeks of meditation training and a short introduction to meditation, while there are many other influencing factors, such as whether the meditator is a novice or an experienced practitioner (Lusnig et al., 2021), the language used in meditation (Belardi et al., 2022), etc. A meta-analysis study also suggests that the "dose" of mindfulness meditation as an intervention in affective research is very important and that the "dose" is reflected in the number of mindful

self-focused meditation sessions, duration and length, and the total number of hours of facilitator contact (Strohmaier, 2020). This demonstrates that there might not be a clear delineation between long-term or short-term training, and the effect of mindful self-focused meditation depends on individual differences and many other perspectives.

Research Techniques in Studying Mindful Self-Focused Meditation

The individual difference in thoughts has been studied by prior work (Wang et al., 2018). Indeed, using Experience Sampling (ES) combined with Multidimensional Experience Sampling (MDES) (i.e., a method asking people to report on their thoughts, feelings, and behaviors in real-time or throughout a task (ES) and measure them across multiple dimensions (MDES)), researchers found the self-focus perspective of mind-wandering thoughts is related to more mindful self-focused meditation (Ruby et al., 2013). Specifically, Baer (2009) indicated that mindful self-focused meditation cultivates present-moment experience and non-judgemental sensations, these experiences and sensations help to improve positive feeling because it has an important feature of mindful self-focused attention. Mindful self-focused attention is the awareness including body sensations, cognition, and emotional states, with qualities of non-judgment and acceptance (Ingram, 1990), which explained the mindful self-focused thoughts in the present study.

Thus, these findings suggest that mindful self-focused meditation fosters attention on the part of the mindful self, and improve positive feeling because it has an important feature of mindful self-focused attention. Mindful self-focused meditation could improve positive affect by enhancing accepting non-judgmental attention to the self. Notably, it has been argued that mindfulness meditation reduces negativity not because it reduces the frequency or degree of repetition of negative thoughts, but rather, it alters the thought patterns of people's perceptions of their relationships with their thoughts (Frewen et al., 2008; Logie & Frewen,

2015). Fresco et al. (2007) used the term "decentering" as a concept to describe the psychological process of increased subjective detachment between oneself and one's thinking. This concept is consistent with the present study in that mindfulness meditation helps to focus attention on oneself in an accepting and non-judgmental way.

Several studies have found that the concept of mind-wandering, and particularly the content of mind-wandering, can reflect changes in thoughts influenced by mindful self-focused meditation. This can be explained theoretically using the Content Regulation Hypothesis (Smallwood & Schooler, 2015), which states that mind-wandering episodes of thinking provide evidence of trait change through habitual thinking. Consistent meditation practice shapes and cultivates one's personality traits in part by altering habitual thought patterns, particularly those reflected through cumulative mind-wandering episodes. This may be because mindfulness meditation modulates brain dynamics (neurocognitive functioning) during depressive rumination (van der Velden et al., 2023), which improves positive affect and provides clinical efficacy.

In addition, as an innovative technique for retrieving specific mind-wandering thoughts, the Thought Sampling Paradigm (TSP) can be used by writing down the thought contents such as "my college GPA", and rating these thoughts based on various variables (Andrews-Hanna et al., 2013) (Chapter 3 will introduce TSP in detail). Since using the TSP can reflect thought patterns, it can be a valid method for assessing mind-wandering. It reflects the changing trajectory of thoughts and provides evidence that personality traits can be changed.

Although the self-other focused mind-wandering thoughts have been studied from previous research, a recent study demonstrated that the principal component analysis of ES and MDES data often contains multiple patterns, and the "self-focused" pattern was recently recognized as one of the four main thought patterns (Konu et al., 2021). Specifically, this

pattern includes higher loadings of self-focus (i.e., choose “completely” in the question “my thoughts involved myself”) and positive affect (i.e., choose “positive” in the question “the emotion of my thoughts was”) and a lower loading of other people (i.e., choose “not at all” in the question “my thoughts involved other people”).

2.5 Humanity-Oriented Trait and Caring Other-Focused Thoughts

The previous sections discussed the importance of wellbeing in relation to self-regulation and mind-wandering, such as positive affect can trigger automatic self-regulation, and negative affect is associated with more mind-wandering. Both self-regulation and mind-wandering involve a focus of mindful self, therefore, to improve positive affect and self-regulation and to reduce negative affect and mind-wandering, it is interesting to investigate whether reducing the mindful self-focused thoughts, i.e., improving caring other-focused thoughts, could therefore improve wellbeing and reduce negative affect associated with mind-wandering.

2.5.1 Humanity-Oriented Trait and the Light Triad

The caring other-focused thoughts in the thesis is related to the Humanity-Oriented Trait. The present study developed this concept to describe an other-focused attitude, with the quality of kindness and caring, and a sense of connection and shared humanity towards others and the world. The humanity-oriented trait can be considered to have a strong positive association with the personality traits of caring and other-focused attitudes and a negative correlation with excessively self-focused personalities and attitudes.

Humanity-oriented trait can be cultivated by practicing caring other-focused meditation. In psychological studies, humanity-oriented trait can be presented using a framework that is similar to this construct, the Light Triad. Light Triad comprises three

positive factors to describe a “lighter” wellbeing-related construct associated with higher mindfulness, better mental health, personal growth, and improved positive connection with others and the world, including Faith in humanity, the belief that human beings are fundamentally good; Humanism, emphasizing the dignity and value of every human being; and Kantianism, the belief people should only act in ways that they would want everyone else to act (Kaufman et al., 2019).

Kaufman et al. (2019) posited that the Light Triad was positively associated with many dimensions of growth and wellbeing. Specifically, Light Triad was positively associated with more positive relationships, higher autonomy, and personal growth, which correspond to three of the six facets of psychological wellbeing. Specifically, higher scores on the Light Triad are associated with higher acceptance of others, satisfaction with relationships, and secure attachment style (Kaufman et al., 2019), which was linked to positive relationships. Higher Light Triad scores also correlate with higher autonomy and personal growth (Kaufman et al., 2019). The Light Triad was developed with reference to the structure of the Dark Triad. The Dark Triad consists of three dark personality traits, Machiavellianism, narcissism and subclinical psychopathy, which suggest selfish and malevolent traits in social relationships (Paulhus and Williams, 2002).

2.5.2 The Origins of the Humanity-Oriented Trait

Ancient Western Philosophy of Humanity-Oriented Trait

The notion of humanity-oriented trait has historical roots and has been considered by philosophers in both the West and the East. In Western philosophy, Aristotle and other Greek philosophers bridged the qualities of kindness, caring, and other-focused attitude (closely related to what this thesis presents as the humanity-oriented trait) with psychological wellbeing and developed the Virtue Ethics to describe such quality. Virtue ethics is a moral

character-based approach to the intrinsic nature of behaviour when faced with challenges, where good character plays a central role (Heintzelman, 2018; Hursthouse, 1999). Virtue Ethics helps to understand the negative effect of high self-regulation combined with socially undesirable consequences of self-focused thoughts, which may be difficult for a person to discover on their own, such as unintentionally hurting others by sharing a photo online of someone without their consent which then incites negative comments. Aristotle also indicated that a critical component of Virtue Ethics is *phronesis*, the moral or practical wisdom to acquire virtue through practice (e.g., Berg, 2020), thus suggesting that such virtue is trainable. It is a dynamic process through learning and habituation in practice.

In theory, Virtue Ethics promotes *eudaimonia*, the pursuit of one's virtuous potential, on which the modern construct of psychological wellbeing is based (Heintzelman, 2018). Ancient Greek Philosophers believed that virtue ethics were traits that could lead to the development of *eudaimonia*. Although researchers found it hard to assess virtue ethics by empirical study, Temiz (2020) conducted a study of 2404 university students from Turkey and found a positive association between Virtue Ethics (measured by the Dispositional Humility Scale; Landrum, 2011) and psychological wellbeing (measured by the Psychological Wellbeing Scale; Ryff & Keyes, 1995). The Dispositional Humility Scale measured the awareness of one's limitations, modest self-presentation, and interpersonal stance that is other-oriented rather than self-oriented (Landrum, 2011), which comprises the factors that represent the aim and meaning of Virtue Ethics.

An important component of Virtue Ethics is the Golden Mean. The Golden Mean describes a personality trait that balances the deficiency and excess characteristics of a virtue. Virtue is defined as the right number of characteristics and is set in the midpoint between two extremes (i.e., vice). For example, in the virtue of "humanity," when we consider "compassion" as the mean, the vice of defective may be the unfeelingness or callousness, and

the vice of excess may be the over-obedience, and neither end of the spectrum contributes to the formation of the good traits of "humanity." The Golden Mean functions like a see-saw, where over and under-driving a certain feature doesn't get up to the optimum. Table 1 below demonstrates the relationship of a virtue: its deficiency, mean, and excess. In the context of the present study, the term "humanity-oriented trait" refers to virtues such as kindness, compassion, and generosity. The "Golden Mean" helps to understand people's thoughts about the motivations for their behaviour, namely that neither a deficiency nor an excess of a virtue optimizes the humanity-oriented trait of oneself and others.

Table 1 The Golden Means: deepening within the mean versus beyond the mean.

The Golden Mean			
	Ex: stinginess	Ex: kindness	Ex: manipulative
	Vice of Defect		Vice of Excess
Virtue	Deficiency	Mean	Excess
Humanity	Harsh/Cruel	Kindness	Manipulative
	Unfeeling	Compassion	Obsequious
	Stinginess	Generosity	Indulgent
	Socially awkward	Social Intelligence	Profligacy
Courage	Cowardice	Bravery	Recklessness
	Laziness	Persistence	Zealot
	Inauthenticity	Integrity	Righteousness
Transcendence	Ungrateful	Gratitude	Suppliant Behaviour
	Hopeless	Hope	Foolishness
	Spiritlessness	Spirituality	Fundamentalism

Note. Table adjusted from Crossan et al. (2013, p. 574).

Ancient Eastern Philosophy and the Humanity-Oriented Trait

In alignment with the Greek philosophy of Virtue Ethics, an Eastern ancient psychologist and philosopher, Wang, YangMing, also found virtue can be practised in promoting wellbeing (originally developed by Mencius). Wang, YangMing proposed the

most distinctive and well-known doctrine, “Unity of Knowing and Acting (zhī xíng hé yī)” (Nivison, 1967), describing knowledge and action should be connected and support each other. This notion can be interpreted from three critical elements: Knowing, Acting, and Unity. Knowing is a rule-driven top-down process to judge what is good and bad, which virtue ethics can be considered as Knowing. Acting is exerting effortless control in a skill-driven bottom-up process, such as using intervention and strategy to exercise self-regulation. Unity is a loop or cycle to transition from Knowing into Acting, from a top-down system to a bottom-up system, and it is a process to form habit into traits. In other words, Acting is using intervention or strategy and practice until it forms a habitual trait. The notion of Unity of Knowing and Acting can be applied in discussing the combination of humanity-oriented trait and self-regulation, where humanity-oriented trait stands for “Knowing” and self-regulation stands for “Acting”, and the effortless bottom-up process of self-regulation as acting requires a prior humanity-oriented knowing to guide the behaviour to promote wellbeing for both oneself and others.

An important implication of Wang, Yang Ming’s framework is that people can train themselves to exhibit virtue in their actions, and these actions can form habits. Virtue is related to humanity-oriented principal to guide people’s behaviour. Wang, YangMing argued that once people cultivate themselves to approach LiangZhi (i.e., virtue), it becomes an automatic response to “loosen the grip of selfish desires”, and ultimately people will benefit from it (Ivanhoe, 2013, p. 60). Importantly, Both Aristotle and Wang, YangMing indicated that if people can be virtuous, all the right things will be achieved effortlessly (i.e., proper functioning). This notion suggests virtuous, humanity-oriented trait, and other-focused thoughts contribute to a person's own wellbeing and help to exert self-regulation and achieve goals.

2.5.3 Self-World Capacity and Worldview in the Humanity-Oriented Trait

To further expand the concept of humanity-oriented trait and discuss its relationships with wellbeing, two current psychological concepts are particularly relevant as they share a similar scope when viewing the big picture of the connection between oneself, others, and the world in relation to wellbeing. These two concepts are the Self-World Capacity and Worldview. The section below introduces the two concepts and discusses their relationships with the humanity-oriented trait.

Self-World Capacity

A main predictor of psychological wellbeing is the recently formulated Self-World Capacity (Dorjee, 2024). Self-World Capacity refers to the neuro-cognitive-affective processes to develop the capacity comprise a sense of self, connection to others, and an ethically-grounded value-orientation including prosociality, compassion, etc. (Dorjee, 2024). The Self-World Capacity enables one to see the self, the broader reality and the world, and the connections between each other with positive and humanity-oriented attitudes. In other words, Self-World Capacity suggests that people view themselves and their surroundings from a broader perspective such as the one described in Bronfenbrenner's ecological theory and have beneficent personality characteristics to behave in line with this wider view.

Self-world capacity encompasses five facets (in brief): Facet of Shared Humanity (a non-judgemental and kind thoughts of self and others), Facet of Connections (a wholesome connection between oneself to closed surroundings, wider community, and nature and spirituality), Facet of Agency (Making a Difference; the prosociality), Facet of Purpose in Life (a central vision of life based on what's most important), and Facet of Flexible Self (a self-perception that is based on ethics, good relationships, prosociality, and flexibility) (Dorjee, 2024). Specifically, two core elements, "Shared Humanity" and "Connection" in the

self-world capacity construct, share the same features with the humanity-oriented trait. They both deliver a sense of what's happening to others and the world and have loving-kindness personality traits and attitudes to direct the behaviour.

Worldview

In addition to the Self-World Capacity, Worldview is a concept related to the other-focused humanity-oriented trait. Worldview is defined as the fundamental belief that people accept others and believe in goodness. Kaufman et al. (2019) revealed a positive association between Light Triad and Worldview.

In the Kaufman et al. (2019) study, worldview was measured by the Cognitive Triad Inventory (CTI) (Beckham et al., 1986) including three dimensions: view of self (e.g., “I am a worthwhile human being”), view of future (e.g., “The future holds a lot of excitement for me”), and view of the world (e.g., “The important people in my life are helpful and supportive”; Beckham et al., 1986; McIntosh & Fischer, 2000). Specifically, Light Triad is significantly positively associated with all three dimensions and the total score of CTI (Kaufman et al., 2019). That means people with higher Light Triad scores (i.e., more humanity-oriented trait) have a more benevolent view of themselves and their surroundings and have more human-centred traits and social-friendly behaviours.

Additionally, in the Kaufman et al. (2019) study, Light Triad was significantly positively associated with worldview (measured by the CTI view of the world at the $p < .01$ level), only after controlling the agreeableness trait (i.e., warm, friendly, and tactful; measured by the facet of Big Five Agreeableness) and honesty trait (i.e., fairness, modesty, sincerity; measured by HEXACO Honesty-Humility dimension of personality) (Kaufman et al., 2019). The agreeableness trait and honesty trait are strongly negatively correlated with Dark Triad (Ashton et al., 2000; Hodson et al., 2018; Jonason et al., 2013) and independently predicted

the Light Triad in a regression model (Kaufman et al., 2019). This evidence suggests a strengthened correlation between Worldview and humanity-oriented trait after partializing personality traits of agreeableness, friendliness, fairness, etc. The Worldview expresses a broad and fundamental perspective of the world and how one feels, thinks, and acts towards oneself, other selves, and the world predicting better wellbeing. Although this thesis employed Light Triad Scale to measure humanity-oriented trait, the Light Triad construct is not the exact same thing of humanity-oriented trait. The Light Triad is a personality construct that describes a love and kindness orientation towards others, emphasising on altruistic treatment of others, while the humanity-oriented trait describes caring and love, emphasising the self-other aspect of wellbeing in a broader construct of implicit social connection.

Considerations about the humanity-oriented trait and related concepts, self-world capacity and worldview, have practical implications for wellbeing in relation to self-regulation, for example in the context of social crises. These crises (e.g., COVID-19, climate change) require people to exert self-regulation, such as obeying the social-distancing rules during the self-quarantine time. Lacking self-regulation may cause violation of these regulations and increase the contagion risk for others (i.e., behaviour undermining wellbeing of others). A sense of the worldview (or the self-world capacity) increases the experience of being aware of what is happening in the world and paying more attention to the positive connection between oneself and others and the world. Such experience may help improve self-regulation by improving social cognition (Bandura, 1991, 1999) and enhancing the process of the Triadic Model of Self-Regulation Learning (Zimmerman, 1989), which promotes the proactive bottom-up process of self-regulation (Inzlicht et al., 2021). This generates positive affect which supports self-regulation (Boekaerts, 2013; Boekaerts & Cascallar, 2006), leading to better wellbeing and less behaviour undermining wellbeing of others.

2.5.4 How Overly Self-Focused Self-Regulation Can Sabotage Other's Wellbeing

As described above, having a sense of self-other aspect of wellbeing is crucial for coping with social crises. This section will further discuss the negative impacts, which being too self-focused may lead to more behaviour that harms the wellbeing of others. In this section, I first discuss the links between self-regulation and Dark Triad. Second, I examine the negative impact of overly self-focused self-regulation that could generate behaviour undermining wellbeing of others.

The self-regulation models this thesis has discussed above demonstrated the important relationships between self, others, and the wider environment, and wellbeing. However, it is important to notice that overly self-focused self-regulation can also have a negative impact on other's wellbeing. More self-regulation can have the negative effect of undermining the wellbeing of others while using self-regulation as a tool to achieve own goals, and this thesis introduces the concept of Behaviour Undermining Wellbeing of Others to describe such behaviours.

Research indicated that individuals who are better at self-regulating themselves are normally more capable of acting covertly and harming others' wellbeing to achieve their goals (Mathes et al., 2017). For example, a study that investigated whether individuals who administered higher-intensity electric shocks (i.e., behaviour undermining wellbeing of others) during a fake television game show suggested that individuals who administered higher-intensity shocks shared the common trait of greater self-regulation (Begue et al., 2015). This 'bad behaviour' (Mathes et al., 2017) associated with high self-regulation (Mathes et al., 2017) is also believed to be related to the Dark Triad (Begue et al., 2015). Importantly, the Behaviour Undermining Wellbeing of Others proposed in this thesis is very similar to such 'bad behaviours' (Mathes et al., 2017), which is associated with Dark Triad

and other malevolence-related traits (e.g., interpersonal manipulation and callousness; e.g., Jones & Paulhus, 2013; Marcus et al., 2018; Moshagen et al., 2018).

Although research has shown that behaviour undermining wellbeing of others is associated with low self-regulation (e.g., Magar et al., 2008; Mawritz et al., 2017), these research findings cannot explain the higher electric shock applied by people who have better self-regulation ability in the Begue et al. (2015) study. Importantly, when considered from a self-other perspective, high self-regulation is more self-focused, which raises the question of whether less self-focused or more other-focused self-regulation can mitigate the negative effects of behaviour undermining wellbeing of others. In particular, given that the humanity-oriented trait is an other-focused trait, does the humanity-oriented trait attenuate the negative effects of overly self-focused self-regulation in reducing behaviour undermining wellbeing of others?

It is noted that the humanity-oriented trait is different from the morality perspective of self-regulation that previous studies have examined (Baumeister & Exline, 2000), where morality refers to what is right and wrong, and it requires the overriding of the selfish impulse for the sake of the public's interest (Baumeister & Exline, 2000). The morality dimension of self-regulation is a top-down process that embeds effortful control to inhibit behaviour undermining wellbeing of others or resisting selfish goals. Although many studies described self-regulation as effortful control in a top-down approach with a series of mental evaluations, monitoring, and execution (Carver & Scheier, 1998; Panadero, 2017), the humanity-oriented trait can be described as a habitual pattern in a bottom-up system, where people behave without calculating or using mental resources. When self-regulation and humanity-oriented trait work as a combination, humanity-oriented trait automatically guide people's awareness to exercise high self-regulation towards a caring and positive approach to protect other

people's wellbeing. Thus, this study proposes the combination of the bottom-up virtue awareness and top-down self-regulation approach.

Interestingly, the Dark Triad has also been associated with a range of growth outcomes (e.g., self-transcendence, self-efficacy, autonomy), suggesting that certain self-focused and growth-related personality traits can be a tool for achieving personal goals and enhancing self-improvement, but often ignoring the fact of whether or not the use of these tools can harm others. These self-focused and growth-related traits were strongly and positively correlated with both self-regulation and psychological wellbeing. It is also noted that the Dark Triad was strongly correlated with self-focused and growth-related outcomes even after removing the malevolence-related traits (Kaufman et al., 2019), suggesting that behaviour undermining wellbeing of others could be something that comes with the individual development of self-regulation.

Specifically, After removing these malevolence-related traits, Dark Triad was positively associated with agentic extraversion (i.e., a persistent, assertive, pro-active, and achievement-driven trait; (Grodin & White, 2015)). Importantly, agentic extraversion (or agency) represented the personal growth dimension and the purpose in life dimension of psychological wellbeing, where agency demonstrated a positive association with both psychological wellbeing (Kuiper & Borowicz-Sibenik, 2005; Smith et al., 2000) and self-regulation (Pandey et al., 2018). This amended version of the Dark Triad combined with high self-regulation was indirectly associated with better psychological wellbeing (i.e., higher self-regulation linked with higher agency, and higher agency linked to higher psychological wellbeing).

Thus, in order to better manage the negative impact associated with high self-regulation (i.e., behaviours undermining wellbeing of others), it is necessary to examine whether eliminating the associated negative traits could reduce the negative impact on others.

However, it is important to note that these negative traits are the lack consideration of others, especially given that this thesis focuses on the self-other aspect of wellbeing. Is it possible, then, that an increase in the psychological trait of consideration of others could avoid the behaviours undermining wellbeing of others associated with high self-regulation?

2.5.5 Introducing Caring Other-Focused Meditation

While mindful self-focused meditation mainly helps to focus on the self, including body sensations and mental contents, caring other-focused meditation cultivates thoughts and associated emotions that are more other-friendly. Caring other-focused meditation aims to increase the ability to resonate with others, and willingness to help, while maintaining a positive emotional state of warmth and caring (Engen & Singer, 2015; Lutz et al., 2008). In a guided meditation practice, caring other-focused meditation stimulates the imagination to evoke a particular affect. Many meditation types are compassion-based, most common ones being loving-kindness meditation (e.g., Fredrickson et al., 2008) and compassion meditation (e.g., Koopmann-Holm et al., 2020).

For example, in loving-kindness meditation, following the repeated instruction: “May you be happy. May you be peaceful. May you be free from suffering”, the practitioner leads the thoughts to think about others in a calming and attentive mental state. In another example of compassion meditation, the guided instruction include: “Think of a situation in which this person may have suffered. May you be free from this suffering. May you have joy and happiness”. The difference between loving-kindness meditation and compassion meditation is that traditionally compassion meditation is about reducing suffering, while loving-kindness meditation is about wishing happiness for others to increase positive feelings of love and caring (Dorjee, 2012). In secular practices both of these meditation types are often combined. There is also self-compassion meditation (Germer & Neff, 2013), aiming to cultivate a non-

judgemental, caring attitude and kindness towards oneself. This thesis will not consider self-compassion meditation further because the focus of this research is on topics and relevant meditations cultivating caring thoughts and emotions towards others.

These meditations normally fit into the M3, which aims to cultivate wholesome and prosocial mental habits (Levit-Binnun et al., 2021). For example, Leiberger et al. (2011) found an increased prosocial behaviour for participants who had received short-term compassion training, suggests the awareness of compassion can be transferred by receiving prosocial behaviour. Compassion can also be viewed as a strategy in emotion regulation through activating positive affect relying on reward-related and affiliation-related systems (Preckel et al., 2018). Short-term caring other-focused meditation (e.g., four minutes) increases social connectedness (Hutcherson et al., 2008), and long-term compassion meditation (e.g., 40,000 hours of training of compassion-related meditation) reduces anger even for victims of fairness violations (McCall et al., 2014).

Compared to other meditations, caring other-focused meditation has a better advantage in increasing positive affect and decreasing negative affect (Hofmann et al., 2011; Zeng et al., 2015), improving life satisfaction and wellbeing (Gu et al., 2022), and enhancing interpersonal relations and social connectedness (Kang et al., 2014; Shonin et al., 2015; Stell & Farsides, 2015; Zhou et al., 2022). Caring other-focused meditation has also demonstrated its effectiveness in reducing the amount of mind-wandering, increasing other-related thoughts, and enhancing caring behaviours for oneself and others (Jazaieri et al., 2015).

Introducing the Loving-Kindness Meditation and its Possible Negative Affective Impacts

Specifically, Loving-Kindness Meditation is a type of caring other-focused meditation. While mindfulness meditation cultivates more self-focused thoughts, caring other-focused thoughts can be fostered by loving-kindness meditation, because it cultivates

positive feelings of love for all beings (Lee et al., 2012). Loving-kindness meditation has demonstrated its effectiveness in decreasing mind-wandering and increasing positive affect (Feldman et al., 2010). Studies found that it cultivates positive emotions towards others (Fredrickson et al., 2008; Stell & Farsides, 2015; Zeng et al., 2015), enhances feelings of interpersonal connection (Seppala et al., 2014), and bolsters social connectedness (Hutcherson et al., 2008).

Loving-kindness meditation was originally developed from the “Four Immeasurables Meditations” (FIM) practised in the Buddhist context (Sirotina & Shchebetenko, 2020; Zeng et al., 2017) and cultivates the first FIM sequential attitude, the love and unselfish friendliness (Buddhaghosa & Nanamoli, 1964). From a psychological research perspective, loving-kindness meditation can also be considered based on psychological outcomes. For example, in the framework of the Mindfulness Map, loving-kindness meditation fits under the third Mindfulness Practice Group (MG3) aiming to cultivate wholesome and pro-social mental habits (Levit-Binnun et al. 2021). Importantly, wholesome emotions and prosociality require individuals to think of themselves and at the same time have a caring and loving awareness towards others. Indeed, the connection between self, others, and the world (i.e., sense of connection), as well as the caring and loving attitude towards others (Dorjee, 2024) are important elements in flourishing (Dorjee & Roeser, 2022).

However, loving-kindness meditation is a unique meditation in the Tibetan Buddhist tradition that has a different goal and focus and complements compassion meditation. In secular contexts, loving-kindness and compassion meditation often overlap (e.g., Gu et al., 2022), although they usually do not overlap in traditional meditation (Dorjee, 2012). They are also meditations that centre on caring for others. Therefore, this paper uses the term ‘Caring Other-Focused Meditation’ to represent them.

There are long-term and short-term induction of loving-kindness meditation in psychological studies. Long-term practice of loving-kindness meditation has been demonstrated to increase positive affect and wellbeing (He et al., 2015; Logie & Frewen, 2015). Importantly, with regards to self-other perspectives and connectedness between self, others, and the world, long-term loving-kindness meditation increased interpersonal interaction, complex understanding of others (He et al., 2015), perceived positive social connection (Kok et al., 2013), and decreased implicit intergroup bias (Kang et al., 2015). Long-term loving-kindness meditation has been studied widely in psychological studies, while short-term induction of loving-kindness meditation has demonstrated its effects recently. For example, a 7-minute short-term loving-kindness meditation induction increased explicit attitudes toward others (Hutcherson et al., 2008). In another study, a 10-minute loving-kindness meditation improved wellbeing and feelings of connection and decreased self-focused thoughts significantly more than other meditation practices focused on increasing positive affect (Seppala et al., 2014). This study suggested that even a 10-minute induction of loving-kindness meditation can be effective in enhancing wellbeing. This could be due to the change in thinking patterns, such as gaining more sense of loving and caring towards self and others (Kang et al., 2014).

There is currently a controversy in research suggesting that other-focused thoughts can be related to both positive affect and negative affect (e.g., Konu et al., 2021). Specifically, some research indicated that, compared to self-focused thoughts, more other-focused thoughts are related to negative feelings (Konu et al., 2021). This is because thinking of others often comes with the thinking of social relations, which occupies a large portion of the daily mind-wandering thoughts (Konu et al., 2021). The complicated social relations are more likely to cause negative feelings than simply thinking of oneself and/or focusing on the

present moment. Accordingly, loving-kindness meditation requires a more complex thought processing and is recommended for more experienced meditators (Levit-Binnun et al., 2021).

For example, many negative affects were generated from mind-wandering content being closely related to other-focused content, such as the social relation problems (Zhou et al., 2022). Specifically, one may experience disappointment and stress in developing and maintaining social relationships, and this “other-focused mind-wandering content” does not add any positive affect. Another example is that someone who has empathy and compassion for others may be affected and have negative emotions when thinking about other people's problems during mind-wandering.

2.6 The Self-Other Focused Meditations, Mind-Wandering, Wellbeing, and Self-Boundaries

Research indicates that humanity-oriented trait and related constructs (e.g., prosocial behaviour) can be developed through meditation (Luberto et al., 2018). This is because humanity-oriented trait is associated with many compassion-related constructs, such as empathy and prosocial actions, which are enhanced by the practice of meditation (Engert et al., 2023; Franquesa et al., 2017; Himichi et al., 2021). In addition, practising meditation has shown effectiveness in improving self-regulation (Tang et al., 2007), reducing mind-wandering (Lusnig et al., 2021), and improving affect and wellbeing (Allen et al., 2021; Waters et al., 2015; Zhou et al., 2022). These studies demonstrated the effectiveness of practising meditation; however, the mechanisms remain unclear, especially in terms of the self-other aspect of wellbeing of the present thesis, and the categorisation of meditation types is often misused. This section expands the caring other-focused meditation and discusses its relationships with mind-wandering and wellbeing.

2.6.1 Comparison of Mindful Self-Focused Meditation and Caring Other-Focused Meditation in Self-Other Focused Mind-Wandering and Wellbeing

Mindfulness meditation and loving-kindness meditation are representative meditations of mindful self-focused meditation and caring other-focused meditation, respectively. Although both mindfulness meditation and loving-kindness meditation originated in Buddhism and many studies use them in combination, they are different in cultivating self-other related psychological traits (Levit-Binnun et al., 2021). Specifically, mindfulness meditation mostly focuses on oneself, by bringing attention back to breathing and observing one's own thoughts, while loving-kindness meditation focuses on others, by cultivating and evoking feelings of warmth and positive thoughts about others (Kok & Singer, 2016). As mentioned earlier, caring other-focused meditation fits into the M3 (i.e., cultivating prosocial trait and mental state) and increases social connectedness (Kok & Singer, 2017). This is normally done by increasing empathetic response towards others' happiness or suffering and imagining providing help accordingly.

Importantly, both mindful self-focused meditation (mindfulness practices) and caring other-focused meditation (compassion and loving-kindness practices) increase a non-judging and non-attached sense (Logie & Frewen, 2015), positive affect, present focus, and decrease mind-wandering (Kok & Singer, 2016), but they may enhance wellbeing through different paths. For example, mindful self-focused meditation, such as the body scan mindfulness meditation, compared to other types of meditation, cultivates self-focused sensory focus and thoughts, which leads to a greater decrease in the amount of general thought content and a greater increase in state interoceptive awareness (i.e., an ability to perceive internal sensations in the body, such as the heart rate, pain sensations, and emotional sensations; Mirams et al., 2013). Loving-kindness meditation, compared to other types of meditation,

cultivates other-focused thoughts, leading to a greater increase in feelings of warmth and positive thoughts about others (Kok & Singer, 2016).

Despite their documented separable effects, many studies used mindful self-focused meditation and caring other-focused meditation in combination or interchangeably to enhance wellbeing. For example, Kemeny et al. (2012) found that contemplative meditation promotes prosocial response after an 8-week intensive meditation training, which included meditation practices focused on both self (i.e., mindful self-focused training) and others (i.e., caring other-focused training). It specifically increased the recognition of emotions in others and activated the cognitive networks associated with compassion (Kemeny et al., 2012).

However, mindful self-focused meditation and caring other-focused meditation improve wellbeing and reduce mind-wandering through different mechanisms. Jazaieri et al. (2015) expanded the research on the effects of meditation in relation to affectivity change of pleasant, neutral, and unpleasant feelings in regard to self-or-other related mind-wandering thoughts. Specifically, they examined the caring behaviours towards self and others over a 9-week compassion cultivating training program, focusing on improving loving-kindness and compassion for oneself and others. They found practising caring other-focused meditation reduced the negative affect of mind-wandering and increased the positive affect of mind-wandering, and it increased the caring behaviour towards both oneself and others (Jazaieri et al., 2015). Their study adds solid evidence to the present study's statement that both mindfulness meditation and loving-kindness meditation increase positive affect, with mindfulness meditation increasing positive affect by cultivating self-focused thoughts and loving-kindness meditation increasing positive affect by cultivating other-focused thoughts.

Specifically, the research outcomes of caring other-focused meditation are integral components of a more altruistically-oriented state, which also helps to achieve one's own meaningfulness. This can be explained by Baumeister et al. (2013) proposed the theory of

comparing the role between self and others in comparing happiness and meaningfulness of wellbeing: happiness can be achieved from being a taker, suggesting a self-focused perspective, while meaningfulness can be achieved from being a giver, suggesting a caring other-focused perspective. These meditation practices, therefore, emerge as a potential method to mitigate the adverse consequences of overly self-focused wellbeing and promote a more balanced and inclusive approach to wellbeing that encompasses both self and others. The loving-kindness meditation empirical research partially provides evidence of the theory that Baumeister et al. (2013) proposed that being a giver and being a caring other-focused person promotes more life meaningfulness.

2.6.2 The Self-Other Distinction in Empathic Response: Compassion and Empathetic Distress

Both mindful self-focused meditation and caring other-focused meditation can be employed to improve positive affect and enhance wellbeing, through cultivating mindful self-focused or caring other-focused thoughts (i.e., self-other distinct) to generate mindful or compassion-related experiences. For example, Jazaieri et al. (2015) provided an innovative perspective to study self-other-focused mind-wandering and utilized meditation training in their study to cultivate humanity-oriented compassionate thoughts.

However, the empathetic response cultivated from caring other-focused meditation may lead to distress if one over-resonates with someone's negative feelings. There is an independent relationship between empathy, the ability to resonate with other people, and mentalizing, the ability to understand another's mental state (i.e., Theory of Mind) (Kanske, Böckler, et al., 2016). Many caring other-focused meditations cultivate feelings of empathy, connection between oneself and others, and kindness for others, and these feelings generate prosocial motivation and willingness to help (Klimecki & Singer, 2012). However, when one

cannot distinguish oneself from others, it is easy for one to be affected by the experiences of others and then feel distressed (Klimecki & Singer, 2012). Consequently, prosocial motivation and willingness to help diminish and instead produce withdrawal behaviour (Batson et al., 1981; Batson et al., 1983).

To understand the self-other distinction in the context of empathy and compassion, it is necessary to first differentiate between “feeling with” and “feeling for” someone, especially in relating to others’ negative feelings. Feeling with someone is sharing the same feeling and this is a self-oriented feeling, this is aligned with empathy. For example, one feels sad when seeing their friends getting sick. Instead, feeling for someone involves affective feelings of caring and the motivation to help relieve the suffering (Klimecki & Singer, 2012). This other-oriented feeling aligns with the definition of compassion (Jazaieri et al., 2013). It has a clear self-other distinction that one understands others but the motivation to help others reduces the distress related to sharing others’ suffering. Conversely, feeling with does not have a clear self-other distinction that makes an aversive feeling of suffering spread out without an emotional boundary. This refers to empathetic distress, a self-oriented negative feeling with a desire to withdraw (Klimecki & Singer, 2012). This perceived suffering is associated with decreased self-wellbeing, less prosocial motivation, reduced help due to contagious distress (Batson et al., 1981; Batson et al., 1983), and more ruminative thoughts (Stocks et al., 2017), repeated and affectively negative mind-wandering.

More specifically, the reduced prosocial motivation due to empathetic distress was examined by manipulating the ease of withdrawal from seeing other people suffering (Batson et al., 1981). In Batson’s study, participants watch and choose whether to help another person escape from receiving electric shocks. They were assigned to two groups, with either an easy-to-escape condition or a hard-to-escape condition. The researchers found that participants who reported higher compassion had a higher rate of helping the suffering person escape,

irrespective of the ease of escape condition. However, participants with more empathetic distress showed a lower rate of helping even in the easy-to-escape condition, compared to participants who reported more empathetic distress in the hard-to-escape condition (Batson et al., 1981).

Both compassion and empathetic distress include and build on empathy, a general capacity to resonate with others (Singer & Klimecki, 2014). This distinction of other-oriented or self-oriented perspective describes the perceived boundary with others and a subsequent reaction of affectivity when seeing others suffering. This self-other distinction can be applied to differentiate empathetic distress from compassion-related feelings. The self-other distinction can be applied to investigate the underlying mechanisms of meditation types, and it helps to choose the appropriate meditations based on individual differences. For example, to generate other-focused thoughts, when the self-other distinction is clear, an individual may choose to practice any of the caring other-focused meditation to cultivate compassionate feelings. However, when the self-other distinction is blurred and an individual can be easily influenced by the negativity of others, the individual may want to avoid practising the compassion meditation and choose loving-kindness meditation instead, as loving-kindness meditation focuses on unconditional love while compassion meditation focuses on alleviating suffering (Hofmann et al., 2011).

Choosing the appropriate meditation practice is critical to the relationship of personal experiences and habitual thinking, especially in terms of developing mindful self-focused or caring other-focused thoughts. While meditation is often considered a protective training to enhance wellbeing, inappropriately chosen meditations may produce more negative affective thoughts that can unexpectedly increase the frequency of negative mind-wandering and reduce one's wellbeing. Specifically, in practising caring other-focused meditation, it is important to develop a protective trait when one practices caring other-focused meditation to

protect oneself from feeling negative. Such negative impacts that may arise from loving-kindness meditation can be mitigated by developing a sense of self-boundaries, which will be the focus of the next section.

2.6.3 The Sense of Self-Boundaries and It's Relation to Wellbeing

As an important and protective element, the sense of self-boundaries describes an experience of the self as separate from others and the world (i.e., nonself) (Dor-Ziderman et al., 2016). It serves a protective function when practising caring other-focused meditation. It protects against the negative affect associated of mind-wandering of others, or even falling into ruminating about others. In psychological studies, the concept of self-boundaries has also been called the perceived body boundaries (e.g., Hanley et al., 2020) or salience of boundaries (e.g., Nave et al., 2021). Specifically, the salience of boundaries describes how one perceives one's distance from others and the world, or the degree of difficulty to connect to others and the world (Hanley et al., 2020). More salience of boundaries indicates the feeling of being enclosed and far distinct from others and the world (Hanley et al., 2020).

Self-boundary is a particularly important concept and a protective element in caring other-focused meditation. When wishing for others' suffering to be alleviated, it protects the self from pain and the potential impact of negative feelings from others. A sense of self-boundaries distinguishes the non-contagious emotions when "feeling for others" from negative emotions when "feeling with others" (Singer & Klimecki, 2014). In fact, practising loving-kindness meditation helps set self-boundaries and distinguishes empathic distress from empathic concern (i.e., compassion) (Singer & Klimecki, 2014). Specifically, empathic distress refers to a self-focused negative feeling that often arises from seeing others' suffering, and the potential to withdraw from helping behaviour to protect oneself from excessive negative feelings (Singer & Klimecki, 2014). In contrast, empathic concern refers

to an emotional state of compassion towards someone in need, which also includes having a positive regard for them (Niezink et al., 2012).

Importantly, it is beneficial for oneself to set boundaries to reduce empathic distress and thus reduce the potential for withdrawal from helping behaviours. Self-boundary and a caring attitude towards others could contribute to the protective mechanisms in the face of others' distress. This may have a positive impact on one's wellbeing (Dorjee & Roeser, 2022). With self-boundaries, people wish others well and are not affected by pain and negative emotions when offering help, and this in turn enhances helping behaviour towards others. Conversely, people with lowered self-boundaries are inherently susceptible to negative emotional states as a result of interacting with the outside world. This susceptibility is causally linked to a tendency to disengage from pro-social behaviour (Singer and Klimecki, 2014).

A clear understanding of the self-boundaries helps to understand the relationship between oneself and others, especially with a focus on self-other-focused thoughts and wellbeing. An individual with fewer self-boundaries would have lower wellbeing because they would be easily impacted with more empathic distress resulting from 'merging' with negative feelings of others (Singer & Klimecki, 2014). However, this seems to contradict with the research findings that fewer self-boundaries are also linked to better wellbeing (Dambrun, 2016). This is because people who are more likely to lower the salience of their body boundaries, are more open to others and the world, and may therefore also be more likely to experience happiness (Dambrun, 2016). People who are more able to connect with others and the world have more positive feelings towards them, and such feelings are closely related to selflessness, a quality of the humanity-oriented trait with more other-focused thoughts.

Specifically, Dambrun (2016) found that reduced bias and distraction associated with practising body scan meditation induction and more happiness can be mediated by the decrease in perceived body boundaries. This suggests that when cultivating empathy, less sense of self-boundaries is linked with greater happiness and less anxiety (Dambrun, 2016) seems to contradict the theory that more salience self-boundaries could protect oneself from generating empathic distress (Singer & Klimecki, 2014).

This could be due to the different types of meditation used in the Dambrun (2016) study and the Singer and Klimecki (2014) study. Dambrun (2016) used the body scan meditation, which is a kind of mindfulness meditation that cultivates a mindful self-focused sense, while Singer and Klimecki (2014) focused on caring other-focused meditation, cultivating an other-focused sense. Specifically, caring other-focused meditation can enhance the sense of boundaries when connecting with others and the world, while protecting oneself from the negative emotions of others. Mindful self-focused meditation helps to enhance the non-judgement and unbiased perception, thereby reducing the sense of boundaries and better feeling others and the world. Another important distinction from the Dambrun (2016) study is that while more happiness can be mediated by the decrease in perceived body boundaries, the state anxiety was not mediated by the decrease in perceived body boundaries. This also suggests that there might be different mechanisms of the two meditation types on positive affect (i.e., happiness) and negative affect (i.e., state anxiety).

2.6.4 Self-Boundaries in Self-Other Aspect of Wellbeing and Mind-Wandering

Hanley and Garland (2019) investigated the role of self-boundaries (indicated by the Perceived Body Boundary Scale; Dambrun, 2016) in regard to the relation between oneself and others (indicated by the Inclusion of Other in the Self Scale; Aron et al., 1992). They found that more transparent self-boundaries (i.e., less self-boundaries and more extension to

others and the world) are linked to more inclusion of others. Specifically, the notion of selflessness (i.e., more other-focused thoughts) can be used to understand the boundaries between oneself and others. Selflessness increases positive affect by dissolving perceived body boundaries (Dambrun, 2016), so the body boundaries become less salient and one feels more enclosed with others and the world. On the contrary, the notion of self-centeredness (i.e., an “unchanging independent entity with sharp boundaries.” Dambrun, 2016, p. 90) implies that more self-focused thoughts could have more self-boundaries and perceived less happiness and more anxiety.

However, the definition of self-boundaries and the distinction between self and others can be ambiguous (Austin, 1999), especially when self-boundaries serve as an important feature for humans to achieve self-transcendence, an ability to see things beyond the self-focus, with clear awareness and freedom to act (Habermas, 1970; Le & Levenson, 2005; Levenson et al., 2001). Self-transcendence is closely related to an other-focused and humanity-oriented trait (Le & Levenson, 2005), as they both point to something other than oneself and reduce of self-interest. The self-transcendence experience is marked by reduced self-boundaries and increased feeling of connectedness (Yaden et al., 2017).

To further explore self-boundaries, a recent study introduced a spatial frame of reference to explain the process of flexible distinction between the self and the “nonself”, leading to self-transcendence (Yaden et al., 2017). The spatial frame of reference refers to the space where one can perceive one's own thoughts (Hanley & Garland, 2019). Whilst PBBS and IOS have been used to assess self-boundaries, neither of them captures the spatial quality of self-transcendence (Hanley & Garland, 2019, p. 332). In particular, as we discussed in Section 1.1, social relationships can be complicated, and what happened seems far away but may had an invisible impact on people (e.g., wars impact the global economy). Therefore, the Spatial Frame of Reference employed the concept of egocentric frame of reference (i.e.

bounded by bodily boundaries, involving an exclusive internal orientation, or self-centredness) and allocentric frame of reference (i.e. extending beyond the bodily frame into the environment and potentially into everything, or selfless), to describe the instantaneous change from the observer's perspective (i.e., egocentric) to an observer-independent perspective (i.e., allocentric) (Dambrun & Ricard, 2011).

Although both mindful self-focused meditation and caring other-focused meditation increase decentring and positive affect and reduce mind-wandering and negative affect (Logie & Frewen, 2015), it's important to note their self-other focus is different. Caring other-focused meditation, therefore, emerges as a potential method to mitigate the adverse consequences of overly self-focused wellbeing and promote a more balanced and inclusive approach to wellbeing that encompasses both self and others.

In addition, self-boundaries could be an indicator to distinguish the self-other focused thoughts, as Logie and Frewen (2015) suggested, to assess the mechanism behind the positive and negative affect cultivated from self-other-based meditation, and whether the affectivity was related to self-referential processing or other-referential processing. That is, although fewer self-boundaries are associated with more positive affect, it also could work as a protective factor that stronger self-boundaries can be a protective factor to protect individuals with more other-focused thoughts from generating negative feelings.

To better investigate the role of self-boundaries and to study caring other-focused thoughts compared with mindful self-focused thoughts, TSP can be a better choice for assessing self-other-focused mind-wandering, although it can be a complex design in psychological studies. One way to approach this is to guide thoughts through mindful self-focused or caring other-focused meditations. As discussed previously, shifting perceptions of oneself and others through a meditation practice can mitigate the negative effects of wandering thoughts. Indeed, to increase the positive affect and lower mind-wandering,

practising meditation has been studied empirically and showed effectiveness (Kok & Singer, 2016). However, few studies focused on investigating the effectiveness when comparing mindful self-focused or caring other-focused meditation and the role of self-boundaries between them. Meditations, such as body scan meditation and loving-kindness meditation, demonstrated strong abilities in improving positive affect (e.g., Carson et al., 2004; Feldman et al., 2010) and decreasing mind-wandering (Brewer et al., 2011), but the underlying mechanism is different for different meditation types and is likely also the case for meditations cultivating self- or other-focused thinking patterns. These are the questions that this thesis aimed to answer empirically (see Chapter 1 Section 1.2).

2.7 Summary

This chapter achieved the Overarching Research Aim I through theoretically investigated the self-other aspects of wellbeing in relation to self-regulation, mind-wandering and different types of wellbeing. This chapter first compared three often used wellbeing conceptualizations and proposed the innovative self-other aspect of wellbeing. Second, by investigating the self-regulation theories in literature, this thesis highlighted the importance of positive affect in promoting self-regulation. Third, this chapter considered the related and more recently-studied concept of mind-wandering, another self-focused concept, and considered the negative affect associated with more mind-wandering. To expand the self-focused mind-wandering thoughts, this chapter also introduced the mindful self-focused meditation to increase positive affect, reduce mind-wandering, and improve wellbeing.

To compare with the mindful self-focused thoughts, fourth, this chapter introduced the caring other-focused thoughts and humanity-oriented trait, elaborated the sense of others and the world cultivated through the caring other-focused meditation can also improve wellbeing. With the consideration of other-focused thoughts, this chapter also elaborated the

fact that one can sabotage other's wellbeing from overly self-focused self-regulation, and introduced the caring other-focused meditation to attenuate such negative impact. Fifth, this chapter compared the mindful self-focused meditation and caring other-focused meditation improving wellbeing through different mechanism and proposed the protective factor of the sense of self-boundaries when cultivating an other-focused humanity-oriented trait.

Chapter 3 Methodology

This chapter describes the study design, data collecting procedures, methods and techniques used, experimental materials developed, and data analysis in this thesis. Chapter 2 has theoretically discussed how the self-other aspect of wellbeing related to one's self-regulation, mind-wandering, and wellbeing based on existing research (i.e., the Overarching Research Question I in Chapter 1 section 1.2), this chapter introduces research methods and techniques used in the cross-sectional study in Chapter 4 and the randomized controlled study in Chapter 5 to answer the overarching Research Questions II and III. This chapter justifies the design of the empirical studies and the adopted methods in this thesis.

This chapter begins with a methodological consideration to address the two empirical overarching research questions (see Chapter 1 Section 1.2 for details), and what study designs could best answer the two questions. The next section further develops sub-research questions and introduces the recruitment strategies. Third, the specific quantitative research methods that this thesis adopted are discussed in greater depth, including the development and preparation of study materials. Fourth, this chapter introduces the measuring techniques, choice of measures, and quantitative statistical tests and models, and psychophysiological data collecting and progressing techniques. In the end, I discuss the ethical issues linked to research presented in this thesis.

Please note that this chapter describes the psychophysiological measures of Heart Rate Variability in self-regulation and mind-wandering (Section 3.7), which was originally planned to be used in an experiment in the thesis but had to be postponed indefinitely due to the Covid-19 self-quarantine rule. I included this section in this Chapter because it is closely related to self-regulation, mind-wandering, humanity-oriented trait, and affectivity and should have been a part of my thesis, and as such can inform future research to be considered in the discussion chapter.

3.1 Methodological Considerations and Research Design

This section provides the justification of method choices and study design from a philosophical standpoint from three perspectives. First, I discuss the positivism approach of empirical research in study of self-regulation and mind-wandering. Second, I discuss the Levels of Evidence Pyramid to consider a specific study design to address empirical research questions of this thesis. Third, I compare self-report questionnaire approach with psychophysiological approach to provide another perspective on study of self-regulation and mind-wandering.

3.1.1 The Positivism Approach of Empirical Research

The research presented in this thesis uses a positivist philosophical approach. Positivism believes in the existence of an objective reality that can be understood through empirical observation and the scientific method. Although some argue that studies such as a randomized controlled studies involving social interventions could be with realism philosophy (Bonell et al., 2018), the intention of this thesis is to test theories through objective observation and measurement, and it is in line with positivist philosophy stating that carefully measuring and analysing data, especially with numerical data.

3.1.2 Levels of Evidence Pyramid, Study Design and Measure Choices

In order to provide robust evidence, I referred to the Levels of Evidence Pyramid (Ho et al., 2008) when designing the empirical studies, since the pyramid describes the hierarchical strength of evidence for experimental studies. The top of the pyramid includes studies with secondary data or filtered types of studies, such as systematic reviews. Then, the second top tier of studies are studies with primary data, with the rigorous order from top to

down presenting randomized controlled studies, cohort studies, case-control studies, and cross-sectional studies (Guyatt et al., 1995). Although the research model set on top of the Pyramid demonstrates a more rigorous study design and better strength of evidence, it is not feasible to pursue only the highest level in the pyramid in reality, particularly in areas of research which are new and have limited evidence base. The most appropriate research model needs to be selected based on the research questions and the stage of the study.

Study I Design: On this basis, in the present thesis, the purpose of Research Aim II is to explore the relationship among variables. Using cross-sectional study is best fit for this, because it is cost-effective, and can be used to understand relationships in a short amount of time (Wang & Cheng, 2020). Although the cross-sectional study design is considered a type of observational descriptive research and cannot be used to determine cause-and-effect relationships, it allows to collect data from a population at a single point in time to provide initial insights into relationships between variables. It helps to identify trends by testing hypotheses and collect preliminary data for further research. Therefore, a cross-sectional study was designed and conducted to answer Research Question II in Chapter 4 (Study I).

Study II Design: After understanding the relationship of the key variables (Research Aim II), in the next step, the purpose of Research Aim III is to compare mindful self-focused and caring other-focused thoughts generated by guided attention inductions. Using a randomized controlled study design is well-suited for this because it allows comparison between groups and also before and after the guided attention inductions in each group. The randomized controlled study is considered a deductive type of research, which allows for testing hypotheses derived from prior theory and preliminary data. This fits well in Study II, especially after Chapter 2 proposed the innovative theory of self-other aspect of wellbeing and Study I provided initial data in testing this theory. Randomized controlled studies are

considered a higher standard for evidence-based practice, aiming to estimate the causal impact of interventions on the sample (Hariton & Locascio, 2018).

3.1.3 Self-Report Questionnaire Vs. Psychophysiological Index

Although Study I and Study II could provide empirical evidence, both of them used self-report questionnaires in collecting data. The self-report questionnaire, as a commonly used way of collecting data in psychological studies, can be subjective and lack accuracy. To compensate for this limitation, in previous research many researchers used psychophysiological measures accompanied by self-report measures to add stronger evidence, because the physiological indexes reflecting mental health outcomes can compensate for errors in human interpretation and biases of questionnaires. Therefore, at the end of this chapter I describe a psychophysiological measure of Heart Rate Variability that can assess self-regulation and mind-wandering. As a psychophysiological measure, it is more reliable than self-report questionnaires.

3.2 Study Design, Participants Recruitment, and Procedures

This section describes the study design for both empirical studies. For both Study I and Study II, I introduce the Overarching Research Question, explore specific research sub-questions, and discuss the data collecting procedure and participants recruitment strategies.

3.2.1 Study I

Study I is designed to answer the overarching Research Question II: What is the relationship between self-regulation, mind-wandering, humanity-oriented trait, and psychological wellbeing? This study is a cross-sectional study. I first aim to understand the relationships among the key variables, and based on that, I second aim to understand the role

of humanity-oriented trait in the models of self-regulation and mind-wandering in relation to psychological wellbeing. Based on that, I developed the research sub-questions for Study I.

Research Sub-Questions for Study I

1. What are the relationships among self-regulation, mind-wandering, psychological wellbeing, and humanity-oriented trait?
2. Would a model where self-regulation is combined with the humanity-oriented trait predict psychological wellbeing better than self-regulation alone?
3. Can the negative effects of more mind-wandering on psychological wellbeing be mitigated by greater scores on the humanity-oriented trait?

Chinese participants aged 16 years or older were recruited for this study. To recruit participants, I used snowball sampling and convenience sampling strategies, which are sampling methods to recruit participants through a chain referral process and to select participants based on convenience rather than random selection. The online self-report survey (using Qualtrics) was distributed through the administration or receptionist from the several departments at the University of York to the students, and the students shared the link with their friends or classmates. Sample size estimation and power analysis can be found in Study I (Chapter 4) Method section.

3.2.2 Study II

Study II is designed to answer the overarching Research Question III: Do brief mindful self-focused and caring other-focused meditation inductions impact mindful self-focused thoughts and caring other-focused thoughts differently and if so how do such differences relate to changes in mind-wandering frequency and affect? The study is a randomised-controlled experimental study divided with three groups (i.e., caring other-

focused meditation group, mindful self-focused meditation group, and attention control group) conducted at two time points (i.e., pre-test and post-test).

I aim to answer this research question by first assessing the baseline relationship of caring other-focused thoughts with positive affect, and also between mindful self-focused thoughts and caring other-focused thoughts in predicting positive affect. Second, I expand it by cultivating participants with mindful self-focused, caring other-focused, and attention controlled thoughts, and compare mind-wandering and affect across the three groups. Based on that, I developed the research sub-questions for Study II.

Research Sub-questions for Study II

1. Is there a positive association between trait other-caring thoughts and trait positive affect (at the baseline)?
2. Does a higher frequency of caring other-focused state mind-wandering thoughts predict positive affect better than a higher frequency of mindful self-focused thoughts (at the baseline)?
3. Will both Caring Other-Focused Meditation and Mindful Self-Focused Meditation significantly reduce mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, perceived body boundaries, spatial frame of reference continuum) in comparison to the Attention Control condition? Will there be a difference between the Caring Other-Focused Meditation and Mindful Self-Focused Meditation in reducing mind-wandering?
4. Will participants in the Caring Other-Focused Meditation condition show a significantly higher increase in positive affect (or decrease in negative affect) and other-caring thoughts than participants in the Mindful Self-focused Meditation and Attention Control conditions?

Native English-speaking participants over the age of 19 were recruited for Study II to avoid possible misunderstandings and misinterpretations of the self-reports and the guided meditation instructions. To recruit participants, I emailed the study invitations to administrators and secretaries in several departments at the University of York, who then distributed the invitations to students. The invitations contained a general description of the study with a link to Qualtrics where potential participants could fill in their names and contact information. I then contacted potential participants through their personal contact information and set up a time and place for the study if they were still interested in taking part. Since this is a group experiment (participants were tested in groups of mindful self-focused meditation, caring other-focused meditation, and attention control practice), participants know in advance that they will be tested together with other participants.

Unlike Study I which used an online data collection (Qualtrics) questionnaire, this study required a lab experiment approach. Experiments were conducted in classrooms or seminar rooms (labs) on campus. Participants were directed to the testing rooms via prior e-mail contact. The experiment was conducted on weekdays in afternoons to control for mood differences between weekdays and weekends and times of the day. Each experimental session lasted approximately 30 minutes. Participant numbers were determined using sample size estimation and power analysis which can be found in Study II (Chapter 5) Method section.

3.3 Development and Preparation of Study Materials

In order to conduct the empirical studies, there were some preparatory works that needed to be done before data collection. These included, first, translating the Light Triad Scale into Chinese following the WHO procedures for Study I. Second, modification of the three meditation induction scripts for Study II so that the three meditation inductions could be

controlled by the same voice and completed within the same amount of time. This section describes the rationale and procedures followed during these preparatory steps.

3.3.1 Translating the Chinese Light Triad Scale Using the Forward-Translation and Back-Translation Procedures

This section introduces the methods used to translate the Chinese version of the Light Triad Scale to measure the humanity-oriented trait. To assess whether the translated version can be used to measure humanity-oriented trait, I tested the validity to assess whether the Light Triad Scale can accurately reflect humanity-oriented trait and the reliability to assess whether the Light Triad Scale is reliable and consistent with its results. This will be covered on the section of quantitative data analysis in this Chapter (Section 3.5). First, I adopted the WHO forward-translation and back-translation procedures (WHO, 2009) to translate the original English version of the Light Triad Scale into Chinese. The process aims to approach the conceptual equivalent of different language versions to the original English instrument, especially in adapting to different cultures and regions. To achieve this aim, WHO provides a four-step guidance.

First, Forward translation. The translators are recommended to have knowledge of the questionnaire field and understand the culture of English-speaking countries, but their native language should be Chinese (in the case of the present study). The translators should use simple and concise language, target the most common audience, and avoid a word-to-word translation. In the present study, a psycholinguistics researcher did the forward translation work.

Second, Expert Panel. A panel of bilingual experts then identifies and resolves inappropriate expressions and concepts in the translated text. The panel of bilingual expert questions certain words or expressions and suggests alternatives. The result of this process is

to have a fully translated version of the questionnaire. This study involved another psycholinguistics researcher together with the author in completing this step.

Third, Back translation. This step is similar to the first step, to translate the Chinese version from the forward translation back to the original English language. This step focuses on the conceptual and cultural equivalence instead of the linguistic equivalence. In this study, an independent native-English translator with no prior knowledge of the questionnaire conducted the back-translation work.

Fourth, Reconciliation. The panel of bilingual experts compares the original text with the translation and identifies any differences. Then, adjustments are made as needed to optimise the final translation. The check whether there are discrepancies between the back-translation English version with the original English version, the forward-translator and the panel experts should discuss any ambiguous items until reaching an agreed version.

3.3.2 Development of the Guided Attention Induction Materials

The purpose of this section is to describe the development/adaptation of three attention practice inductions (a mindful self-focused meditation induction, a caring other-focused meditation induction, and a controlled attention practice) for the randomized controlled study. These inductions guide individuals in developing mindful self-focused or caring other-focused thoughts. Although this study could have used existing meditation induction practices that have been validated by previous studies, this study required that the three practices were highly compatible with each other and standardised with regards to the same length, script complexity, voice with British English accent, rhythm and timing.

Therefore, I searched existing meditation inductions and control practices and modified them for the particular use of this thesis. I firstly did an initial search from meditation-related studies based on the inclusion and exclusion criteria described below and

have selected 15 guided attention practises. Second, I compared the 15 practices with a specific review from their original empirical studies and narrowed down the selection to five practices. Third, I further compared self- and other-perspective among the five selected potential interventions and selected three practices to modify for this thesis.

Inclusion and Exclusion Criteria For an Initial Search

I listed five inclusion and exclusion criteria for the initial search. First, for caring other-focused meditation induction, the selected practices should be designed to cultivate other-focused thoughts. This precludes meditations such as self-compassion meditation. Second, for mindful self-focused meditation induction, to ensure simplicity and clarity in fostering mindful self-focused thoughts, the induction contents should be in line with MG1 (cultivating attention to the present moment somatic and sensory experience) or MG2 (cultivating a non-reactive and non-judgmental attitude to experience) based on the Mindfulness Map (Levit-Binnun et al., 2021). Third, the practices should have been validated in previous empirical studies to ensure the quality and effectiveness for scientific use. Fourth, the total time and total word counts of the three guided attention practices should be matched in general, such as within 15 minutes, so these can be further modified and tailored to match each other. Fifth, the guided attention practices had to be scripted so that an experienced meditation practitioner could modify and re-record the scripts with the same voice. After an initial search, 15 meditation inductions and practices were included and can be further compared through the self-other focus and control aims (see table 2 for details).

Second-Round Comparison: 15 Guided Attention Practices

Upon the initial search results, I included 15 guided attention practices: five caring other-focused meditation inductions, five mindful self-focused meditation inductions, two attention control practices (for controlled group), and three other meditation inductions (e.g.,

positive affect induction). I further studied whether they have been used or validated with empirical evidence, the total recording time and total number of words, and the total number of positive words (see table 2 for details).

After the second round of comparison, five guided attention practices were included and could be further studied, including two caring other-focused meditation inductions, two mindful self-focused meditation inductions, and a control attention practice. I excluded 10 inductions and practices that were lacking specific self- or other-focused thoughts cultivation (e.g., focusing on emotions), or the total time was either too long or too short, etc.

Third-Round Comparison: Five Selected Guided Attention Practices

For five of these selected guided attention practices, I conducted a close comparison, focusing on the proportion of time spent focusing on the self or focusing on others (see Table 3 for detail). Specifically, I compared the contents to focus on the self and others. Within the contents focused on others, there was focus on Close Ones (L1, i.e., a relative, a close friend, someone with not too complicated a relationship.), Neutral People (L2, i.e., someone from work or school), and Strangers/Worlds (L3, i.e., a dog or a cat), with each class containing “receive love from them” and “send love to them”. Although all three types of ‘others’ involve giving to and receiving love from others, it provides a perspective that these can be done by different people.

In addition, to match the total words and total time and keep the essentials of the three selected guided attention practices, my PhD supervisor, Dr Dusana Dorjee, an experienced psychologist, has adjusted the total words to reduce or expand the recording to approximately nine-minutes recordings. Specifically, Dr Dusana Dorjee reduced the total words for the caring other-focused meditation induction from the original 766 to 727, expanded the total words for mindful self-focused meditation induction from the original 534 to 720, and

reduced the total words for attention control practice from the original 1693 words to 718 words.

As a result, I decided to adopt the Loving-kindness Meditation as the caring other-focused meditation, the Breath, Sound, Body Meditation as the mindful self-focused meditation, both of them were developed from the Mindful Awareness Practices (MAPs) Research at the University of California, Los Angeles (UCLA). The control attention practice is adapted from a short narrative, *The Natural History of Selborne* (White, 1981). For consistency with the present study and to reduce the word count, Dr Dusana Dorjee adjusted the instructions to clearly map onto M1 and M2, so the scripts of these guided attention induction could be matched to each other and were all under 10 minutes. An experienced meditation practitioner who is a native English speaker re-recorded the three guided attention practices so the voice and the rhythm can be matched.

Table 2 Comparison of 15 Guided Attention Practices

#	Category	Reference	Total time	Total Word	Positive word	Empirical Evidence	Decision
1	Caring Other-Focused Meditation	Loving Kindness Meditation - UCLA	9:31	765	N/A	Mindful Awareness Practices (MAPs) Research	Included.
2	Mindful Self-Focused Meditation	Breath, Sound, Body Meditation - UCLA	12:00	534	N/A	Mindful Awareness Practices (MAPs) Research	Included.
3	Caring Other-Focused Meditation	Loving Kindness meditation (Seppala et al., 2014)	13:45	749	91	(Seppala et al., 2014) (Stell & Farsides, 2015)	Included.
4	Mindful Self-Focused Meditation	The Body Scan (Williams & Penman, 2011) Mindfulness: A practical guide to finding peace in a frantic world	14:45	1042	N/A	(Ridderinkhof et al., 2017)	Included.
5	Attention Control	Active listening condition selections from <i>The Natural History of Selborne</i> (White, 1981).	11	1697	0	(Hanley et al., 2020)	Included.
6	Caring Other-Focused Meditation	Loving Kindness meditation (Seppala et al., 2014)	8.15	749	91	(Seppala et al., 2014)	Excluded.
7	Mindful Self-Focused Meditation	Mindfulness-Oriented Recovery Enhancement (MORE) intervention (Garland, 2013)	11	602	N/A	(Hanley et al., 2020)	Excluded.
8	Other Meditation	Relaxation Exercise (Öst, 1987)	5	375	N/A	(Ridderinkhof et al., 2017)	Excluded.

9	Other Meditation	Mind-Wandering Control Exercise (Ridderinkhof et al., 2017) (Tan et al., 2014)	5	325	N/A	(Ridderinkhof et al., 2017)	Excluded.
10	Mindful Self-Focused Meditation	5-minute mindfulness induction (Tan & Martin, 2013, 2015; Tan et al., 2014)	5	N/A	N/A	(Tan & Martin, 2013, 2015; Tan et al., 2014)	Excluded.
11	Mindful Self-Focused Meditation	(Mantzios et al., 2021)	10+			(Mantzios et al., 2021)	Excluded.
12	Attention Control	Neutral Control (Seppala et al., 2014)	8.45	743	0	(Seppala et al., 2014)	Excluded.
13	Other Meditation	Positive Affect Induction (Seppala et al., 2014)	8.15	738	90	(Seppala et al., 2014)	Excluded.
14	Caring Other-Focused Meditation	Lovingkindness Meditation (Salzberg) Note: less on other-regarding dimension	20	N/A	N/A	N/A	Excluded.
15	Caring Other-Focused Meditation	Lovingkindness for a Difficult Person (Salzberg) Note: no transcripts.	10	N/A	N/A	N/A	Excluded.

Table 3 Comparisons of Self- and Other-Perspective among five Selected Potential Interventions

Self/Others	Pure Self	Others: Closed ones (L1)		Others: Neutral People (L2)		Others: Strangers/World (L3)		Total Time	Total Words
		Receive Love	Send Love	Receive Love	Send Love	Receive Love	Send Love		
Guided Attention Practices	Sensation								
Loving Kindness Meditation - UCLA	0	1:33	1:27	0	0	3:00	2:00	9:31	765
Breath, Sound, Body Meditation - UCLA	12:00	0	0	0	0	0	0	12:00	534
Attention Control Task: The Natural History of Selborne (White, 1981).	0	0	0	0	0	0	0	11:00	1697
Loving Kindness Meditation (Seppala et al., 2014)	0	2:55	4:43	0	3:00	0	1:55	13:45	749
The Body Scan (Williams & Penman, 2011)	14:45	0	0	0	0	0	0	14:45	1042

3.4 Data Collection and Analysis Methods

This section introduces the data collection methods. First, this section introduces the mind-wandering research techniques including the Experience Sampling (ES) Method combined with Multi-Dimensional Experience Sampling (MDES) used in many studies, and the innovative Thought Sampling Paradigm (TSP) used in this thesis. Second, this section introduces the key psychometric scales with a focus on the development of these scales and the rationale in choosing them, including self-regulation, psychological wellbeing, self-transcendence, self-boundary, and the spatial frame of reference continuum.

3.4.1 The Measuring Techniques to Capture Mind-Wandering Thoughts

This section introduces the measuring technique to capture mind-wandering thoughts and includes two subsections. In the first subsection, I introduce the most commonly used technique in mind-wandering studies, the Experience Sampling (ES) Method combined with Multi-Dimensional Experience Sampling (MDES), and I also discuss their limitations in recording the details of thought content. In the second subsection, I introduce the Thought Sampling Paradigm (TSP) that this thesis adopted, and how this method could compensate for the limitation of ES and MDES to record a more detailed thought content.

Experience Sampling (ES) Method and Multi-Dimensional Experience Sampling (MDES)

Given the heterogeneous nature of mind-wandering (see Chapter 2 Section 2.4 for details), exploring the thought-capturing techniques in the study of mind-wandering can help to understand personal experiences and habitual thinking about oneself and others. This subsection specifically introduces the measuring techniques to capture mind-wandering thoughts. I first

introduce the Experience Sampling (ES) method and Multi-Dimensional Experience Sampling (MDES), a trending combination technique to capture state mind-wandering contents. Second, I consider using ES to assess mind-wandering and affect in lab settings (task-related experiments) and in daily life settings. Third, I explain how researchers have studied the different outcomes of mind-wandering in the lab and everyday life settings and provide three perspectives for interpreting the difference. Fourth, I expand that ES can be limited in obtaining sufficient content to reflect accurate thoughts, which could be one of the causes of different research findings between the laboratory and everyday life settings.

Chapter 2 Section 2.4 briefly introduced the ES and its combined use with MDES to investigate the mind-wandering contents. For example, many contemporary studies employed the ES method (Weinstein, 2018), a computer or smartphone-based approach that assess each mind-wandering thought and uses Likert-scale (MDES) for evaluating each thought to assess whether participants are currently experiencing mind-wandering, the frequency of such occurrences, and whether the mind-wandering thought is self-or-other-related, or past-or-future-related (e.g., Smallwood & O'Connor, 2011; Smith et al., 2018).

The self-other perspective of mind-wandering originated from using the ES method, and it has been generalised to many psychological studies. In the ES, participants do not need to specifically report the details of the content of their thoughts, nor do they need to consider their relationship to the self or others. They simply provide the extent to which their thoughts involve the self or others by completing the questionnaire items. These self-other related items are designed in the MDES (Smallwood et al., 2016), assessing whether the thought episode involved future events, past events, the participants themselves, or other people, in the form of images, words, etc. Smallwood et al. (2016) first developed the MDES and used it in combination with

ES to provide an early-stage investigation of the self-other aspect of mind-wandering. The ES combined with MDES can be both used in lab setting and everyday life situations.

In lab settings, ES is often designed in combination with task-related experiments. These tasks are used to distract participants or ask them to focus, such as SART (Sustained Attention to Response Task, a GO/NOGO task that has been widely used in mind-wandering research. Robertson, Manly, et al., 1997) and d2-Revision (an assessment of sustained attention and the ability to focus on a task. Brickenkamp et al., 2010) tasks with ES prompts during the task. During the task, the reaction time and the accuracy from tasks could be used as indicators to reflect the change of mind-wandering, in which a shorter reaction time and more accuracy of the task represent reduced mind-wandering (e.g., Cantone et al., 2021). Since the task requires the participants to full concentrate, the ES prob questions embedded in the cognitive tasks (e.g., SART, d2-Revision) attempt to randomly capture off-task mind wandering during task performance (ZanESCO et al., 2024). Specifically, ES and MDES queries appear unexpectedly on a monitor screen while participants are immersed in attention-demanding tasks. For example, during a cognitive task, participants were probed to ask if their mind was wandering on the monitor, how interesting, useful and novel the thoughts were, and a separate question to assess their affect at that moment (Franklin et al., 2013). This approach helps researchers gain insights into participants' immediate thought patterns.

In everyday life situations (e.g., Jazaieri et al., 2015), participants receive periodic ES and MDES prompts on their smartphones to indicate if they are presently engaged in mind-wandering, and their immediate thoughts are collected a couple of times a day for a few or several weeks. This approach has the advantage of linking their state mind-wandering directly with affectivity, because the first question prompted on the smartphone, asks “Are you thinking

about something other than what you're currently doing?" with a direct single choice from "no", "yes, something pleasant", "yes, something neutral", and "yes, something unpleasant".

The difference of using ES combined with MDES between lab settings and everyday situations has also been studied. For example, McVay et al. (2009) conducted an experiment in which participants completed an executive-control task with thought probes using ES combined with MDES (i.e., in lab setting), and then carried portable devices for a week to report their thoughts (i.e., in everyday life setting). Those who reported more mind-wandering during the task in lab also reported more mind-wandering in everyday life, and mind-wandering occurred less when they were feeling happy. However, Kane et al. (2017) found different results when comparing laboratory settings to everyday life settings. They found that mind-wandering is reduced when performing demanding cognitive tasks in a laboratory setting compared to a daily life setting (Kane et al., 2007; Kane et al., 2017). Linz et al. (2019) also found that participants mind wander about different things in their daily lives compared to in the laboratory setting.

This difference between lab and everyday settings can be explained from three perspectives. First, it can be due to the **different correlates and causes of mind-wandering**. Kane et al. (2017) argued that mind-wandering studies based on laboratory experiments alone may be inconsistency, as they found that in the laboratory, mind wandering can be predicted by neuroticism, while in daily life, it can be predicted by openness. Second, it can be due to the **context-dependent feature and the complexity of task**. Some research suggests that the extent of mind-wandering doesn't correlate across experimental contexts, but the content of thought does. For example, mind-wandering thoughts with self-other focused, future-directed, and negative affect associated can translate across contexts (Linz et al., 2019), such as self-directed rumination can generate worries in both the laboratory and everyday life (e.g., the thought of

‘Why do I have problems that other people don't have?’ during high demanding task and in everyday life) (Watkins, 2008; Wong et al., 2023).

Importantly, third, it can be due to current techniques being limited in capturing the complex components of thoughts. While the ES method is effective for assessing the amount of mind-wandering (Weinstein, 2018), it has limitations when it comes to exploring the actual content of the wandering thoughts. Especially, when studying mind-wandering-related affect, participants may confuse one thought episode with other affects, ignoring the fact that their affects may not be generated by a single thought episode. Specifically, Konu et al. (2021) found ongoing thoughts have complex components, such as affective styles, cognitive abilities (Turnbull et al., 2019), which are influenced by both intrinsic features and external environment. For example, participants have less mindful self-focused thoughts and better cognitive ability to focus on details during a complex thought (Turnbull et al., 2019). ES combined with MDES provide a broader understanding, but the complex components related to mind-wandering (Konu et al., 2021) can be difficult to understand by a self-report questionnaire such as MDES, which only rate feelings but may ignore the complex thoughts and experiences that behind those feelings.

Especially, As suggested by Klinger (1984) and in line with Weinstein (2018), one of the most reliable and unbiased methods for collecting data on mind-wandering involves an open-ended approach where participants record each of their thoughts verbatim. ES is effective at providing a broader picture of HOW the wandering thought is related to many perspectives, e.g., self-other related, past-future related, however, it is limited in providing the WHY information, such as the thoughts verbatim, and specifically presenting why certain perspectives are linked to better or worse wellbeing. For example, in using MDES combined with ES, we could find out

whether a mind-wandering content could be related to a past event, other-focused, and negative valence, but what we wouldn't be able to infer is why these dimensions are linked together: whether the negative valence is caused by the past event or other-focused perspective.

Thought Sampling Paradigm (TSP) Captures Mind-Wandering Contents to Examine the Intentional Thoughts

Due to ES being limited in capturing sufficient data to explain the thought contents, this subsection further discusses another method, the Thought Sampling Paradigm (TSP) and its effectiveness in studying mind-wandering thoughts including the aspects ES can't capture effectively. In this subsection, I first introduce the TSP and explain how it compensates for the limitations of ES. Second, I discuss that TSP reveals the awareness of thoughts and possibly reflects the personality behind a wandering thought. Third, I use the notion of Prosociality to discuss how TSP captures self-other related intentional thoughts that the behavioural studies often ignore.

To compensate for the limitations of ES, TSP is effective in capturing specific thoughts and further provides a possible explanation for the occurrence of each thought (Andrews-Hanna et al., 2013) associated with the experience. With TSP, participants are asked to write down their current mind-wandering thoughts using brief three-word descriptions, such as "what to eat" or "my essay deadline." Participants are then asked to rate each thought using a Likert scale similar to the MDES. This method provides more detailed information to delve deeper into the content of mind-wandering thoughts (Andrews-Hanna et al., 2013). TSP is similar to the method "SART with thought probes" in the Stawarczyk et al. (2011) study, where participants write a description of the thoughts they were experiencing during the SART and each thought was assessed by the Thought Characteristics Questionnaire (derived from Johnson et al., 1988) to investigate the

phenomenological characteristics such as affective, repetitive and importance aspects. Compared to this method, TSP extracts more detailed thoughts, as the original study allowed participants to write down 36 thoughts that had recently occurred to them (Andrews-Hanna et al., 2013), which can extract thoughts as specifically as possible.

TSP can also be applied to assess the intentions behind behaviours from the wandering thoughts, and possibly reflects people's personality traits from what they usually think. Due to the heterogenous nature of mind-wandering (Wang et al., 2018), inconsistent findings can arise, particularly when examining the self and other related mind-wandering and linking it to affect, there can be complex thought processes behind the behaviour, i.e. discrepancies between the consequential behaviour and the intended idea (Böckler et al., 2016). That is, the intended idea behind the behaviour (i.e. the motivation) may be different from what the behaviour expresses or appears to others. For example, recent studies have questioned whether behaviour supporting some people's own wellbeing may have a negative impact on the wellbeing of others (Uziel, 2018; Uziel & Hefetz, 2014), e.g., individuals may engage in charitable behaviour as a primary way of seeking self-redemption or alleviating the guilt they feel for harming others.

Indeed, TSP can capture self-other related thoughts that the behaviour studies often ignore. Previous studies identified the difference between pro-social behaviour and altruistic thoughts, where pro-social behaviour can be motivated by a variety of factors (e.g., Jensen et al., 2014; Weinstein & Ryan, 2010), while altruistic thoughts are motivated by the desire to help others without expecting anything in return (Batson & Powell, 2003; Lay & Hoppmann, 2015). Therefore, this difference can be explored and examined from the perspective of self-other aspect of wellbeing using the TSP. Firstly, each thought can be logged and examined from multiple perspectives, such as pro-sociality, motivation, and self-other aspect of wellbeing. Thoughts can

then be further investigated, such as the intentions that led to these thoughts, and their relationship with thinking patterns and personality traits. Therefore, TSP may be a better choice for studying self-other focused thoughts, because TSP can present the thoughts clearly, even in a laboratory setting, these thoughts can be extracted and recorded in detail, and these details can be evaluated from a specific perspective, such as the self-other aspect of wellbeing discussed in this thesis.

3.4.2 Psychometric Scales

This section presents a broader perspective of key variables in the thesis. Although both Study I and Study II contain a ‘Measures’ section, they focus on providing instructions on how the scales were used in the studies in a research publication format. This section provides a more in-depth explanation of the choices made about selection of the measures. Indeed, some of the psychological constructs used in this thesis have a long history of study, such as self-regulation and wellbeing, with a wide range of scales to choose from (e.g., brief self-control scale, self-regulation inventory; psychological wellbeing, WHO-5, etc.). Researchers also continually update/adapt the scales, making them more suitable for use with different ethnic groups or reducing the number of questions to shorten the completion time (e.g., 84-item, 42-item, and 18-item Scale of Psychological Wellbeing).

This section discusses the five variables with their backgrounds, the development of the measures, and the rationale for selecting them for this thesis. Specifically, first, I introduce the psychometric scale of psychological wellbeing and self-regulation. Both variables have many scales/versions to choose from and have been constantly adjusted and updated. Second, I introduce the variable of self-transcendence. Although the self-transcendence scale was used in

Study 1 to validate the Light Triad to assess humanity-oriented trait, it is closely related to the self-other aspect of wellbeing in this thesis. Third, I introduce the measures of self-boundaries and the spatial frame of reference continuum, as they both assess the sense of bodily boundaries. The rest of the psychological constructs in this thesis have been discussed in Chapter 2, such as trait mind-wandering, or have been commonly adopted with few scales to choose from (e.g., PANAS), so I will not expand them in this section.

Psychological Wellbeing

A detailed discussion of psychological wellbeing was provided in Chapter 2. To measure psychological wellbeing, Study I used Ryff's Scale of Psychological Wellbeing (SPWB). It has six sub-scales, including Self-acceptance, Positive relations with others, Autonomy, Environmental mastery, Purpose in life, and Personal growth. There are three forms of SPWB. The original SPWB was the longest, consisting of 84 items (14 for each scale), the mid-length version consists of 54 items (9 per scale), and the shortest version consists of 18 items (3 per scale), which is commonly used in psychological surveys. SPWB has demonstrated excellent reliability in many studies (e.g., 42-item version scales Cronbach's α ranged from .72 to .85 in Gallagher et al. (2009)) and its positive association with Eudaimonia (Ryff, 2014).

Example items include "I judge myself by what I think is important, not by the values of what others think is important." (dimension of Autonomy), "In general, I feel I am in charge of the situation in which I live." (dimension of Environmental Mastery), "I think it is important to have new experiences that challenge how I think about myself and the world." (dimension of Personal Growth), "I enjoy personal and mutual conversations with family members or friends." (dimension of Positive Relations with Others), "I am an active person in carrying out the plans I set for myself." (dimension of Purpose in Life), and "In general, I feel confident and positive

about myself.” (dimension of Self-Acceptance). Chinese validation of the 18-item SPWB does not include any reversely worded items and exhibited improved confirmatory factor analysis validity and reliability (Cronbach’s α was 0.92 for total scale and above 0.60 for each dimension; Li, (2014)).

Self-Regulation

Self-regulation has been studied extensively in previous research. There are many self-regulation psychometric scales, as well as many theories and models that underlie these scales (see Chapter 2). As one of the key concepts of this study, it is critical to select a measure that is aligned with the theories of this study and is relevant to the construct of wellbeing. Prior studies have identified four primary domains of self-regulation, including thoughts, emotions, impulses, and performance (Heatherton & Tice, 1994). Individuals with higher levels of trait self-regulation are able to maintain higher achievement, are better able to adapt to utilize tools to achieve goals, and have better interpersonal skills to maintain positive social relationships (Tangney et al., 2004). Self-regulation psychometric scales can be broadly categorized into trait self-regulation scales and state self-regulation scales. Many studies have shown a positive correlation between trait self-regulation and state self-regulation, which people with better trait self-regulation are also able to self-regulate at the moment (i.e., state self-regulation).

Although many scales can be used to measure trait self-regulation (Drobetz et al., 2012), the present study examines trait self-regulation described above by the measure of The Brief Self-Control Scale (BSCS). The development of BSCS (Tangney et al., 2004) emphasized self-regulation as the ability to fit and adjust to the environment (Rothbaum et al., 1982) and a prosocial attitude to conform to the demands of group life (Freud, 1930). These points are in line with the present study focus, emphasizing the wellbeing perspectives of oneself, others, and the

world. The original BSCS is a 13 item-scale with four dimensions, including self-discipline (5 items), inclination toward deliberate or non-impulsive action (3 items), healthy habits (2 items), self-regulation in service to build a strong work ethic (2 items), and reliability (1 item). Example items include “I have trouble concentrating” (dimension of self-regulation) and “I often act without thinking through all the alternatives” (dimension of self-discipline) (Tangney et al., 2004). In the present study, I used the Chinese validated version of this scale (Fung et al., 2019), an 11-item scale with four dimensions, including self-discipline (4 items), impulsivity (3 items), healthy habits (2 items), and self-regulation (2 items).

Self-Transcendence

Self-transcendence is related to the wellbeing emphasizing the relationship between oneself and the broader environment. Self-transcendence considers the connection between oneself and others, emphasises altruism and prosociality, and has a broader perspective of the world beyond the focus of oneself (Reed & Haugan, 2021), and this is associated with the humanity-oriented trait and the construct of Light Triad Scale in Study I. The theory of self-transcendence was developed based on two assumptions, first, human beings are integral to their environment, suggesting the coexisting relationship between human beings and the environment (Reed, 2008). Reed’s theory was influenced by Martha Roger’s Science of Unitary Human Beings that human beings exchange “energy” through interaction with the environment (Rogers, 1980). Reed believes this perspective can help the individual to expand their current boundaries and help achieve a healthy state of mind and a good sense of wellbeing. Second, self-transcendence is an essential path to human development, suggesting an individual’s capability to develop and can be observed through outward expression (Reed, 2008).

The theory of self-transcendence is associated with wellbeing (Verhaeghen, 2021). In the present study, I used the Self-Transcendence Scale (STS) to validate Chinese version of Light Triad Scale in Study I. It is a 15-item scale. The original STS is a one-dimensional scale (Reed, 2018), example items include “Able to move beyond some things that once seemed so important” and “Sharing my wisdom or experience with others” (Reed, 2018). The Chinese version of the STS has been validated with 4-dimensional scale with good reliability (Cronbach alpha of the scale was 0.83) in measuring self-transcendence with Chinese participants (Zhao et al., 2018).

Self-Boundary

Self-boundary is normally measured by self-report scales to indicate self-construal, i.e., whether people define themselves as independent from others, or as interdependent with others (Cross, 2020). In psychological studies, the Self-Construal Scale was used to assess how people view themselves in relation to others (Singelis, 1994) using simple statements such as: “I often have the feeling that my relationships with others are more important than my own accomplishments.” More recently, studies captured the phenomenological aspects of self-construal in which participants described their sense of self-boundaries during mindful self-focused meditation (Dor-Ziderman et al., 2016).

The phenomenological aspects of self-construal describe aspects of experience such as time, location, control, and centredness, etc. (Ataria et al., 2015). For example, it describes the experience that as the self-boundary increases, the sense of centredness diminishes until the body no longer serves as a point of reference in relation to the external world. Specifically, in psychological studies, Dambrun (2016) developed the phenomenological measure of self-boundaries, the Perceived Body Boundaries Scale (PBBS). PBBS is a 7-point visual analogue

scale depicting seven human figures whose body outlines become increasingly transparent (Dambrun, 2016). It was based on the Self-centeredness/Selflessness Happiness Model (SSHM) (Dambrun & Ricard, 2011), a theoretical model which explains that self-focused psychological functioning (assessed through egocentrism and materialism) induces fluctuations in happiness, while selflessness (assessed through self-transcendence and connectedness to others) is associated with “authentic and durable” happiness that can be lasting for a long time (Dambrun, 2017). Empirical evidence suggests that mindful self-focused meditation fosters reduced perceived body salience and more extended self-boundaries to the world, which predicts more happiness and less anxiety (Dambrun, 2016).

The Spatial Frame of Reference Continuum

The Spatial Frame of Reference Continuum (SFoRC) was developed to assess the boundary between self and nonself in order to predict better self-transcendence. SFoRC is measured by asking participants how far the self currently extends in the world. Participants make choices within six nested and progressively smaller symbolic circles based on a 6-point Likert scale (1 = ego-centred frame of reference, 6 = distribution-centred frame of reference), with the centremost circle representing the sense of stopping at the body and the outermost circle representing the sense of extending into the universe and beyond (Hanley & Garland, 2019). SFoRC describes a spatial situation beyond the self-report scale (e.g., Self-Construal Scale) and the two-dimensional pictorial scale (e.g., PBBS, IOS). SFoRC suggested that more extension to the universe is positively correlated with more positive affect (Hanley & Garland, 2019). It demonstrated that a more allocentric frame mediated the effect of mindfulness on increased positive affect.

3.4.3 Summary

This section discussed five variables, including the development of the scales and the rationale for their selection in this thesis. Psychological wellbeing and self-regulation have both been studied in the field of psychology for decades, and the self-boundary and spatial frame of reference continuums are a pair of related scales that have been emphasised in recent years. As these concepts are related to self-transcendence, this section also discussed the theories of self-transcendence related to wellbeing. Details on how to apply these scales will be described in the method sections in Study I and Study II.

3.5 Quantitative Data Analysis Methods

This section discusses the data analysis methods in Study I (Chapter 4) and Study II (Chapter 5). Five inferential statistical approaches are discussed in this section, including factor analysis, Pearson correlation matrix, hierarchical multiple regression model, indirect association test between self-regulation and psychological wellbeing, and randomized control study design. Specifically, first, Factor Analysis was applied to validate the Light Triad Scale - Chinese Version (LTS-C), including an Exploratory Factor Analysis to identify the structure of the LTS-C among Chinese participants and a Confirmatory Factor Analysis to test whether the observed structure can accurately reflect the hypothesized structure. The Light Triad Scale was used in Study 1 as a measure of the humanity-oriented trait. Second, Pearson's correlation matrix was used to report the zero-order correlations among variables. Third, the Hierarchical Multiple Regression Model was applied to assess whether a model where self-regulation is combined with the humanity-oriented trait predict psychological wellbeing better than self-regulation alone. Fourth, the indirect association test, including Sobel's test, was applied to test the indirect

relationship of the humanity-oriented trait and test whether the negative effects of more mind-wandering on psychological wellbeing can be mitigated by greater scores on the humanity-oriented trait. Fifth, a randomized controlled design was used to compare between mindful self-focused and caring other-focused groups to an attention control group to determine whether self-focused and other-focused thoughts yield difference in mind-wandering and affectivity.

3.5.1 Factor Analysis

Exploratory Factor Analysis (EFA)

Factor analysis was used to validate the Chinese Version of the Light Triad Scale (LTS-C). Factor analysis was developed by Charles Spearman in early 1900, and there are two main factor analysis methods, Exploratory Factor Analysis (EFA) and Confirmatory Factor analysis (CFA) (Yong & Pearce, 2013). EFA is considered a variable reduction technique that helps researchers to identify factors structurally based on participants' responses. CFA enables testing of hypotheses by observing relationships between variables and latent variables (Little, 2013).

EFA starts with a correlation matrix that shows the interrelationships between variables, which also identifies latent variables and underlying factor structures (Costello & Osborne, 2019). Several indexes in EFA could be adopted to validate the LTS-C. For example, Kaiser-Meyer-Olkin (KMO) indicates whether the study has adequate sampling and an over 0.6 KMO demonstrates adequate sample size. Bartlett's Test of Sphericity indicates whether the data is normally distributed. The scree plot suggests the appropriate factor loading, indicating the number of sub-scales or dimensions. The IBM SPSS software can be used in processing and analysing data for EFA.

In this study, the EFA of the Light Triad Scale (12 items) was conducted by using Principal Component Analysis with oblique oblimin rotation, in line with the approach to validation of the original English scale in the Kaufman (2019) study. This method allows the factors to be correlated and to simplify the mathematical description of the manifest variables (Field, 2013). The specific process of EFA applied to the data in Study I and the results can be found in Chapter 4.

Confirmatory Factor Analysis (CFA) using Structural Equation Modelling

Based on findings from the EFA, I conducted Confirmatory Factor Analysis (CFA), which compares observed variables with unobserved variables. In addition to IBM SPSS, IBM AMOS is a software package to run CFA, test the model fit, and conduct the Structure Equational Modelling (SEM). SEM can be used to combine the principles from factor analysis and multiple regression analysis, which also reveal the correlations between variables (Knoke, 2005). It can represent complex theories and structures to respond the Overarching Research Aim II (see Chapter 1 Section 1.2). This process included three steps: testing the model fit, demonstrating the structure, and convergent validation of the scale with similar constructs.

First, to test the model fit, several indexes can be used. For example, the standardised root mean squared residual (SRMR) equal or less than 0.08 and the Root Mean Square Error of Approximation (RMSEA) equal to or less than .06 indicate a good fit, and an RMSEA equal to 0.00 shows a perfect fit (Hu & Bentler, 1999); the Perfect Fit Index (CFI) equal or more than .95 also indicate an excellent fit and a CFI more than 0.9 indicated an acceptable fit (Hu & Bentler, 1999); Chi-square/degree of freedom less than 3.0 indicated a good fit in a model (Kenny &

McCoach, 2003). A specific process and results of CFA conducted in Study I can be found in Chapter 4 Method section.

Second, AMOS graphs can be used to demonstrate the model structure and to perform structural equation modelling, which examines the measurement items using first-order confirmatory factor analysis of measurement models on selected scales. SEM is a type of modelling that enables the assessment of observed variables with test variables to demonstrate whether the model can be used in scientific studies. SEM is capable of estimating complex relationships involving multiple dependent and independent variables within a unified analytical framework. This makes it an ideal tool for testing theoretical models. In the present study, I conducted an SEM of the LTS-C assessing the interrelationships among three sub-scales within the scale suggested by the CFA.

Third, to validate the LTS-C, convergent validity can be established by assessing the associations with similar psychological constructs and measures. In the present study, to evaluate the convergent validity of the Light Triad Scale in Chinese, I selected two constructs that conceptually positively related to the Light Triad Scale, Self-Transcendence and Satisfaction with Life, where self-transcendence can lead to compassion and altruistic goals beyond the self, and satisfaction with life is associated with purpose and meaning and other aspects of human flourishing. Strong positive correlation demonstrated good convergent validity of the tested scale (i.e., LTS-C) with the selected convergent constructs (i.e., Self-Transcendence and Satisfaction with Life).

3.5.2 Pearson Correlation Matrix

The Pearson correlation matrix describes the relationship between variables. There are three types of relationships between two variables: positively related, not related at all, and negatively related (Field, 2013). In the correlation matrix, the relationship between every two variables can also be described by these three relationships. The significance level indicates whether two variables are related, either positively or negatively. Pearson Correlation Matrix has been used in a wide range of psychological studies, and in the present study, it was used both in Study I (Chapter 4) and Study II (Chapter 5), such as to assess the relationship between self-regulation and psychological wellbeing.

3.5.3 Hierarchical Multiple Regression Model

The Hierarchical Multiple Regression Model is adopted in the Study I and Study II. In a Hierarchical Multiple Regression Model the aim is for researchers to enter independent variables into an equation in a specific order, and compare the variance change when adding the new variables (Ross & Willson, 2017). Specifically, this approach was used in Study I to explore whether self-regulation together with the humanity-oriented trait can predict wellbeing better than self-regulation alone. This approach was used in Study II to compare between mindful self-focused thoughts and other-caring thoughts in predicting increased positive affect.

In the model, independent variables are entered in blocks in an order of progression, with each block representing a model. The order in which the independent variables are entered is based on theory and the researcher's rationale (Ross & Willson, 2017). For example, when the hypothesis requires an assessment of whether a new variable should be added to a model to better predict the dependent variable, the first step is to enter the independent variables in the first model, and the second step is to enter the same variables with the new variable in the second

model. Since the only difference between the first model and the second model is the new variable, the researchers compare the two models and study whether the second model explains more variance than the first one.

In Study I, the humanity-oriented trait was the new variable that was added to the existing model. The hierarchical multiple regression model tested whether the humanity-oriented trait should be added to the model of self-regulation to predict psychological wellbeing better than self-regulation alone. A detailed process and results can be found in Study I (Chapter 4). In Study II, the other-focused thought was the new variable that was added to the existing model containing self-focused thoughts to predict increased positive affect (or reduced negative affect). The hierarchical multiple regression model tested whether the new model with the additional entered variable of other-focused thought would explain the possible significance of increased positive affect (or reduced negative affect).

An example of a hierarchical regression model in comparing the frequency of self-focused thought and other-focused thought in predicting positive affect is presented below. Model 1 contains a single dependent variable of self-focused thoughts, and Model 2 contains two dependent variables of both self-focused thoughts and other-focused thoughts. In comparing Model 1 and Model 2, ΔR^2 shows how much other-focused thought adds variance beyond self-focused thoughts. A detailed process and results can be found in Study II (Chapter 5).

- **Model 1:** positive affect = $\beta_0 + \beta_1$ (frequency of self-focused thoughts) + ϵ
- **Model 2:** positive affect = $\beta_0 + \beta_1$ (frequency of self-focused thoughts) + β_2 (frequency of other-focused thoughts) + ϵ
- **Key Test:** Compare ΔR^2 between Model 1 and Model 2. A significant increase in explained variance ($p < .05$) indicates that other-focused thoughts uniquely predicts affect beyond self-focused thoughts.

3.5.4 The Indirect Associations between Mind-Wandering and Psychological Wellbeing

While hierarchical multiple regression modelling provides a quick insight into whether additional variables in the model help better predict dependent variables, it is limited in explaining the role of additional variables, such as the role of humanity-oriented trait in the relationship between mind-wandering and wellbeing. The present study further assessed whether humanity-oriented trait can attenuate the negative impact of more mind-wandering on improving psychological wellbeing through SEM and Sobel tests. Examining the indirect association between the dependent and independent variables allows for an assessment of how a third variable affects the relationship between the other two variables (MacKinnon et al., 2007). Detailed tests and results are presented in Study I (Chapter 4).

3.5.5 Repeated ANOVA

Study II (Chapter 5) used a three (group: Caring Other-Focused Meditation, Mindful Self-Focused Meditation, Attention Control) by two (time: pre-test, post-test) repeated mixed ANOVA with the first factor being between-groups and the second factor within-groups. Repeated ANOVA was used to determine if there was an interaction between the factors of group and time reflecting expected intervention effects. The between-group factor compares the outcome variables for the intervention and control groups, while the within-group factor compares the outcome variables within the same group of participants before and after the intervention (or control).

Sometimes in a three-arm study, researchers combine the two intervention groups (e.g., a combination of the mindful self-focused and caring other-focused groups) and compare it with the attention control group, but this approach was not applicable to Study II because it aimed to

examine differences both between the two intervention groups and between each of the intervention groups and the control group. Within-group factors compare the effects of the same individual within the same group before and after the intervention (or control), such as the pre-test and post-test in Study II

In Study II (Chapter 5), first, I examined whether there is a group-by-time interaction effect (Maxwell et al., 2017; Searle, 2006), comparing the significance of pre-post changes across the three groups (i.e., caring other-focused meditation group, mindful self-focused meditation group, and attention control group). A significant group-by-time interaction indicates a significant change between the pre-test and post-test of one or two groups in comparison to the other group/groups. Since in Study II this was to test across three groups, between group independent t-tests were used to follow up any significant interactions to examine which group differences generated the significant change that contributed to the significant interaction. Third, a within-subject paired sample t-tests from pre- to post-test were conducted to examine whether the intervention (or attention control task) had an effect at the post-test. However, if there was no significant group-by-time interaction, I reported the main effect of time and the main effect of the group (Maxwell et al., 2017).

3.5.6 Summary

This section introduced five key quantitative data analysis methods in both empirical studies. These methods were chosen based on the development of the research questions (Section 3.2), such as to validate Light Triad Scale in Chinese using Factor Analysis and to understand the relationship among variables using Pearson Correlation in Study I, and to compare self-other focused meditation on the effects of mind-wandering and wellbeing using Repeated Mixed

ANOVA in Study II. These quantitative analysis methods can best answer the research questions, sub-questions, and fulfil the research aim of this PhD thesis.

3.6 Ethical Considerations

Ethical approvals for Study I and Study II were obtained from the University of York, Department of Education, Education Ethics Committee (see Appendix). More details can be found in Chapter 4 and Chapter 5, and a copy of the information page and consent form for both studies can be found in the Appendix.

During the ethical application process, an Ethical Audit Form was completed, and participant consent forms were created for both the cross-sectional and randomized controlled studies. The Ethical Audit Form covers the issues in conducting primary data-related studies, including the anonymity and confidentiality of participants, sensitive and distressing topics, randomization of participants in Study II, and data management issues.

During the ethical approval process, the main concern was the nature of the sensitive topic involving issues related to wellbeing and mental health, and the desire not to cause a sense of distress to the participants. The variables chosen for this thesis are positive. Although Chapter 2, Section 2.5 discussed Behaviour Undermining Wellbeing of Others in relation to the Dark Triad, I have avoided the use of negative variables and have instead used positive aspects of variables (i.e., humanity-oriented trait) to address the research aims.

In addition, data collection for the randomised control design in Study II was conducted after the abolition of the Covid-19 self-quarantine rule. To avoid any potential contagion, I used a laboratory room with a minimum capacity of 10 people and spacing between participants' seats.

Participants were not required to interact with each other. The laboratory was regularly disinfected by campus staff, which ensured the safety of participants.

Open Research and Pre-Registration

Study I has been pre-registered with explicit hypotheses and measures so that the development of this study can be tracked transparently at the Open Science Framework (OSF). See OSF <https://doi.org/10.17605/OSF.IO/M73Y2> for pre-registration details. The pre-registration with the Open Science Framework (OSF) enables openness, integrity and replicability in research, which provides other researchers with a footprint of how this study has been developed (Foster & Deardorff, 2017).

3.7 Psychophysiological Measure of Heart Rate Variability in Self-Regulation and Mind-wandering

This section introduces the Heart Rate Variability (HRV), the data collection methods to capture it, and its association with self-regulation and mind-wandering. The psychophysiological indicator of HRV has been studied to measure self-regulation for a relatively long time (e.g., Reynard et al., 2011; Segerstrom & Solberg Nes, 2007) and HRV has also been used in mind-wandering research in recent years (e.g., Bortolla et al., 2021). However, a more targeted investigation of affectivity and wellbeing using HRV is underdeveloped, such as the self-other-focused perspective during mind-wandering. This section describes how mental processes are reflected in the psychophysiological index of heart rate variability, how to design and use electrocardiography and photoplethysmography to capture heart rate variability, and how smartphone applications can record and calculate heart rate variability.

The research in this thesis was originally aimed to pioneer the use of the photoplethysmography-based smartphone application in capturing HRV during state mind-wandering. However, the research required in-person human contact, and due to the self-quarantine rule of COVID-19, this experiment was postponed. I included this section in this chapter because it is strongly related to my thesis topics, which I will further expand on in my next career step.

In this section, first, I provide a biological research background on how psychological responses to thoughts and experiences can be reflected in the nervous system, and the use of heart rate and heart rate variability as indicators of such responses. Second, I explain the electrocardiogram, a widely used tool for capturing such indicators. Third, I present photoplethysmography as an alternative technique to capture heart rate variability in large populations as compared to electrocardiography. Fourth, I introduce the Neurovisceral Integration Model and expand the discussion that self-regulation and mind-wandering can be reflected in heart rate variability. Fifth, I further expand heart rate variability measures and parameters in self-regulation and mind-wandering in terms of time-domain metrics, frequency-domain metrics, and nonlinear-domain metrics. Sixth, I discuss the relationship between heart rate variability in measuring self-regulation and mind-wandering. Seventh, I specifically compare electrocardiography-based and photoplethysmography-based smartphone applications to capture heart rate variability and reflect self-regulation and mind-wandering.

3.7.1 The Autonomic Nervous System and the Heart Rate

The nervous system controls sensations and motions that enable communication between human organs and the brain (Thayer et al., 2009; Thayer & Ruiz-Padial, 2006). For example,

when humans sense fear (e.g., public speaking, seeing spiders), they sweat, tremble, and feel dizziness or fainting. This process is the so-called "fight or flight" response where the body automatically reacts to a stressful or frightening situation (Blons et al., 2019; Thayer et al., 2012). The nervous system gets activated due to brain responses to the fearful situation, conveys the signal to the body's organs which in turn respond (e.g., butterflies in the stomach). These signals are transmitted by neurons (Ernst, 2017).

These processes are taking place in the nervous system, which connects the brain, spinal cord, and nerves and is responsible for basic body functions such as movement, senses, and heartbeat and breathing (Ernst, 2017). Specifically, the nervous system comprises the Central Nervous System and the Peripheral Nervous System (Thayer & Ruiz-Padial, 2006). The Central Nervous System consists of the brain and spinal cord, which processes and sends information through a combination of electrical signals and chemical messengers. The Peripheral Nervous System consists of nerves outside the brain and the spinal cord, and it takes input from the Central Nervous System to the organs, limbs, and skin of the body. The Peripheral Nervous System consists of the Somatic Nervous System and the Autonomic Nervous System. The Somatic Nervous System represents a system that can be voluntarily controlled, while the Autonomic Nervous System represents the system that can't be voluntarily controlled. The Autonomic Nervous System consists of the Sympathetic System and the Parasympathetic System (Vagal System - the vagus nerve represents the main component of the parasympathetic nervous system) (Breit et al., 2018). The Sympathetic System increases heart rate (HR), and the Parasympathetic System decreases heart rate (Thayer & Ruiz-Padial, 2006).

The nervous system processes and responds to sensations it receives; for example, when people feel fear, this fear signal is processed by the Central Nervous System first. The signals

can be passed to the Sympathetic System of the Autonomic Nervous System of the Peripheral Nervous System, which increases the heartbeat.

These brain regions are parts of the Central Autonomic Network (CAN; see the Figure 7 in Riganello et al., 2019)¹ that support goal-directed behaviour and adaptability (Benarroch, 1993). The CAN is a component of the Central Nervous System (Benarroch, 1993; Thayer & Ruiz-Padial, 2006), it controls the internal regulation system, affects goal-directed behavioural response, adaptability, and health (Thayer & Siegle, 2002). The primary output of the CAN is mediated through the sympathetic neurons via the stellate ganglia², and parasympathetic neurons via the vagus nerve³ that innervates the heart (Thayer et al., 2012). The interplay of the CAN output to the sinoatrial node⁴ of the heart to generate a complex variability of electrical impulses that cause the heart to beat (Saul, 1990).

3.7.2 Electrocardiography Captures Heart Rate and Heart Rate Variability

¹ “Central Autonomic Network (CAN) includes the anterior cingulate; insular, orbitofrontal, and ventromedial prefrontal cortices; the central nucleus of the amygdala; the paraventricular and related nuclei of the hypothalamus; the periaqueductal gray matter; the parabrachial nucleus; the nucleus of the solitary tract (NTS); the nucleus ambiguus; the ventrolateral medulla; the ventromedial medulla; and the medullary tegmental field” (Benarroch, 1993; Thayer & Siegle, 2002).

² “The stellate ganglion is formed by the fusion of the inferior cervical and superior thoracic sympathetic ganglia and provides most of the sympathetic innervation to the head, neck, upper extremity, and a portion of the upper thorax”(Petersohn, 2011).

³ “The vagus nerve is the major nerve of the parasympathetic division of the autonomic nervous system, which is critically involved in neuroimmunomodulation”(Petersohn, 2011).

⁴ “Sino-atrial node is a group of cells located in the wall of the right atrium of the heart” (Keith & Flack, 1907).

The Nervous System enables the communication between the brain and the heart, and the Heart Rate (HR) expresses a physiological change that reflects the brain processes. HR is the number of heartbeats per minute (Gonzalez-Sanchez et al., 2017), and an average HR for an adult is between 60 and 90 beats per minute (bpm). It reflects human body function and responses to external stimuli (e.g., fear).

However, whereas in trait-related research, HR is limited to demonstrating repetitive mental states and presents individual differences, HRV was introduced to show how a person's mind and thoughts reflect their heartbeat. HRV measures the beat-to-beat (or interbeat) heart rate changes as a more appropriate indicator to reflect people's physical health and mental processes (Malik et al., 1996). Both HR and HRV are calculated by time differences between beats in the Electrocardiogram (ECG), a medical method to record heart activity, where it monitors the heart and tracks the HR activities over time. The ECG output is a series of graphical waveforms, and an important concept is the QRS complex, which displays the peak and dip of the heartbeat by time (Ashley & Niebauer, 2004). Q, R, and S are three visible points in the graphical waveform of the heart activity. These three points combine as a complex to demonstrate a heartbeat cycle. One beat in the heart is a QRS complex in the ECG waveform.

The visible points in the QRS complex are used to calculate HRV, such as using the distance between the two R peaks to calculate the "RR interval". Although both HR and HRV measure heart activities, their values can differ: two identical HRs can have very different HRVs. In an example demonstrated from Farnsworth (2019) (see Figure 7 below), with the HR measure, an average of 92 bpm in HR could demonstrate an average of 1.53 beats per second ($92 \text{ bpm} / 60 \text{ sec} = 1.53 \text{ beats per second}$). Under the same heart rate conditions, each person's HRV may be very different. Since HRV is related to neurological responses, this suggests that people may

have very different mental states associated with HRV but the same heart rate. In this example (Farnsworth, 2019), one condition demonstrates an individual with a relative stable heart beats (the sample RR intervals in this condition are 630ms, 675ms, 645ms, 650ms, etc.), and the HRV is calculated to be 313 ms. With the same HR of 1.53 beats per second condition, another condition can be more psychologically arousing than the previous condition (the sample RR intervals in this condition can be, 744ms, 427s, 498ms, 931ms, etc.) , and the HRV is calculated to be 31 ms. This example demonstrates the difference between HR and HRV, which indicated the importance of using HRV in reflecting mental state.

Figure 7 An example of difference between HR and HRV

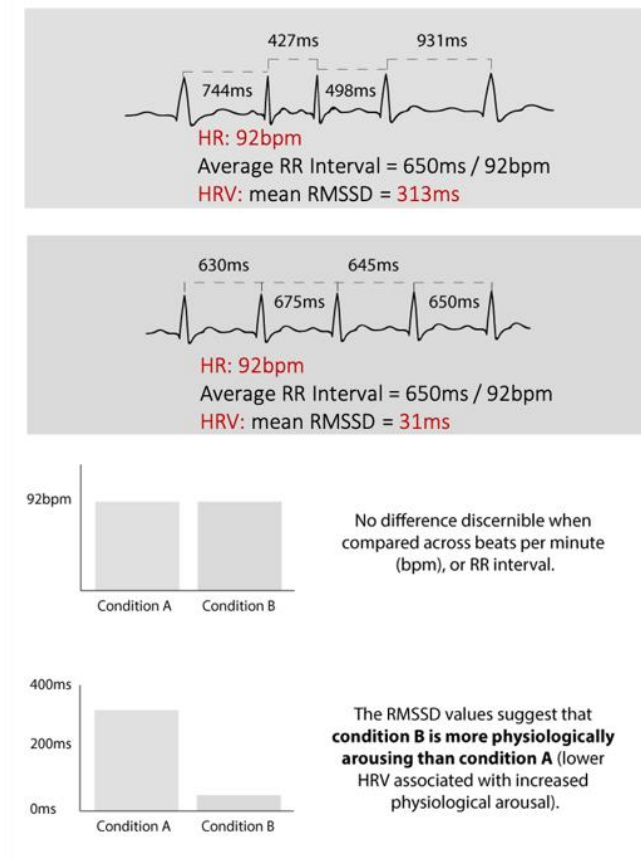


Figure adjusted from Farnsworth (2019). RMSSD: Square root of the mean squared differences between regular adjacent RR intervals.

3.7.3 Photoplethysmography Technique as an Alternative HRV Method

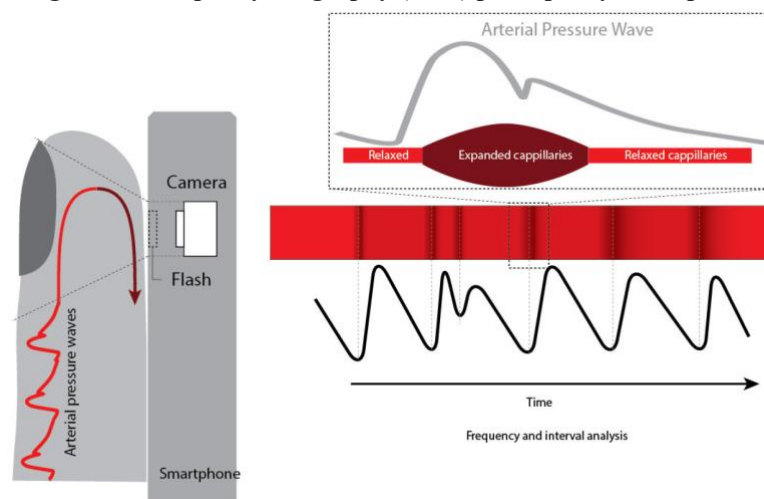
HRV is mostly measured by a conventional ECG in the lab setting. The medical ECG in the lab is usually wired, and it is large and inconvenient to move. The individual testing time with a conventional ECG is also limited, and it is hard to capture irregular heart activity in daily life. A portable ECG (i.e., Holter) is available to be carried and applied for 24-hour monitoring, but it also requires a printed display and a professional consultation. A conventional medical ECG has 12 angles (i.e., 12-lead ECG) to detect the heart cycle. The mechanism of ECG is that each cardiac cycle (heartbeat) generates electrical changes that can be detected by the electrodes under the skin. The ECG process is to record the electrode changes with wired sensors normally on the surface of the chest and the limbs. However, it has several disadvantages: it is inconvenient to carry, time-consuming and requires professional consultation of the waveform report.

These disadvantages can be solved by the Photoplethysmography (PPG) technique. It is an alternative HRV measure technique to monitor heart activity (i.e., wristband). The PPG technique empowers electrical signals to detect the colour changes of blood flow under the skin that are reflected from the heart cycle and transfer to a waveform on display. It uses an electric optical technique to detect the blood flow over a shining light through the tissue under the skin surface (J. Allen, 2007; Thayer et al., 2009). Specifically (see Figure 8, a PPG technique on the smartphone-based application), the moment when the heart pumps blood to the body, it expands the capillaries that allow it to flow through a large stream of blood. The colour of blood flow under the tissue (fingertip or wrist) at this moment becomes darker than the relaxed time, and the camera captures this change. This colour change transfers to a spectrum wavelength change that is analysed by the Fourier method. Then it displays as a pulse waveform with time variables.

When participants place a fingertip on a smartphone camera, the camera records a video of the blood flow volume change and displays it in a pulse waveform. The PPG technique is a flexible, non-invasive, low-cost, and home-detect-friendly method. The result can be calculated and displayed on any computer, tablet, or smartphone.

A smartphone-based application (App) can use the PPG technique to replace the device-based recording (i.e., wristband) for a more flexible measure in daily life. People place a fingertip on the camera sensor, and the light-based camera detects the different colours when the heart pumps blood to reach the fingertip. I adopted the Figure 8 below for demonstration purposes (Vandenberk et al., 2017). This process was recorded to generate a pulse waveform. The smartphone-based HRV App uses the PPG technique, which is more cost-effective than an ECG. To date, the PPG-based smartphone HRV App can be downloaded on any smartphone with an IOS or Android system. Compared to the PPG-based smartphone HRV App, ECG requires individuals to either test their HRV in the hospital or buy a heart rate monitor and test it at home. It is time-consuming and expensive. The smartphone-based HRV App saves money, and time, and it provides a more convenient way to monitor the heart and understand your heart on smartphones. In this case, this technique can be used in a larger population.

Figure 8 Photoplethysmography (PPG) principle by smartphone



Note. Figure adjusted from Vandenberg et al., (2017).

3.7.4 The Neurovisceral Integration Model Connects Self-Regulation Ability with Heart Rate Variability

As HRV could reflect mental state, it can be used as a psychophysiological index of self-regulation (Segerstrom & Nes, 2007; Thayer & Siegle, 2002) and mind-wandering.

Neuropsychologists found that HRV indicates stress and emotion regulation (Thayer & Lane, 2000), where HRV previously demonstrated its effectiveness as a biomarker index reflecting self-regulation (e.g., Correia et al., 2020; Noda et al., 2020; Smith et al., 2020; Thayer et al., 2012). Specifically, Thayer & Siegle (2002) introduced the Neurovisceral Integration Model specifying a set of flexible and interacting brain structures involved in emotion, affection, and self-regulation abilities which are related to the HRV index (Thayer & Lane, 2000; Thayer & Siegle, 2002). The CAN controls the heart rate by altering the sympathetic and parasympathetic outputs, which adapts to situational demands and supports goal-directed behaviours (Thayer & Lane, 2000; Thayer & Siegle, 2002). In a meta-analysis, Thayer et al. (2012) indicated that three anatomical neural structures of the CAN (Riganello et al., 2019) are associated with the HRV: the right pregenual cingulate in the medial prefrontal cortex, the right subgenual cingulate in the medial prefrontal cortex, and the left sublentiform extended amygdala/ventral striatum (SLEA). See “Fig. 1. (a) map of the whole brain showing significant activations” in Thayer et al. (2012) p.753 for details. Empirical evidence suggested that higher HRV indicates better self-regulatory ability and self-regulatory effort (Di Palma et al., 2019; Holzman & Bridgett, 2017; Lane et al., 2013; Segerstrom & Nes, 2007; Steinfurth et al., 2018).

3.7.5 Heart Rate Variability Measures and Calculations in Self-Regulation and Mind-Wandering

Many HRV metrics have been used to assess the sympathetic and parasympathetic nervous systems. These metrics are using time domain, frequency domain, and non-linear domain methods. According to the Society for Psychophysiological Research's Task Force committee, these methods are HRV parameters for analysing periodic components of HRV, each of these has advantages and disadvantages towards specific study design and research aims. In the present study, I chose metrics from all three domains to measure HRV.

Time Domain Metrics

Time-domain metrics of HRV (see Table 4) quantify the time between successive interbeat intervals (IBI; The beats series with a time interval in an QRS complex). It is one of the most widely used HRV metrics. The unit is usually expressed as seconds (or milliseconds) or the natural logarithm to achieve normal distribution (Shaffer & Ginsberg, 2017). The parameters used in previous studies to measure self-regulation include the Root Mean Square of Successive RR Interval Differences (RMSSD, ms), the Standard Deviation of NN Intervals (SDNN; ms), and the Percentage of Successive RR Intervals that Differ by More Than 50 ms (pNN50; %) (Holzman & Bridgett, 2017; Reynard, Gevirtz, Berlow, Brown, & Boutelle, 2011; Shaffer & Ginsberg, 2017).

Frequency Domain Metrics

Frequency domain metrics of HRV (see Table 4) classify and distribute the absolute or relative power into four frequency bands by the Fourier method, a signal method based on the

wavelength data. It is another frequently used HRV metric that was discovered later than the time domain metrics. Frequency domain metrics are commonly used in HRV metrics to assess self-regulation and wellbeing (Holzman & Bridgett, 2017; Kim et al., 2013; Reynard et al., 2011; Shaffer & Ginsberg, 2017). There are four frequency categories. High frequency (HF) (0.15-0.40 Hz) reflects the activity of the parasympathetic nervous system (PNS). Low frequency (LF) (0.04–0.15 Hz) (is generally accepted to) reflect the activity of the sympathetic nervous system. This measure is still under debate, whether it is primarily under sympathetic control or both sympathetic and parasympathetic influences (Singh et al., 2018). The other two bands are Very Low Frequency (VLF) (0.0033–0.04 Hz) and Ultra-Low-Frequency (ULF) (≤ 0.003 Hz). Besides, the LF/HF ratio expresses the relationship between sympathetic and parasympathetic activity. Singh et al. (2018) indicated that LF becomes dominant to HF ($LF > HF$, $LF/HF=3$) during tilt and other physical stress, the absolute LF is less than HF ($LF < HF$, $LF/HF=0.8$) during rest and the HF becomes dominant to LF during emotional and mental stress.

Non-linear Domain Metrics

Non-linear domain metrics (or Geometric Domain) of HRV (see Table 4) quantify and visualize the unpredictability of a time series. It was discovered later than time domain and frequency domain metrics. Toichi et al. (1997) introduced the Cardiac Sympathetic Index (CSI) and Cardiac Vagal Index (CVI), which are two indexes to reflect the sympathetic and vagal/parasympathetic function separately. The two indexes were calculated using a geometric method, the Lorenz Plot (or Poincare Plot), by RR interval (see Figure 9), which was initially applied in meteorology (Lorenz, 1963) and electrophysiology in more recent years (Toichi et al., 1997). I plot each RR interval in the x-axis as (I_k) against the following RR interval in the y-axis

as (I_{k+1}) ($k=1, 2, \dots, n-1$). The transverse axis (T) reflects beat-to-beat variation and is vertical to the $I_k=I_{k+1}$ line, while the longitudinal axis (L) reflects the overall fluctuation and is parallel to the $I_k=I_{k+1}$ line. Each Lorenz plot represents one subject. Calculation of the standard deviations for the transverse direction (Sd1) (1) and the longitudinal direction (Sd2) (2) is done with the following equations (Toichi et al., 1997):

$$Sd1 = \sigma \left(\frac{\sqrt{2}}{2} [(I_1 - I_2 \cdots I_k - I_{k+1})] \right); k = \{30; 50; 100\} \quad (1)$$

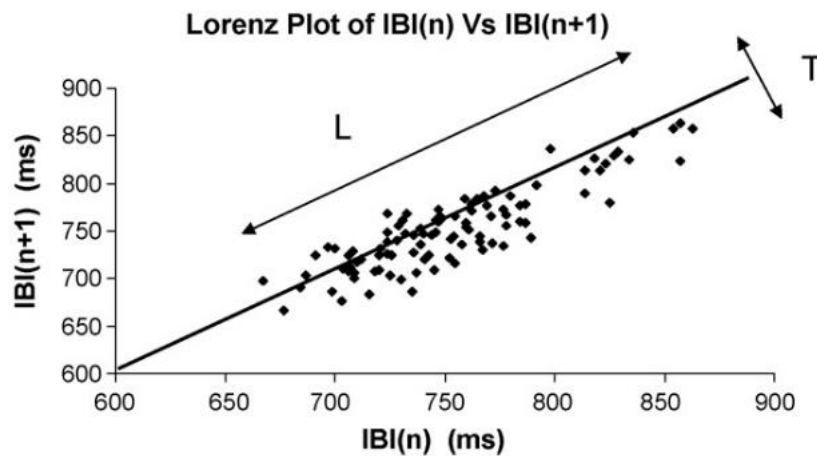
$$Sd2 = \sigma \left(\frac{\sqrt{2}}{2} [(I_1 + I_2 \cdots I_k + I_{k+1})] \right); k = \{30; 50; 100\} \quad (2)$$

, where σ represents the standard deviation, and k represents the three different RR intervals (30, 50, 100). The calculation of the Cardiac Sympathetic Index (CSI) (3) and Cardiac Vagal Index (CVI) (4) from the Lorenz plot can then be given as L/T and $\log_{10}(L \times T)$ respectively (Toichi et al., 1997).

$$\text{Cardiac Sympathetic Index (CSI)} = \frac{L}{T}; \quad (3)$$

$$\text{Cardiac Vagal Index (CVI)} = \log_{10}(L * T); \quad (4)$$

Figure 9 A Lorenz plot of each IBI (x-axis) plotted against the subsequent IBI (y-axis) for a single participant



Note. Deviations in the direction transverse to the line $IBIn = IBIn+1$ reflect high beat-to-beat variability and putatively reflect predominantly parasympathetic influences". Figure adjusted from J. J. B. Allen, Chambers, & Towers (2007).

Table 4 Metrix and Description of HRV Parameters

Acquisition	Metrics (units)	Description	Autonomic Reflection
Time-domain	RMSSD (ms)	The square root of the mean squared differences between normal adjacent R–R intervals	PNS activity
	SDNN (ms)	The standard deviation of all normal–normal (R–R) intervals	PNS and SNS activity
	pNN50 (%)	Percentage of consecutive N–N intervals that deviate from one another by more than 50 ms	PNS activity
	TP (ms ²)	Total power (< 0.4 Hz)	Overall autonomic variability
Frequency-domain	VLF (ms ²)	Very low frequency power (0.003–0.04 Hz)	Thermoregulatory cycles ^a
	LF (ms ²)	Low frequency (0.05–0.15 Hz)	Mix of PNS and SNS activity ^a
	HF (ms ²)	High frequency (0.15–0.4 Hz)	PNS activity
	LF/HF	The ratio of low to high-frequency power	SNS-to-PNS balance ^a
Non-linear domain	SD1	Standard deviation of the width of the Poincare plot	Short-term PNS and SNS activity
	SD2	Standard deviation of the length of the Poincare plot	Long-term PNS and SNS activity
	CSI	Cardiac Sympathetic Index	SNS activity, except for in the supine resting condition
	CVI	Cardiac Vagal Index	PNS activity

Note. PNS: parasympathetic nervous system, SNS: sympathetic nervous system. Table adjusted from Dobbs et al. (2019) and Toichi et al. (1997).

^a More research is needed on autonomic reflection

Choosing HRV indices to prove their association with self-regulation and mind-wandering is critical since there is no "golden standard" in HRV indices. Frequency-domain HRV indices were expected to reflect a stronger relationship between HRV and top-down self-regulation than time-domain HRV indices (Berntson et al., 1997; Holzman & Bridgett, 2017). Both the parasympathetic nervous system and sympathetic nervous system reflect self-regulatory efforts (see Table 4) (Holzman & Bridgett, 2017). The HRV time-domain, frequency-domain, and non-linear domain analysis were identified in the 1960', 1970', and 1990' respectively (Berntson et al., 1997). The non-linear domain method was suggested to be more reliable than the other two methods (Toichi et al., 1997). Future studies should further examine the relationships among CSI, CVI, self-regulation, and mind-wandering.

3.7.6 Heart Rate Variability, Self-Regulation, and Mind-Wandering

Previous scientific research has examined the association between HRV and self-regulation in both ECG and PPG technique-based devices and smartphone applications. Segerstrom & Nes (2007) indicated that people exerting higher self-regulatory efforts demonstrated higher HRV during a self-regulatory task (eating carrots or cookies) and the anagram tasks (N = 83). It implied the HRV at baseline predicts persistence at a subsequent anagram task. Reynard et al. (2011) also demonstrated the changes in HRV relative to baseline for both high and low self-regulators, but it failed to replicate findings from Segerstrom & Nes (2007) that HRV was elevated during high self-regulatory effort (emotion regulation and behaviour regulation). Di Palma et al. (2019) implied that the higher HRV reliably predicts higher self-regulatory effort (N = 48). This study was designed from a societal and political

perspective to illustrate that participants have greater CAN activation when they are observing actors receiving harmful stimuli from their same race (in-group) than different races (out-group). Based on the "Contrasting Forces Model", the self-regulating effort is measured by participants' lag-time in a self-report scale, and the lag-time increases when the CAN processes greater activation in the brain (Berlingeri et al., 2016; Di Palma et al., 2019). This means that when participants delay rating the painful experience of out-group actors, it expresses self-regulatory effort of cognitive and emotional processes (Berlingeri et al., 2016; Di Palma et al., 2019; Steinfurth et al., 2018).

A meta-analysis examined 123 studies ($N = 14,347$, individual effect size = 766) of association between HRV biomarkers and top-down self-regulation (sample size ranged in included studies from 13-1076; Holzman & Bridgett, 2017). It reported a significant but small effect ($r = 0.09$) between greater HRV and better top-down self-regulation. This study suggested that HRV as a biomarker to reflect top-down self-regulation can be conceptualized more broadly rather than a single facet of self-regulation, such as the facet of emotion regulation in self-regulation (Holzman & Bridgett, 2017). Another meta-analysis of 26 studies and 132 effects ($N = 2317$, sample size ranges from 14 - 817) found a positive association between HRV and self-regulation with an average effect of $r = 0.15$ (Zahn et al., 2016). The HRV recording devices in this study comprised of ECG, heart rate monitor, pulse wave-based device ($n = 21$), and ambulatory ECG (Zahn et al., 2016).

In addition to the use of HRV as a biomarker of top-down self-regulation (e.g., Reynard et al., 2011; Segerstrom & Solberg Nes, 2007), it has also been validated as a tool for assessing state mind-wandering (e.g., Bortolla et al., 2021), albeit with a small sample ($n = 28$ in the Bortolla study). Bortolla et al. (2021) assessed mind-wandering (with Amsterdam Resting State

Questionnaire; Diaz et al., 2013) and HRV (recorded by electrocardiography) during the baseline, a mindful self-focused breathing meditation, and the final rest condition, and found changes in mind-wandering is mirrored with changes in HRV, where the mindful self-focused meditation reduced mind-wandering and increased HRV. Large cohort studies using ECG- or pulse-wave-based devices could be further developed, particularly to understand issues related to thoughts and experience. In addition, much of the literature has used time- and frequency-domain analyses, but these have been found to be less reliable than nonlinear-domain metrics (Allen et al., 2007; Toichi et al., 1997).

3.7.7 Electrocardiography-based and Photoplethysmography-based Applications with Heart Rate Variability

As discussed, both PPG and ECG can detect HRV that reflects attentional regulation, affective information processing, and physiological flexibility. Using the PPG-based smartphone HRV App could enable study of large cohorts to establish the association between self-regulation, mind-wandering, and psychological wellbeing on a large scale. This section compares the innovative PPG with conventional ECG HRV Application in examining mind-wandering.

The PPG technique in the HRV App is a more innovative method than the conventional ECG. It has a different mechanism and uses different sensors. The previous section (Section 3.7.3) introduced the PPG technique as an alternative method to measure HRV and compared the sensor difference: ECG sensor measures the bio-signal by the electrodes, whereas the PPG sensor measures the light-based colour change of blood flow. This difference causes different waveforms. Since studies indicated no statistically significant differences when comparing

ECG-, PPG, and ECG/PPG-based approaches (Orphanidou, 2017), it implies PPG can be an alternative technique of ECG which also enables the capture of large cohort data.

Specifically, ECG generates a graphical waveform of the QRS complex, which the RR intervals are used in the QRS complex to calculate HRV metrics. In contrast, PPG generates peak-to-peak intervals (i.e., PP interval), which obtains pulse rate variability (PRV) waveform. PRV is a simple graphical ECG waveform. It reflects the RR interval but in a relatively vague waveform. This is mainly because the detection of light-based colour change in the PPG technique is more difficult than the bio-signal. PPG technique enables calculations of HRV based on the PP interval instead of the other intervals in the QRS complex (e.g., RR interval, NN interval). Besides, the PPG-based smartphone requires an additional algorithm to filter the noise from the blood flow volume change video, a sensitive sensor to recognize different finger pressure, and detects less frequency range in the frequency-domain metrics. Other potential errors caused by the hardware include overheat, different quality of camera lens, etc. These difficulties lead to reduced accuracy and sensitivity in the PPG technique.

However, in practice, these disadvantages can be neglected when considering the advantages of using PPG-based apps (Dobbs et al., 2019; Holzman & Bridgett, 2017; Li et al., 2019). A meta-analysis with 123 studies ($N = 14,347$) suggested that the differences (errors) of self-regulation measurement methods and the HRV computational techniques can be neglected (Holzman & Bridgett, 2017). Other studies (e.g., Dobbs et al., 2019; Li et al., 2019) revealed smaller error differences between PPG and ECG validation, which could be acceptable due to cost-benefit and convenience advantages of PPG. The drawbacks include the noise filter, overheating, different sub-fields, and sample size should consider coding algorithm, hardware devices (camera lens) used for data collection, etc.

Besides, in scientific research, the lab-based ECG requires a small number of participants, while the PPG-based smartphone HRV App allows extensive cohort studies. For example, Avram et al. (2020) used smartphone-based HR biomarkers to detect its association with diabetes prevalence in the primary cohort study ($n = 53,870$). This cohort study used the App-based PPG technique, but it reported HR data. Another cohort example examined 8 million individuals with the HRV collected by consumer wrist-worn tracking devices (Natarajan et al., 2020). These novel methods in non-lab-based settings increase the probability of using larger sample sizes in studying healthcare and wellbeing from a public health perspective. The smartphone-based App detection provides a more cost-effective way to help more people achieve remote healthcare support. It also enhances the research development in psychology and psychophysiology.

However, some studies find it hard to reveal the association between HRV and mind-wandering, such as using ECG (Ottaviani et al., 2013; Gontier, 2017) or virtual reality-based HRV biofeedback implementation (Blum et al., 2019). For example, Ottaviani et al., (2013) found mind-wandering showed a relatively stable, rigid, and inflexible pattern when measured by the thought-prob method during a lab cognitive task. Thus, on the psychophysiological field to examine self-regulation or mind-wandering, the innovative method of PPG-based smartphone HRV App and more reliable non-linear-domain statistical analysis can possibly improve the methodology reliability. This research could possibly add empirical evidence on the use of HRV for large cohort studies of self-regulation and mind-wandering.

3.8 Summary

This chapter explored the methodological perspective of this thesis. Beginning with methodological considerations from a philosophical perspective (Section 3.1), this thesis is developed based on a positivist approach and includes two quantitative studies. In order to expand on the overall research questions, to better address the research aims of the study (see Chapter 1, Section 1.2), and to select the appropriate research designs, I examined the Levels of Evidence Pyramid and decided to use a cross-sectional study (Study I) and a randomised controlled study (Study II) in the next two chapters. I also compared self-report questionnaires and psychophysiological indicators in measuring self-regulation and mind-wandering in this section.

I expanded the sub-questions of the two studies based on the Overarching Research Questions (Section 3.2). I also discussed the development of the research materials, including the development of the Chinese version Light Triad Scale in the first study, and the development of the meditation and control inductions in the second study (Section 3.3). In addition, I specifically reviewed the methods of data collection and analysis (Section 3.4), including the mind-wandering measurement techniques and psychometric scales used in this thesis. I then described the quantitative data analysis methods for the two empirical studies (Section 3.5), followed by a discussion of the ethical considerations (Section 3.6). Finally, I introduced the psychophysiological measure of self-regulation and mind-wandering, the heart rate variability, and the smartphone-based photoplethysmography technique used to record and calculate heart rate variability (Section 3.7). The next chapter presents the first empirical study using the above methods.

Chapter 4 Humanity-Oriented Trait as a Predictor of Psychological Wellbeing, Mind-Wandering, and Self-Regulation

Abstract

While many studies indicated that higher psychological wellbeing is associated with better self-regulation and lower mind-wandering, previous research mostly applied an individualistic self-centred perspective on these constructs. The present study proposed an ethically-grounded relational perspective on self-regulation and mind-wandering via postulation and examination of the humanity-oriented trait in relation to self-regulation and mind-wandering. Specifically, I investigated whether this trait could counter possible negative self-centred aspects of self-regulation, and whether the humanity-oriented trait could attenuate the negative (self-focus related) effects of mind-wandering, in predicting increased psychological wellbeing. Three hundred and eighty Chinese students filled out questionnaires on self-regulation, mind-wandering, humanity-oriented trait, and psychological wellbeing. I first validated the Chinese version of the Light Triad Scale (LTS-C) used in this study to measure the humanity-oriented trait. As expected, psychological wellbeing was positively correlated with self-regulation and negatively correlated with mind-wandering. Humanity-oriented trait, in combination with self-regulation, better predicted psychological wellbeing than self-regulation alone. Humanity-oriented trait also attenuated the negative effect of mind-wandering in predicting enhanced psychological wellbeing. These results provide the first empirical evidence indicating that the humanity-oriented trait needs to be cultivated alongside self-regulation to foster psychological wellbeing and lower mind-wandering.

Keywords: Humanity, mind-wandering, self-regulation, psychological wellbeing, self-focus.

4.1 Introduction

Current considerations of wellbeing and its protective factors have been mostly focusing on the individual self-centred perspective, not taking into account wider relational and societal implications. For instance, there is extensive research evidence indicating that better self-regulation and lower mind-wandering are related to better psychological wellbeing (Willems et al., 2019), however, self-regulation can manifest in a self-centred and self-serving manner, such as in service of accomplishing one's goals at the cost of others or extensive obedience to authority in ethically questionable circumstances (Kjell, 2011). This suggests the need to explore a more fine-grained view on the positive association between self-regulation and psychological wellbeing. In addition, while higher mind-wandering is negatively related to both self-regulation and psychological wellbeing, mindful self-focused or caring other-focused nature of mind-wandering may be an additional factor influencing its wellbeing-related effects. Therefore, this empirical study aimed to examine the role of a new potential protective factor - the humanity-oriented trait – since it represents virtue-oriented relational perspective which may be needed to balance the currently predominant self-centred views on self-regulation and mind-wandering in order to provide a more comprehensive understanding of positive social aspects of psychological wellbeing. Specifically, I investigated whether the humanity-oriented trait alongside self-regulation may be a better predictor of psychological wellbeing than self-regulation alone and also mitigate the self-focused negative impacts of mind-wandering on psychological wellbeing.

4.1.1 Relational Perspectives on Wellbeing

Amongst the various perspectives on wellbeing, the framework of psychological wellbeing (Ryff & Keyes, 1995) linked to the realization of one's authentic potential goes beyond hedonistic pleasures, emphasizing deeper facets of human fulfilment, which also illustrate the connection among self, others, and the environment. In contrast to alternative wellbeing constructs (e.g., pleasure attainment), psychological wellbeing is a stronger predictor of both quality of life and health-related outcomes. For instance, individuals with increased psychological wellbeing reported enhanced overall health, greater life satisfaction, and improved social relationships (Ryff et al., 2004).

This wider approach to wellbeing is favoured also from the perspective of potential limitations within prevailing models of wellbeing, primarily due to their predominant emphasis on the individual, even though it is not clear if Ryff's model reaches 'wide enough'. Specifically, Kjell (2011) has advocated for a broader perspective, contending that contemporary conceptualizations and metrics of wellbeing should extend beyond the confines of individual-centered paradigms. Instead, they should adopt a more comprehensive relational model of wellbeing, wherein individual wellbeing does not come at the expense of the wellbeing of others (i.e., a. behaviour undermining wellbeing of others; see Uziel, 2018; Uziel & Hefetz, 2014 for details.) This shift towards a wider perspective of wellbeing aligns with the Bioecological Model of Human Development (Bronfenbrenner, 1977), which, when applied to the domain of wellbeing, offers insights into the reciprocal relationships between individual wellbeing and larger systems, including one's community, broader society, and the global context. This evolving perspective on wellbeing acquires particular relevance when addressing contemporary societal challenges, such as the COVID-19 pandemic and climate change. These crises

underscore the inherent interdependence between individual and societal wellbeing (Dorjee, 2021; Kjell, 2011).

Arguably, the conceptualization of psychological wellbeing is closest to a wider interdependent perspective of wellbeing. This might be partially due to its roots in Aristotle's concept of virtue-based eudaimonia which emphasizes that other-regarding behaviour is essential to actualizing of own potential. Indeed, both ancient Western philosophers (Aristotle, 384 - 322 BC) and Eastern philosophers (Mencius, 391 - 308 BCE; Wang YangMing, 1472 - 1529) indicated that wellbeing could be promoted by virtue-oriented attitude and behaviour towards others (Ivanhoe, 2013). Aristotle introduced Virtue Ethics to promote wellbeing via an innate intention-based (rather than consequence- and duty-based) ethical behaviour (Hursthouse, 1999). Similarly, Chinese Taoist philosopher Wang YangMing proposed the well-known doctrine, "Extending Conscience (Zhì Liáng Zhì)", describing a personality trait where people conceptualise and perceive the world with a sense of harmony, compassion, and virtue (Angle, 2010) to reach their potential. In more contemporary conceptualisations of wellbeing, Slote (2004) developed an agent-based Virtue Ethics to describe that virtue ethics develops in relation to the wellbeing of others or with good or virtuous motivation involving love and care towards others. This idea is also in line with the Self-World Capacity as one of the two key cognitive and affective capacities underpinning wellbeing in a recently formulated wellbeing framework (Dorjee, 2021).

4.1.2 Self-Regulation and Mind-Wandering in the Context of Relational Wellbeing

Amongst the predictors of psychological wellbeing, self-regulation has been consistently highlighted as one of the key factors (Garcia et al., 2015). Self-regulation is an individual's capacity to override or direct self-generated thoughts, feelings, and undesired behaviour

tendencies (i.e., impulses) and achieve one's goals accordingly (Moffitt et al., 2011). To promote psychological wellbeing, self-regulation can foster the commitment to goal attainment (De Ridder & Gillebaart, 2017) in the context of accomplishing one's potential.

However, the relationship between self-regulation and relational wellbeing becomes more complex when examining the ethical aspects of self-regulated behaviour. Indeed, high self-regulation can be associated with behaviour that can undermine the wellbeing of others (Begue et al., 2015; Mathes et al., 2017; Uziel, 2018; Uziel & Hefetz, 2014), when people self-regulate themselves at the expense of other people's wellbeing. For example, in one study, participants who applied a (fake) higher electric shock in the name of science shared the trait of high self-regulation (Begue et al., 2015). Other studies suggested that people high in self-regulation are better at planning to accomplish their selfish goals (Uziel, 2018; Uziel & Hefetz, 2014), such as earning money and pursuing fame, via engaging in covert behaviours to look more successful, such as cheating on exams (Mathes et al., 2017; Uziel & Hefetz, 2014) and offering bribes. Accordingly, higher self-regulation can lead to calculated goal-oriented rational yet selfish behaviour (Uziel & Hefetz, 2014). People with higher self-regulation could choose to manipulate and display different behaviours under different social contexts, whether public or private, depending on social expectations and personal interests (Mathes et al., 2017; Uziel & Hefetz, 2014). This suggests that high self-regulation as a desirable quality should be considered together with virtue-orientation in the context of relational wellbeing.

Interestingly, the relational wellbeing perspective may provide new insights not only into the ethical aspects of high self-regulation but also to understanding the associations between low self-regulation and diminished psychological wellbeing (Andrews-Hanna et al., 2014). The concept of mind-wandering, defined as a rapid shift of attention away from an ongoing task or

current thoughts (Poerio et al., 2013), provides a cognitive explanatory link here since individuals with lower self-regulation tend to exhibit higher rates of mind-wandering (Smallwood & Schooler, 2015). This propensity often has adverse consequences for wellbeing, primarily stemming from self-regulation related difficulties in achieving present objectives or maintaining focus on the immediate task at hand (Killingsworth & Gilbert, 2010; Poerio et al., 2013; Smallwood & Schooler, 2015). Crucially, research shows that mind-wandering frequently exhibits a self-centred orientation which is further associated with diminished wellbeing (Andrews-Hanna et al., 2013). This suggests that the virtue-oriented, other-focused attitude aligned with relational wellbeing may potentially engender positive effects on enhancing self-regulation among individuals with low self-regulatory capacities, by reducing self-centred mind-wandering episodes.

4.1.3 Introducing the Humanity-Oriented Dimension of Self-Regulation

These limitations inherent in self-regulation and mind-wandering underscore the need to consider virtue-oriented protective factors of psychological wellbeing to mitigate potential adverse impacts of self-regulation and mind-wandering on wellbeing of both oneself and others. Indeed, it has been suggested that self-regulation should be complemented by what is referred to as the Self-World Capacity, serving as an additional key determinant of wellbeing (Dorjee & Roeser, 2022). The Self-World Capacity is characterized by cognitive and affective processes encompassing a sense of connection with others and the world (including nature), as well as an inclination towards compassion and care in one's responses to others (Dorjee, 2021).

While there is strong research evidence that prosociality, as a key virtue-oriented quality, contributes positively to wellbeing (Weinstein & Ryan, 2010), it can manifest in both intention-based and consequence- or duty-based forms, akin to the distinctions drawn in Aristotle's virtue

ethics. Importantly, intention-based and consequence- or duty-based prosociality have differing consequences for the wellbeing of individuals and recipients (others) (Jensen et al., 2014; Weinstein & Ryan, 2010). Intention-based prosocial behaviour yields benefits for both the helper (self) and the recipient by promoting greater need satisfaction (Weinstein & Ryan, 2010).

In this study, I expand upon the conceptualizations of intention-based prosociality and the overarching construct of the Self-World Capacity. Specifically, our focus lies in examining personality-related characteristics related to the interconnection among the self, others, and the broader world, aiming to elucidate their dynamic relationships within this framework. Our proposition centres on the introduction of a complementary determinant of wellbeing, namely, the humanity-oriented trait of personality which comprises a set of positive qualities, including compassion, compassion (entailing sympathetic sentiments towards the suffering of others), and the awareness to both give and receive love and care. It operates as a bottom-up process, characterized by intention-based mechanisms wherein individuals naturally and reflexively think and respond. This stands in contrast to the more top-down processes of prosociality, often rooted in consequences and duties. Notably, the humanity-oriented trait has the potential to mitigate heightened self-focus, a common characteristic among individuals with high self-regulation tendencies. Consequently, it may serve as a means to curtail behaviours that undermine wellbeing.

While researchers find it hard to assess humanity-oriented traits in practice (Fröding, 2011), the Light Triad Scale (Kaufman et al., 2019) emerges as a promising measure for gauging this construct. The Light Triad Scale encompasses three facets that closely align with the humanity-oriented trait: Kantianism, emphasizing the treatment of individuals as ends in themselves, not merely as means to an end; Humanism, underscoring the significance of human

values and dignity; and Faith in Humanity, reflecting a belief in the inherent goodness of human nature (Kaufman et al., 2019). Individuals exhibiting higher scores on the Light Triad also score higher on psychological wellbeing (Stavraki et al., 2023). This corroborates the utility of the Light Triad Scale as a measure that not only captures the humanity-oriented trait but also serves as a useful value-oriented indicator of enhanced psychological wellbeing.

4.1.4 The Present Study

Therefore, the present study is designed to address the research aim II (to explore the relationship between self-regulation and mind-wandering in relation to a broader construct of self- and other-related wellbeing) and answer the overarching research question of this thesis (RQ II), what is the relationship between self-regulation, mind-wandering, humanity-oriented trait, and psychological wellbeing? The primary objectives of this study are twofold: first, to determine whether the combination of self-regulation and the humanity-oriented trait yields a more robust predictor of psychological wellbeing compared to self-regulation alone, and second, to ascertain whether the humanity-oriented trait could attenuate the negative impact of mind-wandering (due to self-focused thoughts) to yield more enhanced psychological wellbeing. This research thus aims to provide innovative insights into the intricate interplay among self-regulation, mind-wandering, and humanity-oriented trait in the context of predicting psychological wellbeing.

The present study first validated the Chinese version of the Light Triad Scale (LTS-C), and employed it as an assessment tool for the evaluation of the humanity-oriented trait. The first research question (RQ1) asked what are the relationships among self-regulation, mind-wandering, psychological wellbeing, and humanity-oriented trait? The second research question (RQ2) examined whether a model where self-regulation is combined with the humanity-oriented

trait predict psychological wellbeing better than self-regulation alone? The third research question (RQ3) asked can the negative effects of more mind-wandering on psychological wellbeing be mitigated by greater scores on the humanity-oriented trait? I hypothesised that: Hypothesis 1.1 (H1.1): self-regulation will be positively associated with psychological wellbeing.

Hypothesis 1.2 (H1.2): humanity-oriented trait will be positively associated with psychological wellbeing.

Hypothesis 1.3 (H1.3): mind-wandering will be negatively related to psychological wellbeing.

Hypothesis 2 (H2): self-regulation, combined with the humanity-oriented trait, will be a stronger predictor of psychological wellbeing than self-regulation alone.

Hypothesis 3 (H3): the negative impact of the greater amount of mind-wandering on psychological wellbeing will be attenuated through higher humanity-oriented trait.

4.2 Method

4.2.1 Participants

After the data collecting process, this study included 513 data entries. The present study accepted missing data of less than 5% as generally suggested (e.g., Enders, 2022; Heymans & Twisk, 2022; Schafer & Graham, 2002), which excluded 133 data entries. A total of 380 Chinese post-secondary education students over 16 years old were recruited from research universities, colleges, high schools, and vocational institutions in China and in the UK. Participants' age varied from 16 to 62, with a mean age of 24 ($SD = 5.4$). Age, education level, home region, and gender were not correlated with LTS-C and either of its subfactors ($p > .1$). Descriptive statistics for the sample are listed in Table 5.

Table 5 Demographic Table of Sex, Educational Grade, Hometown, and Age

Characteristics		(n = 380)	
Sex			
	Female	237	62.40%
	Male	135	35.50%
	Prefer not to say	8	2.10%
Education Grade			
	Master's education	181	47.60%
	Undergraduate education	138	36.30%
	PhD education	27	7.10%
	Vocational higher education	27	7.10%
	High school	5	1.30%
	Vocational high school	1	0.30%
Hometown			
	East China	166	43.70%
	North China	112	29.50%
	Southwest China	28	7.40%
	South China	24	6.30%
	Central China	22	5.80%
	Northeast China	13	3.40%
	Northwest China	11	2.90%
Age			
	16-19	283	74.50%
	19-29	62	16.30%
	29+	30	7.90%

4.2.2 Measures

Self-Regulation

The Brief Self-Control Scale (BSCS) has four scales assessing the general capacity for self-discipline, inclination toward deliberate or non-impulsivity action, healthy habits, and self-

regulation in service to building a solid work ethic (Tangney et al., 2004). Each item is rated on a five-point scale, from strongly disagree to strongly agree. The 11-item Chinese version of BSCS demonstrated good reliability with Cronbach's α of .81 (Fung et al., 2019). Cronbach's α value for the BSCS in the present study was .79.

Mind-Wandering

The 5-item Mind-Wandering Questionnaire (MWQ) was used to measure trait mind-wandering (Mrazek et al., 2013). Each item is rated on a six-point scale, from 1, almost never, to 6, almost always. An example item include “While reading, I find I haven’t been thinking about the text and must therefore read it again.” The Chinese version of the MWQ has been validated with a Cronbach's α of .74 (Luo et al., 2016). Cronbach's α value for the MWQ in the present study was .78.

Psychological Wellbeing

The 18-item Ryff's Scale of Psychological Wellbeing (SPWB) was developed to assess six dimensions: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance (Ryff & Keyes, 1995). The items are rated from strongly agree to strongly disagree (seven gradients). The Chinese version of SPWB demonstrated good reliability in previous studies (Li, 2014) with Cronbach's α of .91. Cronbach's α value for the SPWB in the present study was .92.

Humanity-Oriented Trait

The humanity-oriented trait was measured by the Light Triad Scale (LTS) (Kaufman et al., 2019). This 12-item scale has three subscales assessing faith in humanity, humanism, and Kantianism. Each item is rated on a five-point scale, from strongly disagree to strongly agree. LTS was developed to measure how much people have loving and kind attitudes towards others, which aligns with the humanity-oriented trait explored in our study. It also shares similarities in

predicting self-improvement and a growth-oriented trait. In line with the original research, this study included measures of the Satisfaction with Life Scale (SWLS) and Self-Transcendence Scale (STS) in this study to validate the LTS-C. Cronbach's α value for the LTS in the present study was .81, in the original English-version validation study it was .84 (Kaufman et al., 2019).

Self-Transcendence

The Self-Transcendence Scale (STS) is a 15-item scale (Reed, 1986) that assesses how people rise above themselves, expand their personal boundaries, and connect with things beyond themselves. The Chinese version of STS has good reliability with Cronbach α of .83 (Zhao et al., 2018). Each item is rated on a 4-point scale (1 = strongly disagree, 4 = strongly agree).

Cronbach's α value for the STS in the present study was .92.

Satisfaction with Life

Satisfaction with Life Scale is used in the present study to validate the Light Triad Scale. Satisfaction with life scale has been widely used to assess wellbeing, and it is strongly positively associated with psychological wellbeing and self-transcendence (Diener et al., 1985; Diener et al., 2015). Satisfaction with Life Scale (SWLS) is a 5-item scale developed by Diener et al. (1985). Each item is rated on a 7-point scale (1=strongly disagree, 7=strongly agree). Sample items include "The conditions of my life are excellent" and "So far I have gotten the important things I want in life". The Chinese version of SWLS was previously validated with good internal reliability with Cronbach α of .82 (Sachs, 2003). Cronbach's α value for the SWLS in the present study was .84.

4.2.3 Statistical Analysis

To validate the LTS-C so that it can be used as a measure of the humanity-oriented trait, this study first conducted an exploratory factor analysis (EFA) and a confirmatory factor analysis

(CFA). EFA was performed using principal components, and the CFA was performed using maximum likelihood estimation. The study used SEM for testing CFA and model fit in Study I. To evaluate the internal consistency reliability of the LTS-C, I calculated Cronbach's alpha coefficient, indicating whether the scale is reliable for assessing humanity-oriented trait among Chinese participants. For statistical methods, SPSS 28.0 was used for descriptive statistics, correlation analysis, and regression models. AMOS 29.0 was used for EFA, CFA, and Structural Equation Model. SPSS PROCESS macro was used for mediation analysis (Hayes, 2012).

To answer RQ1, a correlational matrix was conducted to answer H1.1, H1.2, and H1.3. To answer RQ2, hierarchical multiple regression model was conducted. Self-regulation was first entered into the hierarchical multiple regression model, and the humanity-oriented trait was then entered in addition to self-regulation. As the inclusion of the humanity-oriented trait represented the only change between the two steps, any changes in the prediction of the outcomes can only be due to the effect of the humanity-oriented trait. This study used the word “combined” in research questions to indicate the use of multiple regression models⁵. To answer RQ3, this study conducted a mediation analysis with the humanity-oriented trait scores as the mediator between mind-wandering and psychological wellbeing.

4.3 Results

4.3.1 Validation of the Chinese version of the Light Triad Scale

⁵ It can be argued that adding an extra variable into a model automatically increases the variance or ability to predict the outcome variable. This may not always be the case because it depends on the nature and relationships with the predictors. Take self-regulation as an example, it is negatively correlated with neuroticism, a personality trait describing experiences of negative affect such as anxiety, depression, and anger. When neuroticism is “combined” with self-regulation, it is not a better predictor of wellbeing. Indeed, we aimed to explain the negative side of using self-regulation as an isolated tool from a preventive perspective, by exploring the possible necessity of fostering humanity-oriented trait and improving self-regulation at the same time.

Process of Translation and Adaptation of the LTS

To ensure the translated items reflected the meaning of the original English items, translations were performed in accordance with the guidance of forward-translation and back-translation procedures recommended by the World Health Organization (WHO, 2009). First, the original scale was forward translated from the source language (English) into the target language (Chinese) by two bilingual Chinese native speakers with previous experience in psychological linguistics. Second, another bilingual English native speaker with living experience in China performed the back-translation to English. Differences between the back-translated questionnaire and the original version were discussed until an agreed version was reached. The equivalence of concepts and cultural validation that was achieved as a result of this process of back translation ensured the valid construction of the translated questionnaire.

Exploratory Factor Analysis

To validate the LTS-C this study first performed an exploratory factor analysis ($N = 380$). The KMO of .83 and Bartlett's Test of Sphericity was significant ($\chi^2 = 1255.24$, $p < .001$) suggesting that the data was normally distributed. The Scree Plot suggested a 3-factor loading (Eigenvalues > 1) to fit the model, which is in accordance with the factor composition of the original English LTS.

We applied the oblique oblimin rotation method in the factor analysis in line with the original English LTS (Kaufman et al., 2019). This is important because this extraction method allows for interrelations among factors. However, one item of LT01_FIH (I tend to see the best in people) has a confusing meaning in Chinese. This item seems to fit in both Faith in Humanity (factor loading: .40) and Humanism (factor loading: .59). This study decided to include it in Faith in Humanity in accordance with the original English version questionnaire.

Previous researchers provided thresholds for factor-loading cut-offs (Field, 2005; Hair et al., 2010), but there is a debate about the cut-off value and whether the thresholds should be decided based on sample size (Tavakol & Wetzel, 2020). For example, Field (2005) suggested when the factor has four or more loadings, to use at least .6 as the cut-off value. Stevens (2012) suggested a smaller value of at least .4. Hair et al. (2010) provided a table of Loadings for Practical Significance (p112) and indicated to use of a .3 as the factor loading cut-off value when the sample size is over 350, which was applied in the present study.

Thus, for better interpretive purpose as suggested by Stevens (2012), and using the cut-off value of .3 since the sample size was greater than 350 per Hair et al. (2010), the Chinese version questionnaire included this item in the Faith in Humanity factor to adhere to the original English version questionnaire. This study settled on a three-factor 12-item solution. The three factor-loading and other items in the factors are in line with the original LTS (Kaufman et al., 2019). The results are shown in Table 6.

The general internal consistency coefficient ($n = 380$) for the LTS-C was $\alpha = .81$, which demonstrated high reliability. The observed internal consistency coefficients for Faith in Humanity, Humanism, and Kantianism were .68, .73, and .69, respectively. Compared with the original English LTS ($\alpha = .84$ for the total scale; $\alpha = .80, .77, .67$ for the three factors, respectively), the LTS-C had comparably good overall internal reliability. Results also showed strong correlations between the three subscales (Humanism and Kantianism: $r = .43, p < .01$, Faith in Humanism and Kantianism: $r = .38, p < .01$, and Faith in Humanism and Humanism: $r = .50, p < .01$), compared to the correlations among subscales of English LTS ($N = 1,518$; Humanism and Kantianism: $r = .41, p < .01$, Faith in Humanism and Kantianism: $r = .34, p < .01$, and Faith in Humanism and Humanism: $r = .60, p < .01$). These findings suggest that the LTS-C

is a reliable measure, and thus can be used in this study to measure humanity-oriented trait for Chinese participants.

Table 6 Exploratory Factor Analysis. Factor Loadings and item descriptive statistics for the Measures of Light Triad (Pattern Matrix) (N = 380)

	Factor Loading				Descriptive Statistics		
	1	2	3	Mean	SD	Skewness	Kurtosis
Factor 1: Humanism							
LT05_H: I tend to admire others.	.77		.12	3.96	.69	-.92	2.61
LT06_H: I tend to applaud the successes of other people.	.74		.14	3.91	.74	-.81	1.81
LT08_H: I enjoy listening to people from all walks of life.	.72		-.16	4.22	.72	-.92	1.45
LT07_H: I tend to treat others as valuable.	.65			4.05	.68	-.90	2.56
Factor 2: Kantianism							
LT11_K: I would like to be authentic even if it may damage my reputation.	-.15	.79	.16	3.39	.92	-.17	.03
LT12_K: When I talk to people, I am rarely thinking about what I want from them.		.70	.13	3.60	.95	-.44	-.14
LT10_K: I don't feel comfortable overtly manipulating people to do something I want.	.30	.61		3.93	.91	-.82	.60
LT09_K: I prefer honesty over charm.	.30	.58	-.11	4.08	.84	-1.04	1.57
Factor 3: Faith in Humanity							
LT01_FIH: I tend to see the best in people.	.57	-.20	.40	3.84	.80	-.81	1.69
LT02_FIH: I tend to trust that other people will deal fairly with me.			.78	3.39	.90	-.37	-.02
LT03_FIH: I think people are mostly good.	.19		.69	3.85	.87	-1.09	1.5
LT04_FIH: I'm quick to forgive people who have hurt me.		.22	.66	2.96	1.1	-.1	-.59

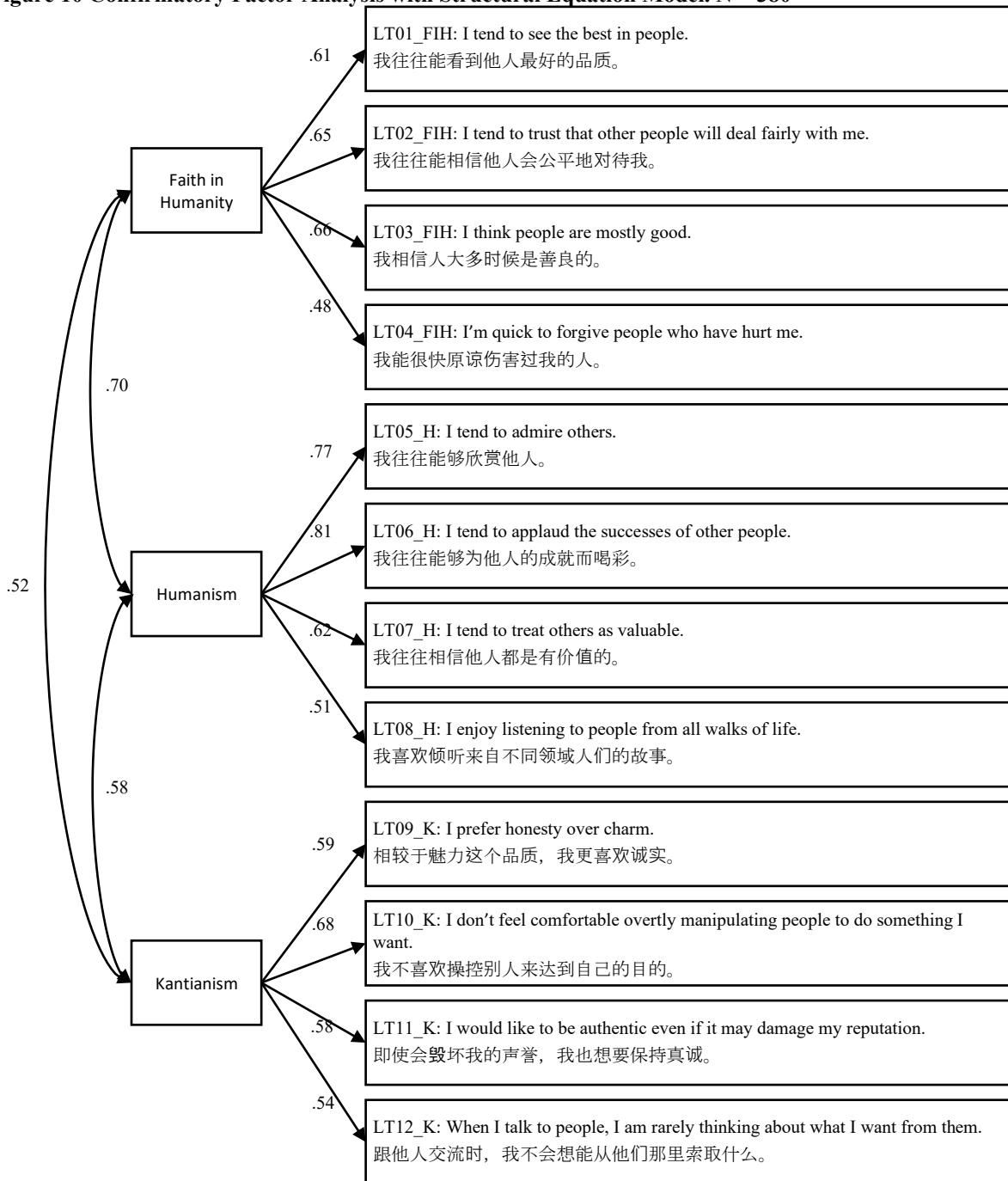
Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization. Rotation converged in 6 iterations.

Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted to examine the structure of the LTS-C based on a Structural Equation Model. The EFA and CFA were conducted on data from the same participant sample. This approach was previously indicated by Thompson (2004), even though it has its limitations. The method of Maximum Likelihood was employed. Three-factor model was examined in line with the original LTS study (Kaufman et al., 2019). The model fit indices of the Chinese version and the original English version were compared. Firstly, Chi-squared χ^2 goodness of fit indicated a fitting model, $\chi^2 (51) = 181.3$, $p < .01$, compared to the English LTS, $\chi^2 (51) = 277.8$, $p < .01$. Second, the CFI of .89 indicated this model was close to an acceptable fitting model (this may be due to questionnaire item 1 fitting in two factors), compared to the CFI of .96 in the English LTS. The SRMR of .06 indicated an acceptable model fit compared to the SRMR of .04 in the English LTS. The RMSEA of .08 [.07 - .10] indicated a fair fit as compared to the RMSEA of .05 [.05 - .06] in the English version of LTS. There was no gender, age, educational, or regional difference for the LTS-C ($p > .1$).

Figure 10 Confirmatory Factor Analysis with Structural Equation Model. N = 380



Convergent Validity

We then conducted a convergent validity test, and Table 7 shows the correlation analyses among the LTS-C, Self-transcendence Scale, and Satisfaction with Life Scale. LTS-C was

positively and significantly associated with Self-Transcendence ($r = .41, p < .01$), indicating that LTS-C showed positive personality traits such as flourishing and positive relations with others. LTS-C was also positively and significantly associated with Life Satisfaction ($r = .35, p < .01$) as expected. As a result of this validation, this study used the LTS-C as an indicator of the Humanity-oriented trait and refer to it as such in reporting further results.

Table 7 Correlation Analysis of Variables (n = 380)

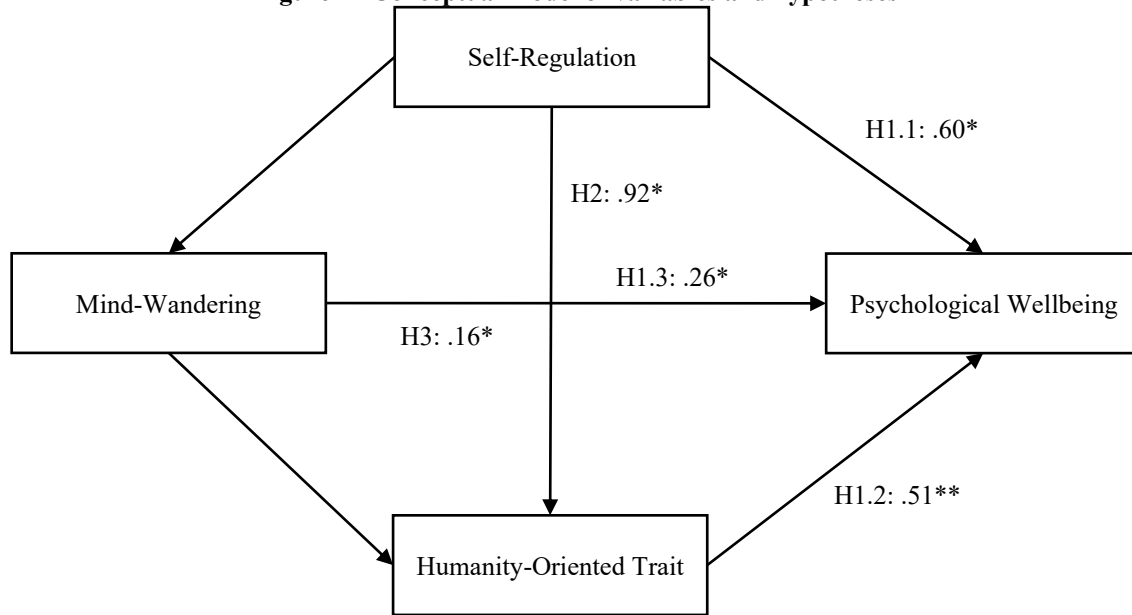
Variable	Mean (SD)	1	2	3	4	5	6	7	8
1. LTS-C	3.77 (.49)								
2. LTS-C_FIH	3.51 (.66)	.80**							
3. LTS-C_H	4.03 (.54)	.79**	.50**						
4. LTS-C_K	3.75 (.65)	.78**	.38**	.43**					
5. ST	2.93 (.54)	.41**	.28**	.43**	.29**				
6. SwL	4.08 (1.18)	.35**	.28**	.34**	.24**	.37**			
7. SR	3.11 (.56)	.20**	.15**	.19**	.14**	.29**	.22**	1	
8. MW	3.34 (.86)	-.18**	-.15**	-.19**	-.09	-.22**	-.21**	-.50**	1
9. PWB	4.27 (.70)	.51**	.36**	.53**	.35**	.50**	.52**	.38**	-.18**

Notes. LTS-C = 12-item Chinese Light Triad Scale (to measure humanity-oriented trait), LTS-C_FIH = Faith in Humanism, LTS-C_H = Humanism, LTS-C_K = Kantianism, ST = Self-Transcendence, SwL = Satisfaction with Life, SR = Self-Regulation, MW = Mind-Wandering, PWB = Psychological Wellbeing. * indicates $p < .05$. ** indicates $p < .01$.

4.3.2 Relating Psychological Wellbeing, Self-Regulation, Mind-Wandering, and Humanity-Oriented Trait

Results of correlation analyses testing H1 are presented in Table 7. Psychological wellbeing was significantly positively associated with self-regulation ($r = .38, p < .01$) and humanity-oriented trait (H2; $r = .51, p < .01$). Psychological wellbeing was significantly negatively associated with mind-wandering ($r = -.18, p < .01$). Figure 11 demonstrated a conceptual model of variables and hypotheses. Coefficients are explained.

Figure 11 Conceptual model of variables and hypotheses



Notes. The path connecting the two variables reflected the association between the constructs. For presentation clarity, only the central variables were included, and error terms were omitted. Hypotheses 1.1 – 1.3 (H1.1 – H1.3): correlational tests; hypotheses 2 (H2): regression model; hypothesis 3 (H3): mediation model.

Coefficients and level of significance were demonstrated,* $p < .05$; ** $p < .01$, *** $p < .001$.

4.3.3 Does Self-Regulation, Combined with Humanity-Oriented Trait, Predict Psychological Wellbeing Better than Self-Regulation Alone?

Hierarchical regression was performed to test the H2. Self-regulation was entered at Step 1, explaining 14.6% of the variance in psychological wellbeing, $F(1, 379) = 64.83$, $p < .001$. After the entry of humanity-oriented trait in Step 2, the total variance explained by the model as a whole was 34.6%, $F(2, 379) = 99.54$, $p < .001$. The humanity-oriented trait explained an additional 19.9% of the variance in predicting psychological wellbeing. Self-regulation and humanity-oriented trait were both statistically significant, but humanity-oriented trait ($\beta = .46$, $p < .001$) made a greater unique contribution to the model than self-regulation ($\beta = .29$, $p < .001$). Results are presented in Table 8.

Table 8 Hierarchical multiple regression analysis in predicting psychological wellbeing

Model and Predictors	β	t	Sig.	R ²	ΔR^2	ΔF	Sig.
Model 1	.38	8.05	<.001	.15	.15	64.83	<.001
Model 2	.29	6.88	<.001	.34	.20	114.74	<.001
	.46	10.71	<.001				

Notes. Dependent Variable: Psychological Wellbeing

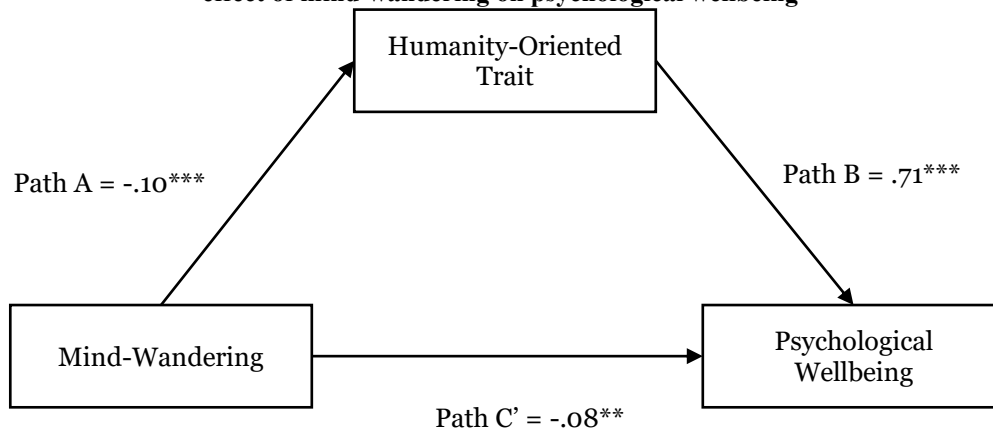
Model 1 predictors: Self-Regulation

Model 2 predictors: Self-Regulation, Humanity-Oriented Trait

4.3.4 The Attenuating Role of the Humanity-Oriented Trait on Mind-Wandering

PROCESS macro in SPSS was utilized to test the mediating effect using the bootstrap method with 5000 replicate sample at 50% confidence interval. The result of testing H3 was in line with our prediction that mind-wandering had an indirect effect on psychological wellbeing through humanity-oriented trait as a mediator [$\beta = -.07$, 95% CI (-.13, -.01)], since zero was not within the 95% confidence interval (CI) of the estimated indirect effect. The direct effect of mind-wandering on psychological wellbeing remained significant [$\beta = -.08$, 95% CI (-.15, -.01)]. The results indicated that both the direct effect of mind-wandering and indirect effect of humanity-oriented trait attained significant levels, which supported hypothesis 3, as shown in Figure 12.

Figure 12 Indirect analysis of H3 testing humanity-oriented trait with its attenuating role of the negative effect of mind-wandering on psychological wellbeing



	β	SE	LLCI	ULCI	Effect
Total Effect	-.19	.04	-.27	-.10	
Direct Effect	-.11	.04	-.18	-.03	57.11%
Indirect Effect	-.08	.03	-.13	-.03	42.99%

Notes. Path A = effect on Humanity-Oriented Trait, $\beta = -.10$, $SE = .03$, $p < .001$; Path B = effect on Psychological Wellbeing, $\beta = .71$, $SE = .06$, $p < .001$; Path C = mediation effect on Psychological Wellbeing via Humanity-Oriented Trait, Path C': $\beta = -.08$, $SE = .03$, $p < .01$.

* $p < .05$; ** $p < .01$, *** $p < .001$.

4.4 Discussion

This study aimed to examine the relationships among self-regulation, mind-wandering, and humanity-oriented trait in predicting better psychological wellbeing. This study validated the LTS-C for use in measuring the humanity-oriented trait. We found (H1) that people with higher self-regulation have better psychological wellbeing, which was in line with previous studies (Moffitt et al., 2011). People who score higher on the humanity-oriented trait also have better psychological wellbeing, which was in line with Verhaeghen (2021) who found that the virtue of humility (involved an interpersonal stance of other-focused thoughts) correlated positively with

psychological wellbeing. The results also showed that more mind-wandering was associated with lower psychological wellbeing, which is in line with previous research (Killingsworth & Gilbert, 2010; Poerio et al., 2013; Smallwood & Schooler, 2015).

Interestingly, we found (H2) that people who have higher self-regulation, and at the same time score higher on the humanity-oriented trait, have better psychological wellbeing than people who only have higher self-regulation. Finally, our results showed (H3) that the humanity-oriented trait attenuated the negative effect of mind-wandering in predicting psychological wellbeing. Therefore, the design of this study met the Research Aims II and answered the overarching Research Question II (see section 1.2 for detail).

4.4.1 The Role of Humanity-Oriented Trait in Predicting Psychological Wellbeing

This study was the first to explicitly link the humanity-oriented trait with concepts of self-regulation, mind-wandering, and psychological wellbeing. As suggested by Aristotelian Virtue Ethics from ancient Western philosophy and ZhiLiangZhi from ancient Eastern philosophy, the humanity-oriented trait might promote wellbeing and help people realize their true potential. Specifically, our findings suggest that promoting a caring attitude towards others and the wider society, when cultivated with self-regulation, might counter the self-focused side of self-regulation to support better psychological wellbeing. In other words, we have found preliminary empirical evidence indicating that focusing on own self-regulation without considering how it affects others seems less effective in supporting own psychological wellbeing than using self-regulation in a virtue-oriented way that also benefits others. In addition, cultivating the humanity-oriented trait may also mitigate the negative effects of mind-wandering as a failure of self-regulation in real life and thus support psychological wellbeing.

These findings have potential implications for educational practice, given the current emphasis on fostering self-regulation as a means to promote a range of positive current and future academic (Garcia et al., 2015) and mental health outcomes (e.g., Moffitt et al., 2011). Our findings suggest that the humanity-oriented trait needs to be cultivated alongside self-regulation to maximise protective effects on psychological wellbeing. This approach aligns with the goal of promoting a more balanced and holistic approach to personal development (Garcia et al., 2015).

4.4.2 Validation of the Chinese Light Triad Scale

This study also filled the gap in previous research that found it hard to assess humanity-oriented trait empirically (Fröding, 2011) by validating and using the Light Triad assessment as a proxy evaluation. The LTS-C was validated to be a rigorous measure in our sample as it was positively correlated with self-transcendence and satisfaction with life, in line with the Light Triad Scale validation study conducted in English (Kaufman et al., 2019). The LTS-C showed no differences among education groups, age, and gender, while the original study found that the scores on the humanity-oriented trait were positively correlated with older age and being female, with no difference among education groups (Kaufman et al., 2019). Overall, the findings show that the Light Triad scale is applicable in a broader range of cultures, such as in the Chinese context, albeit with possible cultural differences with regard to the relationship with age and gender.

4.4.3 Limitations and Future Directions

This study had several limitations. First, it was a self-report study, more behavioural and psychophysiological measures are needed for evaluation of the humanity-oriented trait because

self-reports can be biased due to social desirability. Second, this study was cross-sectional and, thus, doesn't allow for causal inferences about the relationship between the humanity-oriented trait and psychological wellbeing. Third, we did not directly examine the wellbeing-undermining behaviours linked to high self-regulation since it was beyond the scope of the current study which primarily aimed to provide initial evidence on the links between self-regulation, mind-wandering, humanity-oriented trait and psychological wellbeing. Fourth, the mind-wandering questionnaire used in the present study assessed the amount of mind-wandering but lacked the perspectives of valence, habitual thoughts, and self-other focus in assessing the mind-wandering content. Fifth, the EFA and CFA were conducted from the same sample of participants. Sixth, I used a regression model comparing the single predictor of self-regulation with a combined predictor of self-regulation and humanity-oriented trait. However, this is not a commonly used model as I studied. It could be argued that there is no doubt that a combined predictors have more strength than a single predictor. Through literature review, I haven't found a similar scenario to the case to answer research question 2, and this is the most appropriate model I studied in this situation. Future studies could explore it and use more advanced statistical models.

However, the current study opens up several future directions for research on humanity-oriented trait and self-regulation. First, further studies should replicate our findings with other participant samples cross-culturally, this study particularly focused on Chinese students. Second, future research would benefit from designing behavioural assessments for the humanity-oriented trait to provide more rigorous evidence. Third, since we understand that self-regulation together with humanity-oriented trait predicts psychological wellbeing better than self-regulation alone, the next step is to extend existing self-regulation interventions by fostering humanity-oriented trait to support wellbeing in the educational context and evaluate such interventions rigorously

with regards to longer-term academic and wellbeing outcomes. Fourth, the current study highlighted the need for assessments of wellbeing that have a wider focus, beyond the individual, in alignment with the Bioecological model, virtue-based eudaimonia, and eastern philosophy of ZhiLiangZhi. Fifth, future research should include more perspectives in assessing mind-wandering (such as assessing the mind-wandering contents from a self-other perspective, past-future perspective, and negative or positive emotion perspective), especially when it is linked to psychological wellbeing.

4.4.4 Conclusion

Most education programs focus on improving self-regulation since it predicts wellbeing and academic performance. However, there might be a lack of consideration that excessive self-regulation can be used in a manipulative way to harm others. The present study reminds the importance of the humanity-oriented trait when exercising self-regulation, especially in the adolescent sample, and to improve self-regulation and use it in a prosocial way. The present study also intended to suggest that generating more thoughts of others can be a possible way to reduce the frequency of mind-wandering and to improve wellbeing for adolescents.

In summary, this study was the first to show that the humanity-oriented trait might be an important protective factor of wellbeing, particularly when combined with self-regulation and low mind-wandering. This suggests that fostering self-regulation alone in certain contexts, such as in education, might enhance academic performance but is likely to be insufficient in supporting pupils' wellbeing. We hope to stimulate future research, expanding our understanding of the role of positive personality traits in enhancing wellbeing both for self and positive social

action. This might be particularly important during current societal crises, that bring to the forefront the interconnected nature of individual, societal and planetary wellbeing.

Chapter 5 Impact of Brief Caring Other-Focused and Mindful Self-Focused Meditation Induction on Self-Other Related Mind-Wandering and Affect: a Randomized Controlled Study

Abstract

Mind-wandering, described as task-irrelevant thoughts, is often self-focused and associated with negative affect. This study investigated whether the self-focused aspect of mind-wandering can be reduced by Caring Other-Focused Meditation (CM) that invites other-related positive thoughts in contrast to Mindful Self-Focused Meditation (MM) that is more self-focused, albeit in a mindful accepting way. Both types of meditation were expected to reduce negative affect in comparison to an Attention Control (AC) induction condition and accordingly changes in state affect from before to after the brief inductions were investigated.

In this randomized controlled study 55 adults were randomly assigned to either an CM, MM, or AC condition. Participants completed the Thought Sampling Paradigm and self-report inventories that measured trait and state mind-wandering (including its valence, frequency, self-focused habitual thoughts, other-focused habitual thought, other-caring thoughts, perceived body boundaries, and Spatial Frame of Reference Continuum) and affectivity. Compared to MM, CM resulted in increased other-caring thoughts and improved Spatial Frame of Reference Continuum, and decreased perceived body boundaries. No significant changes found in affect impacted by CM or MM.

The study builds on a recently developed wellbeing theory, that expands the scope of wellbeing from mindful self-focus to caring and compassionate other-focus, and on a recently proposed notion of humanity-oriented trait, a positive personality trait of loving-kindness,

compassion, and awareness to give and receive love. The findings suggest that both MM and CM may improve wellbeing but through different mechanisms (mindful self-focus vs caring other-focus), where the sense of self-boundaries was demonstrated to be an important protective factor in cultivating other-focused compassionate feelings of others.

5.1 Introduction

Conceptualisations of human wellbeing differ in the degree of importance they place on mindful self-focused and caring other-focused wellbeing. It could be argued that theories of life satisfaction (subjective wellbeing) (Diener, 2000) are primarily self-focused whereas the theory of psychological wellbeing, building on the concept of eudaimonia, places implicitly slightly greater emphasis on self-other relational wellbeing (Ryff, 1989). Aiming to explore the differential contribution of self vs other focus in wellbeing conceptualisations, a recent study however suggested that the prevalent understanding of wellbeing often centres on the self across current theories and this approach might unintentionally compromise the welfare of others.

To further explore wellbeing from the self- or other-focused perspectives, mind-wandering has been shown to reflect the self-other perspective in the context of wellbeing through the mind-wandering contents. Mind-wandering, as a type of spontaneous thought (the other types include daydreaming or creative thinking; Christoff et al., 2016), refers to a mental state characterized by spontaneous shifts of attention drifting away from the present situation or task (Christoff et al., 2016; Smallwood & Schooler, 2015). Mind-wandering occupies a significant portion of the waking hours (Kane et al., 2007; Killingsworth & Gilbert, 2010) and is often linked to negative emotional states (Jazaieri et al., 2015; Smallwood & Schooler, 2015). More mind-wandering is also associated with suboptimal academic or work performance and

reduced work efficiency (e.g., Mason et al., 2007; Poerio et al., 2013), although more mind-wandering can help refine concrete personal goals with specific actions and objectives (Medea et al., 2018), provide the source of creative inspiration and help make long-term plans (Smallwood & Andrews-Hanna, 2013).

In recent years, mind-wandering has gained prominence in predicting wellbeing from both a mindful self-focused perspective and a taking into account perspective of others (Jazaieri et al., 2015; Medea et al., 2018), especially in the context of psychological wellbeing (Borella et al., 2022), a type of wellbeing that reflects individual flourishing and the connections between oneself and others. Mind-wandering can be self-focused (Kanske et al., 2017; Medea et al., 2018), and individuals prone to extensive mind-wandering often dwell on self-focused past regrets or unfulfilled actions (Marchetti et al., 2016), and this frequently leads to negative affect (Kane et al., 2017; Smallwood, 2013; Smallwood & O'Connor, 2011). To mitigate the negative affect of mind-wandering, it is likely that an increase in other-focused thoughts in mind-wandering could lead to more positive affect and better wellbeing. This could be explained by the *Humanity-Oriented Trait*, a positive personality trait characterized by an individual's tendency toward caring thoughts for others and a sense of connectedness with both humans and the broader world.

To cultivate the humanity-oriented trait and lower mind-wandering, meditation practices have been demonstrated as an effective method (Kok & Singer, 2016) which may alter the perceptions towards the self and others. However, meditation types differ in their emphasis on self vs other perspectives. For example, mindful self-focused meditation (MM) seems to mostly cultivate accepting self-focused thoughts (Feruglio et al., 2021) while caring other-focused meditation (CM) fosters kind and compassionate other-focused thoughts (Zeng et al., 2015). But

both of these meditation practices help facilitate the healthy detachment from thoughts, promoting an enhanced focus on sensory experience or visualisation in the present moment, consequently disrupting mind-wandering thoughts and augmenting wellbeing (Borella et al., 2022; Van Gordon et al., 2014).

Importantly, different meditation types likely impact affectivity and wellbeing in different ways but these distinctions are often lost when the same label, most often mindfulness, is applied widely to designate a range of meditation practices (Levit-Binnun et al., 2021; Dorjee, 2010). For example, mindfulness meditation in its secularized form cultivates attention to the present moment with a non-judgmental attitude (Kabat-Zinn, 2003), and it is often considered an entry-level meditation and the foundation for other meditation practices such as those cultivating wholesome emotions. However, many studies utilize the label ‘mindfulness meditation’ for other meditation types, including loving-kindness and compassion practices. To clearly distinguish the effects and mechanisms of the MM and CM, we adopted the Mindfulness Map (Levit-Binnun et al., 2021) framework to highlight the differences between MM and CM. Specifically, in this study we applied MM in terms of the second group of MM practices in this framework, cultivating both sensory awareness and non-judgmental attitude. We consider the CM an independent group of meditation practices building on MM practices, but in mindfulness research, it is sometimes included under the general label of mindfulness practices and in the Mindfulness Map framework would fall under the third group of mindfulness practices.

Despite the suggestion that CM practices are likely to increase positive affect due to their humanity orientation, more focus on others as part of CM could also produce negative affect, such as incessant ruminative thinking about maintaining social relationships or the negative impact of other’s suffering leading to withdrawal (Singer & Klimecki, 2014). These negative

effects are associated with a low sense of self-boundaries, an experience of the self as separate from others and the world (Dor-Ziderman et al., 2016), which suggests that a sense of self-boundaries can be a protective factor for those whose thoughts are more focused on others. Therefore, investigation of possible other-focused effects of CM also needs to take into account the possible impacts of CM on changes in self-boundaries in relation to shifts in affect and wellbeing.

Previous research has often studied mind-wandering from the perspective of self-focused wellbeing (e.g., subjective wellbeing) or other-focused wellbeing (e.g., social connections), without comparing the two different approaches. Even though both positive mindful self-focused and caring other-focused mind-wandering can improve wellbeing, their underlying mechanism could be different. To compare the self-focused perspective of mindfulness meditation to the other-focused perspective of caring other-focused meditation with its possible effects on wellbeing, the current study aimed to compare the impact of meditations focused on self and others on mindful self-focused and caring other-focused thoughts in mind wandering and in the context of wellbeing. In assessing affectivity and thoughts, previous studies have examined other-focused thoughts through the Experience Sampling method, followed by questionnaires investigating the content of specific thinking, such as thinking about the past-future or about the self-others (e.g., Wang et al., 2018). However, this approach has limitations in obtaining sufficient evidence to study the thoughts behind the behaviour. We adapted the innovative Thought Sampling Paradigm beyond Experience Sampling in studying mind-wandering in lab-based setting asking the participants recall thoughts from their daily life experience.

The Present Study

This randomised controlled study was designed to address the research aim III (to understand the theoretical and empirical differences between mindful self-focused thoughts, caring other-focused thoughts, and their associations with mind-wandering and wellbeing) and answer the overarching research question of the thesis (RQ III): Do brief mindfulness and caring other-focused meditation inductions impact mindful self-focused thoughts and caring other-focused thoughts differently and if so how do such differences relate to changes in mind-wandering frequency and affect?

Specifically, this randomised controlled study aimed to contrast the effects of a brief caring other-focused meditation (CM), brief mindful self-focused meditation (MM) and an attention control condition (AC) on mind-wandering, specifically, its affective valence, habitual experience, frequency, and the other-caring perspective, as well as positive affectivity in general. The MM condition was included because it is effective at reducing mind-wandering in general but from a mindful self-focused perspective, in comparison to CM can also reduce mind-wandering but fosters the other-focused perspective. The AC was included because it doesn't directly aim to reduce mind-wandering via either self or other-focused guided practices but is assumed to involve closely similar cognitive load processes as the other two conditions. AC allowed us to contrast mindful self-focused and caring other-focused mind-wandering with unguided, spontaneous mind-wandering experiences.

We also assessed participants' trait mind-wandering, trait mindfulness, and trait wellbeing at the baseline, to control for pre-existing group differences. Additional state pre- and post-assessments were conducted before and after the interventions and included a positive and negative affect measure and a Thought Sampling Paradigm (TSP) to evaluate the valence,

habitual experience, frequency, and other-caring perspective of state mind-wandering.

Specifically, the present study answered the following research questions.

1. Is there a positive association between trait other-caring thoughts and trait positive affect (at the baseline)?
2. Does a higher frequency of caring other-caring state mind-wandering thoughts predict positive affect better than a higher frequency of mindful self-focused thoughts (at the baseline)?
3. Will both CM and MM significantly reduce mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, perceived body boundaries, spatial frame of reference continuum) in comparison to the AC condition? Will there be a difference between the CM and MM in reducing mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, perceived body boundaries, spatial frame of reference continuum)?
4. Will participants in the CM condition show a significantly higher increase in positive affect (or decrease in negative affect) and other-caring thoughts than participants in the MM and AC conditions?

5.2 Methods

5.2.1 Ethics Approval

This study used the opportunity and snowball sampling methods to distribute experiment invitations. Only native-English-speaking adult participants were recruited via email, posters, and posts by administrators at the university. Specifically, we first collected participants' emails

on a separate sheet from Qualtrics, and that information was not linked to their questionnaire data. In recompense for participants' time, every participant received a £5 Amazon voucher and had a chance to win an additional £20 Amazon voucher from a prize draw.

The experiment and data collection procedure complied with the ethical standards of psychological research. The University of York, Department of Education, Education Ethics Committee approved this project. In preparing the ethical application, the researcher considered various risks, including participant anonymity, voluntary participation and confidentiality, and data security. The risk of participants' mental health being negatively affected by answering the questions was minimised by designing the questions from a positive perspective. Nevertheless, , participants were provided with mental health support information on the information page (e.g., mental helpline, mental advice from the university). The approved Ethics Issues Audit Form and Informed Consent Form can be viewed in the Appendix 3.

5.2.2 Participants

Fifty-five participants (see Table 9 for demographics) were randomly assigned to CM ($n = 18$), MM ($n = 20$), and AC ($n = 17$) conditions (see Figure 13 for details on the data collection procedure).

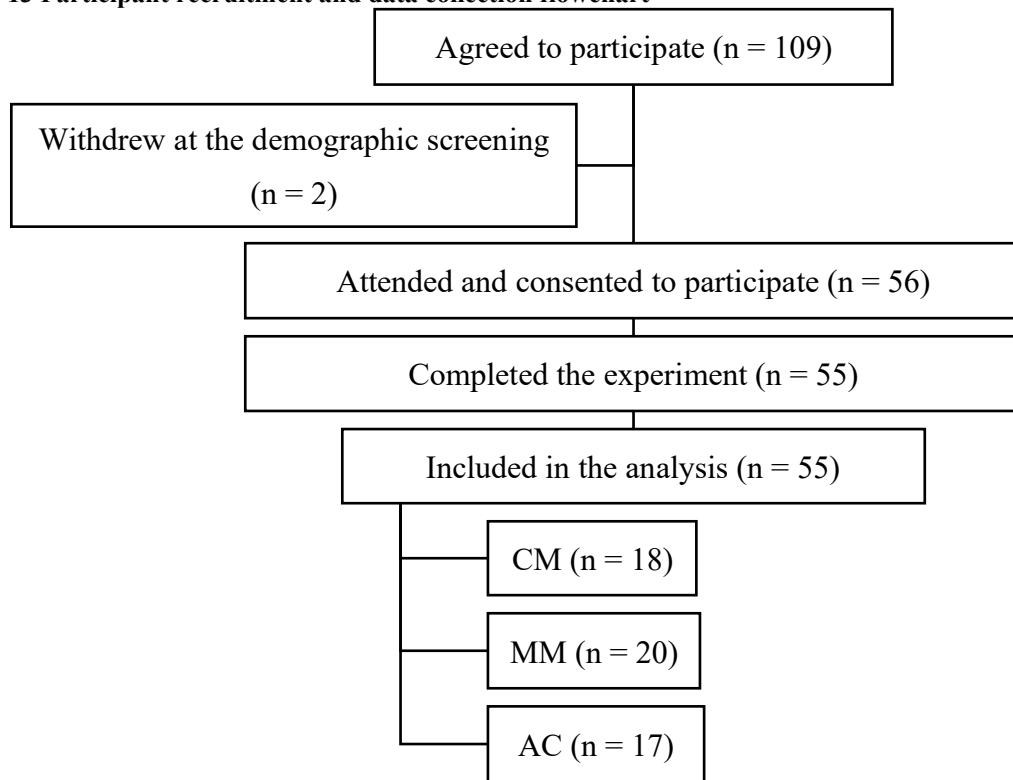
Power analysis was calculated based on a meta-analysis study of the CM on self-other-regarding variables and positive affect with a medium effect size on CM (Zeng et al., 2015), using Cohen's d or Hedges' g of 0.15, 0.40, and 0.75 to interpret small, medium, and large effects (Brydges, 2019; Cohen, 1988). The sample size was calculated for Hedges' $g = .397$ (Seppala et al., 2014), with an alpha error probability of .05 and power of .75 in the software G*Power 3.1. The total sample size was estimated to be 47, with 15 – 16 participants in each

group. We also referred to other compassion and mindfulness meditation-related randomized controlled studies to be in line with this sample size (Luberto et al., 2018).

Table 9 Demographic characteristics of participants (n = 55).

Characteristics	Mean (SD)	Range	n	Percentage
Age	22.61 (5.63)	19 - 45	55	
Gender				
Female			29	52.7%
Male			19	34.5%
Non-binary/third gender			5	9.1%
Prefer not to say			2	3.6%
Education				
Further education (e.g., A-levels, BTEC, NVQ, sixth form)			43	78.2%
Bachelor's degree			6	10.9%
Postgraduate degrees			6	10.9%
Previous Meditation Experience				
Yes			29	52.7%
No			26	47.3%
Meditation Frequency				
Never			28	50.9%
Very occasionally			11	20.0%
Once in a couple of weeks			7	12.7%
A few times a week			3	5.5%
Once or twice a week			2	3.6%
About once a month			2	3.6%
Everyday			2	3.6%
Meditation during the last 7 days				
No			46	83.6%
Yes			9	16.4%
Meditated today				
No			52	94.5%
Yes			3	5.5%

Figure 13 Participant recruitment and data collection flowchart

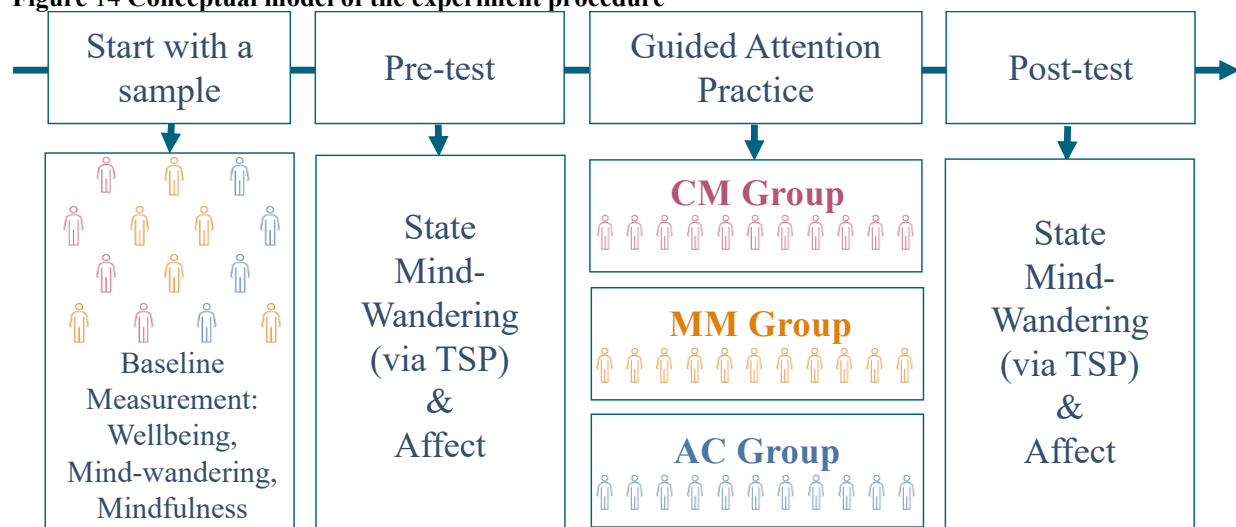


5.2.3 Procedure

All participants were randomly allocated into three groups: the CM group, the MM group, and the AC group. Experiments were conducted on weekdays in the afternoon in small groups. After participants entered the testing room (a quiet room on the university campus), they were asked to review and sign the informed consent form. At the beginning of the experiment (see Figure 14 for a conceptual model of the experimental procedure), participants completed a baseline assessment, which included demographics questions, a trait mind-wandering measure, a trait mindfulness measure, and a trait wellbeing measure. Then participants were asked to do the pre-test via the Thought Sampling Paradigm to measure their state affect and state mind-wandering. After the guided attention practice, participants were asked to complete the post-test of the same state measures as those at the pre-test.

The pre-test and post-test contained the same two questionnaires. The first questionnaire asked participants to complete a Thought Sampling Paradigm to assess their state mind-wandering contents. Specifically, participants recorded five different ongoing thoughts as their minds wandered. Participants wrote down their wandering contents on five stickers. Then each sticker was peeled off and stuck back on a set position above the measures/questions on the following pages. Each thought on the sticker was then evaluated via specific questions to assess its self-other focused thoughts of mind-wandering. After completing the first question of the Thought Sampling Paradigm, the second question of the pre-test or post-test was to assess the positive and negative affect using a Positive Negative Affectivity Scale (Thompson, 2016). The entire experimental session lasted approximately 30 minutes.

Figure 14 Conceptual model of the experiment procedure



Note. CM: Caring other-focused meditation; MM: Mindful self-focused meditation; AC: Control attention; TSP: Thought sampling paradigm.

5.2.4 Measures

Mind-Wandering

Trait mind-wandering measure was used to control for baseline differences in mind-wandering between participants in the three groups. The Mind-Wandering Questionnaire (MWQ) is a 5-item Likert scale that measures the frequency and amount of trait mind-wandering (Mrazek et al., 2013). An example of items is “While reading, I found I wasn’t thinking about the text and therefore had to read it again.” Items are rated on a 6-point scale from 1 (almost never) to 6 (almost always). MWQ has demonstrated strong internal consistency in previous studies (e.g., Cronbach’s alpha of .85; Mrazek et al., 2013). The internal consistency reliability of the MWQ in the current study was .76.

Mindfulness

Trait mindfulness measure was used to control baseline differences in mindfulness levels between participants in the three groups. Since participants may have experienced different levels of meditation training prior to the experiment, they may have had different baseline mindfulness levels. The Freiburg Mindfulness Inventory (FMI) has been used in previous research in relation to affectivity and wellbeing (Walach et al., 2006). FMI is a 14-item measure assessing mindfulness on a 4-point Likert scale from 1 (rarely) to 4 (almost always). Examples of items include “I watched my feelings without getting lost in them.” FMI has demonstrated strong internal consistency in previous studies (e.g., Cronbach’s alpha of .93; Walach et al., 2006). The internal consistency reliability of the FMI in this study was .73.

Wellbeing

Trait wellbeing measure was used to control for baseline differences in wellbeing across participant groups. The WHO-5 Wellbeing Index (WHO-5) consists of 5 items that measure daily wellbeing (e.g., “My daily life was filled with things that interest me”; (WHO, 1998). Each item is rated on a 6-point Likert scale from 0 (at no time) to 5 (all the time). WHO-5 has

demonstrated strong internal consistency in previous studies (e.g., Cronbach's alpha of .86; Omani-Samani et al., 2019); The internal consistency of the WHO-5 in this study was .63.

Positive and Negative Affect

The International Positive and Negative Affect Schedule Short Form (I-PANAS-SF) was used in this study (Thompson, 2016) to assess state changes in affect from before to after the brief interventions. Originally the Positive and Negative Affect Schedule (PANAS) was a 20-item scale including ten positive affect adjectives and ten negative affect adjectives (Watson et al., 1988). I-PANAS-SF is a 10-item scale that includes five positive affect adjectives (e.g., inspired) and five negative affect adjectives (e.g., upset), and it has been validated by Thompson (2016). Each item is rated on a 5-point Likert scale from 1 (very slightly or not at all) to 5 (extremely). I-PANAS-SF has demonstrated good internal consistency in previous studies (e.g., Cronbach's alpha of .78 for PA and .76 for NA; Thompson, 2016). The internal consistency reliability of the I-PANAS-SF in this study was .74.

Thought Sampling Paradigm and Measures

The thought Sampling Paradigm (TSP) was used to assess state mind-wandering (Andrews-Hanna et al., 2013). Participants were asked to write down five of their thoughts Right Now (in the moment) before and after the brief inductions. The measures were adopted from previous thought sampling probes (e.g., Mrazek et al., 2012).

Each thought was then evaluated by seven measures of state mind-wandering. The first item, *Valence*, assessed affective quality of a thought content from 1 (very negative) to 10 (very positive). The second item, *Frequency*, measured whether one's particular thought contents occur a lot on a scale from 1 (strongly disagree) to 10 (strongly agree). The third and fourth items, *Self-Focused Habitual Thoughts* and *Others-Focused Habitual Thoughts*, assessed the

extent a particular thought content is about other people or oneself from 1 (strongly disagree) to 10 (strongly agree). We included these two items because the same thought content can vary from mindful self-focused or caring others-focused perspectives to different degrees. The fifth item to the ninth item assessed *Other-Caring Thoughts*, which comprised five questions measuring the loving and caring quality of a particular thought content from 1 (strongly disagree) to 10 (strongly agree), this assessment was adopted from Kaufman et al. (2019) (see table 10 for details).

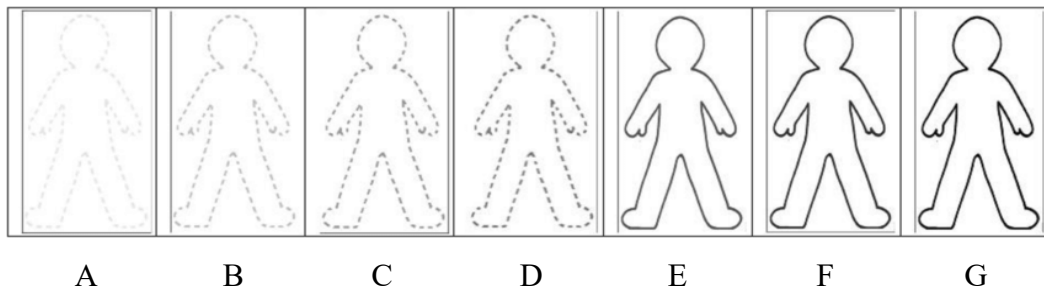
The last two items were phenomenological measures and have not been used in TSP previously. This was the first study to adopt these two measures in assessing state mind-wandering contents. These two measures have the advantage of their phenomenological features predicting wellbeing and human flourishing (Hanley & Garland, 2019). The tenth item, *Perceived Body Boundaries (PBB)*, was developed by Dambrun (2016) (Table 2). PBB measures the experience and boundaries of the self (Hanley et al., 2020, p. 1195). As shown in Table 10, PBB is a 7- point Likert scale rated from the left figure (A), low in salience and strongly connected to the surroundings, 1 = weak boundary, to the right figure (G), high in salience and feel enclosed, 7 = strong boundary. The eleventh item, *Spatial Frames of Reference Continuum (SFoRC)*, is another phenomenological measure developed by Hanley & Garland (2019) (Table 2). SFoRC measures the relational degree of connection between the self, others, and the environment. It was rated from the centre of the circle, A, feelings stopped at one's physical body, to the far edge of the circle, F, feelings extended into others and the universe.

Table 10 Items on the Thought Sampling Paradigm questionnaire

[Participants were first asked to record five different thoughts that are on their mind right now in a few words on the five stickers we provided. Then they were asked to put each sticker on top of a questionnaire table containing 11 questions in the following pages and

evaluated each of the 5 thoughts they just recorded and circled responses that applied to each thought.]

1. My own emotions pertaining to this thought are [Valence]
2. Lately, it seems that this thought has been on my mind a great deal [Frequency]
3. I consider this thought to concern other people [Other-Focused Habitual Thoughts]
4. I consider this thought to be mostly about me [Self-Focused Habitual Thoughts]
5. The thought has an element of caring emotions towards other people [Other-Caring Thoughts]
6. I was thinking about how other people are nice to me [Other-Caring Thoughts]
7. I was thinking that a person/people are mostly good [Other-Caring Thoughts]
8. In my thought, I manipulated people to do something I want [Other-Caring Thoughts]
9. In my thought, I was getting or thinking about what I want from people [Other-Caring Thoughts]
10. The following instruction still pertains to your thought: **How strong is the boundary between yourself and the world, regarding this thought?** Please find below several bodies that are more or less salient. A body high in salience is a body in which one feels enclosed, that is highly distinct from the bodies of others, and that sets a marked boundary between you and the rest of the world. Conversely, a body low in salience is strongly connected to its surroundings; it is a kind of permeable envelope, without any marked boundaries. Please indicate which of the bodies presented below best represents your current body state. If the boundaries of your body are extremely salient, you should circle the image on the extreme right. If the boundaries of your body are almost imperceptible, you should circle the image on the extreme left. You can indicate an intermediate state by circling an image somewhere between the two poles. [Perceived Body Boundaries (PBB)]



11: How far does your self extend into the world in this

thought? Using the letters and images below, please indicate how much you feel that your SELF extends beyond your physical body regarding this thought. “A” represents yourself stopping at your physical body. “F” represents yourself extending into everything (for example, the entire Universe). The letters in-between “A” and “F” represent different levels of self-extension. The rings are symbolic and do not represent actual distances. Please circle one letter. [Spatial Frames of Reference Continuum (SFoRC)]



Note: Item 1 required participants to answer on a scale from 1 to 10 (1 = Very Negative, 10 = Very Positive). Items 2 through 9 required participants to answer on a scale from 1 to 10 (1 = Strongly Disagree, 10 = Strongly Agree). Item 10 required participants to choose from A to G, and item 11 required participants to choose from A to F.

5.2.5 Intervention

For the audio recording selected for the guided attention practices, we used amended Brief Loving-Kindness Meditation (e.g., Hutcherson et al., 2008; Mantzios et al., 2021; Seppala et al., 2014; Stell & Farsides, 2015) and brief Mindfulness Meditation Induction (e.g., Creswell, 2017; Ridderinkhof et al., 2017; Segal et al., 2002). See details on the changes to the meditation scripts in Chapter 3 (Section 3.3.2). For the attention control group, we used a script developed for control purposes in other contemplative studies (e.g., Hanley et al., 2020; Hanley & Garland, 2019), *The Natural History of Selborne* (White, 1981), this one too was adjusted to match the length of the other two intervention scripts. Each of the three brief practices lasted approximately 10 minutes. The audio of each practice was recorded by the same voice - a professional native English-speaking meditation trainer.

5.2.6 Statistical Analysis

The data were analysed using SPSS 29. Effect sizes of ANOVA tests using partial η^2 applied the following cut-off indicators, which can be interpreted as 0.13 for small, 0.26 for medium, and above 0.26 for large effect sizes. Effect sizes of t-test using Cohen's d where 0.2 is small, 0.5 is medium, and 0.8 is large effect size (Cohen, 1988, pp. 413– 414). For rejecting the null hypothesis, we used the p-value threshold of .05 and .01, in line with previous studies (e.g., Hofmann et al., 2011; Shonin et al., 2015; Sirotina & Shchebetenko, 2020), and we also report the near threshold p values as “marginally significant” (Pritschet et al., 2016).

As shown in Table 11, to answer RQ1, a correlation matrix was conducted to explore the relationships among variables. We employed a significance level of 0.05 for established hypotheses (H1 – H6). To account for multiple comparisons in the correlational matrix, we applied the Bonferroni correction, resulting in an adjusted alpha threshold of 0.006 (0.05/9). To answer RQ2, hierarchical multiple regression tests were conducted to compare the variables in predicting the affect.

To answer RQ3 and RQ4, three (groups: CM, MM, AC) by two (times: pre-test, post-test) mixed-design ANOVA tests, with the first-factor between-group and the second-factor within-group, were conducted to investigate changes over time comparing three groups on variables of valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, SFoRC, positive affect, and negative affect of state mind-wandering. If there were group-by-time interaction effects, we reported the interaction effects (Maxwell et al., 2017; Searle, 2006), a follow-up paired sample t-test comparing pre-post change within each group, and a follow-up independent sample t-test comparing groups at post-test. If there was no interaction effect, we reported the main effect of time and the main effect of the group (Maxwell et al., 2017).

Table 11 Research questions and statistical analyses for Study II

Research Questions	Statistical Analysis
First Research Question (RQ1): Is there a positive association between trait other-caring thoughts and trait positive affect at the baseline? Hypothesis 1-1 (H1): The frequency of self-focused habitual thoughts is negatively correlated with positive affect. Hypothesis 1-2 (H2): The frequency of self-focused habitual thoughts is positively correlated with negative affect. Hypothesis 1-3 (H3): The frequency of other-focused habitual thoughts is positively correlated with positive affect. Hypothesis 1-4 (H4): The frequency of other-focused habitual thoughts is negatively correlated with negative affect. Hypothesis 1-5 (H5): Other-caring thoughts is positively correlated with positive affect. Hypothesis 1-6 (H6): other-caring thoughts is negatively correlated with negative affect.	Correlation tests
Second Research Question (RQ2): Does a higher frequency of caring other-focused thoughts predict positive affect better than a higher frequency of mindful self-focused thoughts?	Hierarchical multiple regression tests
Third Research Questions (RQ3): (RQ3-1) Will both CM and MM significantly reduce mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, perceived body boundaries, spatial frame of reference continuum) in comparison to the AC condition? (RQ3-2) Will there be a difference between the CM and MM in reducing mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, perceived body boundaries, spatial frame of reference continuum)?	Three (groups: CM, MM, AC) by two (times: pre-test, post-test) mixed-design ANOVA: 1. Interaction effect of group by time in ANOVA. 2. Between-group independent sample t-test: 1) CM and AC 2) MM and AC 3. Within-group paired sample t-test of the post-test.

Fourth Research Question (RQ4):	Three (groups: CM, MM, AC)
Will participants in the CM condition show a significantly higher increase in positive affect (or decrease in negative affect) and other-caring thoughts than participants in the MM and AC conditions?	by two (times: pre-test, post-test) mixed-design ANOVA
	1. Interaction effect of group by time in ANOVA.
	2. Between-group independent sample t-test:
	1) CM and MM
	2) CM and AC
	3. Within-group paired sample t-test of the post-test.

5.3 Results

5.3.1 Demographic Description and Group Equivalence

We analysed the participants' group equivalence at the pre-test level. For demographic factors, there was no between-group difference in gender, $X^2(6, N = 55) = 2.848, p = 0.828$, age, $F(2, 51) = .245, p = .783$, education level, $X^2(4, N = 55) = 4.782, p = 0.310$, previous experience of meditation, $X^2(2, N = 55) = 2.172, p = 0.338$, meditation experience within last 7 days, $t(2, 52) = .054, p = .957$, or meditation experience on the day of experiment, $t(2, 52) = .123, p = .902$.

We further conducted one-way ANOVA with the three groups as levels to identify if there was any significant difference at the baseline stage for the mind-wandering indices and other self-report measures. There was no between-group difference in valence (as indicated in Table 12), $F(2, 52) = .543, p = .585$, frequency, $F(2, 52) = .425, p = .656$, other-focused habitual thoughts, $F(2, 52) = .979, p = .383$, self-focused habitual thoughts, $F(2, 52) = .228, p = .797$, other-caring thoughts, $F(2, 52) = .824, p = .444$, PBB, $F(2, 51) = .142, p = .868$, SFoRC,

$F(2, 52) = 1.860, p = .166$, positive affect, $F(2, 51) = 2.141, p = .128$, or negative affect, $F(2, 51) = 1.913, p = .158$. There were no baseline differences in trait mindfulness, $F(2, 52) = 2.537, p = .089$, trait mind-wandering, $F(2, 52) = 1.398, p = .256$, or trait wellbeing, $F(2, 52) = 1.987, p = .147$.

Table 12 Baseline Differences Between Groups $F(p, \eta^2)$. $df = 2, 52$.

Measures	Mean	Std. Deviation	$F(p, \eta^2)$
Valence	5.492	1.208	.543 (.585, .020)
Frequency	7.036	1.289	.425 (.656, .016)
Self-Focused Habitual Thoughts	7.087	1.219	.228 (.797, .009)
Other-Focused Habitual Thoughts	5.1634	1.576	.979 (.383, .036)
Other-Caring Thoughts	5.924	.822	.824 (.444, .031)
Perceived Body Boundaries	4.645	1.104	.135 (.874, .005)
Spatial Frame of Reference Continuum	2.735	.833	1.86 (.166, .067)
Positive Affect	2.759	.659	2.141 (.128, .077)
Negative Affect	1.756	.603	1.913 (.158, .070)

5.3.2 RQ1: Relationships between Trait Other-Caring Thoughts and Affect

To answer RQ1 (if there is a positive association between trait other-caring thoughts and trait positive affect), a correlational matrix is presented in Table 13. Contrary to the prediction of H1 – H4 and H6, Self-focused habitual thoughts had no significant association with either positive affect ($r = .02, p > .05$; H1) or negative affect ($r = .05, p > .05$; H2). Similarly, other-focused habitual thoughts had no significant association with either positive affect ($r = .25, p > .05$; H3) or negative affect ($r = .16, p > .05$; H4), suggesting the habitual way of thinking does not link to affectivity regardless of mindful self-focused or caring other-focused perspective. However, other-caring thoughts was positively correlated with positive affect ($r = .34, p < .05$; H5) but there was no significant association with negative affect ($r = -.04, p > .05$; H6), suggesting the quality of loving and caring attitude in thinking of others is related to positive affect.

Table 13 Correlation Matrix among Measures at Pre-Test Level (Trait Level)

	VA	FE	OFHT	SFHT	OCT	PBB	SFoRC	PA	NA
VA	1								
FE	.16	1							
OFHT	.02	.17	1						
SFHT	-.23	.30*	-.34*	1					
OCT	.19	.27*	.32*	.13	1				
PBB	-.30*	-.22	-.11	.06	-.17	1			
SFoRC	.25	.33*	.19	.01	.32*	-.65**	1		
PA	.11	.17	.25	.02	.34*	.01	.10	1	
NA	-.39**	-.09	.16	.05	-.04	.04	-.02	.08	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Note: VA Valence, FE Frequency, SEHT Self-Focused Habitual Thoughts, OFHT Other-Focused Habitual Thoughts, OCT Other-Caring Thoughts, PBB Perceived Body Boundaries, SFoRC Spatial Frame of Reference Continuum, PA Positive Affect, NA Negative Affect.

5.3.3 RQ2: Self- or Other-Focused Thoughts in Predicting Affect

To answer RQ2 (if a higher frequency of other-caring thoughts predicts positive affect better than a higher frequency of self-focused thoughts), hierarchical multiple regression tests were run to see whether self- or other-focused thoughts predicted positive affect or negative affect at pre-test stage. I compared the variables between self-focused habitual thoughts and other-focused habitual thoughts (i.e., Model 2) and between self-focused habitual thoughts and other-caring thoughts (i.e., Model 3) in predicting positive affect and negative affect.

As shown in Table 14, for positive affect as the outcome measure, only other-caring thought statistically predicted positive affect at pre-test in comparing to self-focused habitual thoughts, $F(1, 52) = 5.90, p = .019$. Self-focused habitual thoughts was not statistically significant ($\beta = .03, p = .81$) in predicting positive affect, while other-caring thought made a

greater unique contribution to the model than self-focused habitual thoughts ($\beta = .33, p < .019$).

For negative affect as the outcome measure, none of the predicting measures showed statistically significant results ($p > .1$).

Table 14 Hierarchical multiple regression analysis in predicting positive affect and negative affect at pre-test

Model and Predictors	β	t	t Sig.	R ²	ΔR^2	ΔF	ΔF Sig.
Dependent Variable: Positive Affect							
Model 1	.03	.25	.807	.001	.001	.06	.807
Model 2	.11	.76	.451	.045	.044	2.35	.132
	.22	1.53	.132				
Model 1	.03	.25	.807	.001	.001	.06	.807
Model 3	-.01	-.06	.949	.105	.104	5.90	.019
	.33	2.43	.019				
Dependent Variable: Negative Affect							
Model 1	.04	.26	.799	.001	.001	.07	.799
Model 2	.11	.79	.435	.048	.047	2.50	.120
	.23	1.58	.120				
Model 1	.04	.26	.799	.001	.001	.07	.799
Model 3	.04	.29	.774	.003	.002	.08	.778
	-.04	-.28	.778				
Model 1 predictors: Self-focused habitual thoughts							
Model 2 predictors: Self-focused habitual thoughts, Other-focused habitual thoughts							
Model 3 predictors: Self-focused habitual thoughts, Other-caring thoughts							

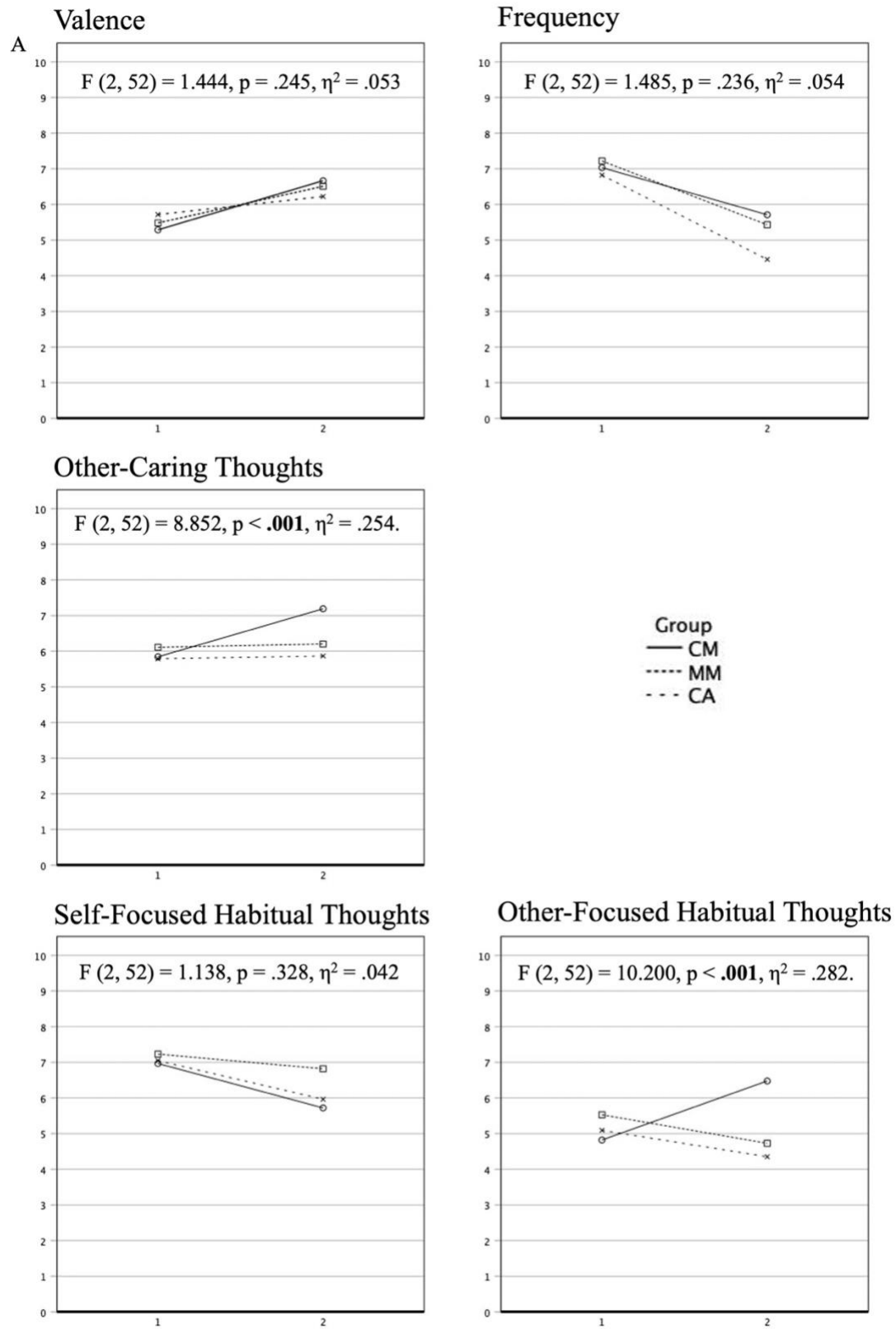
5.3.4 RQ3 and RQ4: Pre-Test and Post-Test of Three Groups

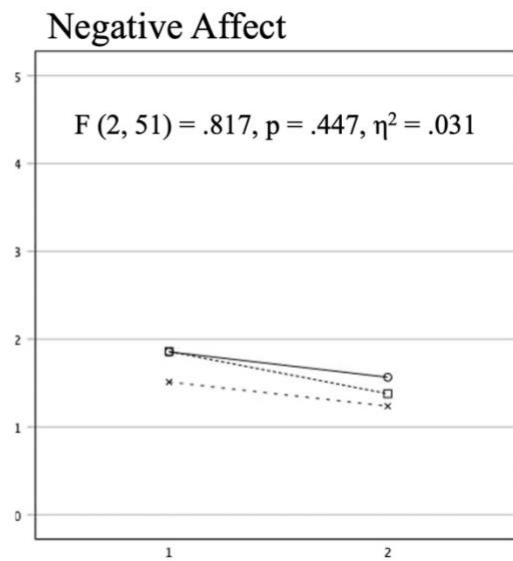
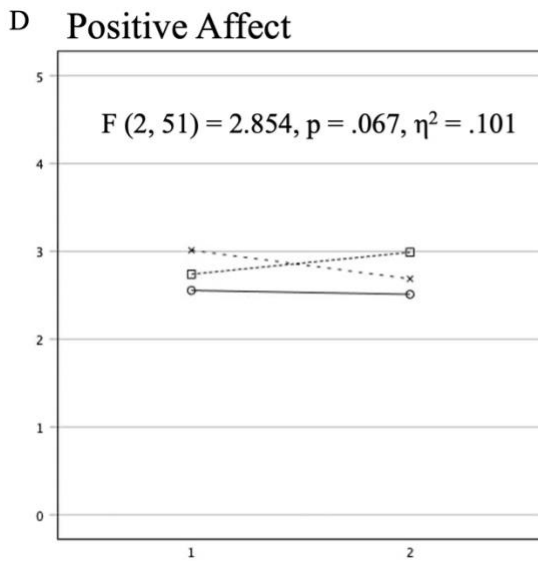
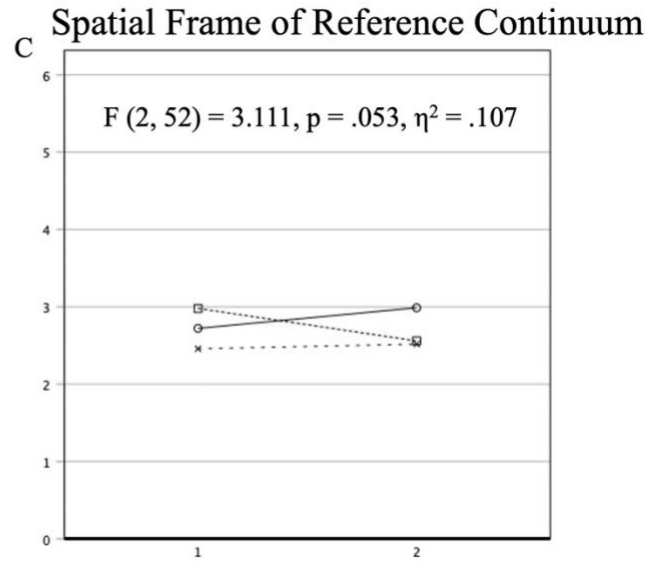
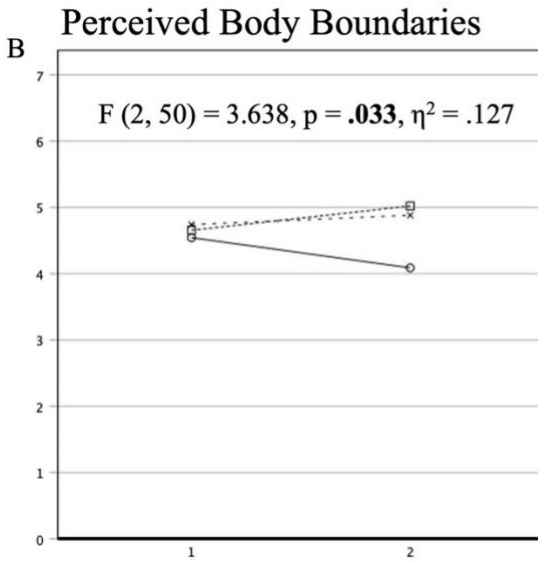
To answer RQ3-1, will both CM and MM significantly reduce mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, SFoRC) in comparison to the AC condition, and RQ3-2, will there be a difference between the CM and MM in reducing mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, SFoRC),

ANOVA results of group by time interaction was first reported and then between-group independent sample t-tests and within-group paired sample t-tests of the pre-post changes to indicate the locus of the interaction.

To answer RQ4, Will participants in the CM condition show a significantly higher increase in positive affect (or decrease in negative affect) and other-caring thoughts than participants in the MM and AC conditions, three (groups: CM, MM, AC) by two (time: pre-test, post-test) ANOVAs with time as the within factor and group as the between factor were conducted and analysed. The result of descriptive statistics, group by time interaction, and main effects of time and group are presented in Figure 15, and Table 15 - 17.

Figure 15 Time by group interactions for state mind-wandering variables





Note. A: scale (1-10): valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts.

B: scale (1-7): perceived body boundaries.

C: scale (1-6): spatial frame of reference continuum.

D: scale (1-5): positive affect, negative affect.

Time: 1: Pre-test, 2: Post-test.

CM: Caring Other-Focused Meditation, MM: Mindful Self-Focused Meditation, CA: Control Attention.

Table 15 Descriptive statistics, group-by-time interactions, and main effects for state mind-wandering and affect variables

	Mean ± SE						Time x Group	Main Effect of	Main effect of Group
	CM Pre	CM Post	MM Pre	MM Post	AC Pre	AC Post	Interaction F (p, η^2), df = 2, 52	Time F (p, η^2), df = 1, 52	F (p, η^2), df = 2, 52
VA	5.29 ± .28	6.67 ± .36	5.48 ± .27	6.51 ± .34	5.72 ± .30	6.22 ± .37	1.444 (.245, .053)	22.174 (< .001 , .299)	.003 (.997, .000)
FE	7.03 ± .31	5.71 ± .39	7.22 ± .29	5.43 ± .37	6.82 ± .32	4.46 ± .40	1.485 (.236, .054)	56.921 (< .001 , .523)	2.105 (.132, .075)
SFHT	6.97 ± .29	5.72 ± .41	7.23 ± .28	6.82 ± .38	7.05 ± .30	5.97 ± .42	1.138 (.328, .042)	13.833 (< .001 , .21)	1.706 (.192, .062)
OFHT	4.82 ± .37	6.48 ± .41	5.53 ± .35	4.73 ± .39	5.09 ± .38	4.35 ± .42	10.200 (< .001 , .282)	.023 (.881, .000)	2.012 (.114, .072)
OCT	5.84 ± .19	7.19 ± .25	6.11 ± .19	6.20 ± .23	5.79 ± .20	5.87 ± .25	8.852 (< .001 , .254)	12.898 (< .001 , .199)	3.390 (.041 , .115)
PBB	4.54 ± .27	4.09 ± .25	4.66 ± .27	4.98 ± .25	4.74 ± .27	4.88 ± .26	3.638 (.033 , .127)	.018 (.894, .000)	1.571 (.218, .059)
SFoRC	2.72 ± .19	2.99 ± .19	2.98 ± .18	2.56 ± .18	2.46 ± .20	2.52 ± .19	3.111 (.053 , .107)	.071 (.791, .001)	1.413 (.253, .052)
PA	2.56 ± .15	2.51 ± .20	2.74 ± .14	2.99 ± .19	3.01 ± .15	2.68 ± .22	2.854 (.067 , .101)	.164 (.687, .003)	1.418 (.252, .053)
NA	1.86 ± .14	1.57 ± .13	1.86 ± .13	1.38 ± .13	1.51 ± .15	1.28 ± .14	.817 (.447, .031)	21.474 (< .001 , .296)	1.952 (.152, .071)

VA Valence, FE Frequency, SEHT Self-Focused Habitual Thoughts, OFHT Other-Focused Habitual Thoughts, OCT Other-Caring Thoughts, PBB Perceived Body Boundaries, SFoRC Spatial Frame of Reference Continuum, PA Positive Affect, NA Negative Affect.

Table 16 Between-Group Independent sample t-test for variables of Pre-Post change

	CM - MM				CM - AC				MM - AC			
	t	df	p	d	t	df	p	d	t	df	p	d
OFHT	-1.430	36	.161	1.796	-.269	33	.790	1.782	1.093	35	.282	1.864
OCT	4.011	36	< .001	.962	3.770	33	< .001	.995	.041	35	.967	1.159
PBB	-2.569	34	.015	.960	-1.927	33	.063	.916	.698	33	.490	.955
SFoRC	2.172	36	.036	.973	1.056	33	.299	.582	-1.472	35	.150	.986
PA	-1.171	36	.249	.774	1.452	32	.156	.562	2.172	34	.037	.789

OFHT Other-Focused Habitual Thoughts, OCT Other-Caring Thoughts, PBB Perceived Body Boundaries, SFoRC Spatial Frame of Reference Continuum, PA Positive Affect.

Table 17 Within-Group Paired Samples Test for variables of Pre-Post change

	CM					MM					AC				
	m	t	df	p	d	m	t	df	p	d	m	t	df	p	d
OFHT	-1.656	-4.785	17	<.001	1.468	0.800	2.084	19	0.051	1.717	0.741	1.292	16	0.215	2.365
OCT	-1.347	-7.652	17	<.001	0.747	-0.094	-0.373	19	0.713	1.120	-0.078	-0.266	16	0.794	1.204
PBB	0.456	2.095	17	0.051	0.922	-0.367	-1.561	17	0.137	0.996	-0.141	-0.641	16	0.531	0.908
SFoRC	-0.267	-1.971	17	0.065	0.574	0.420	1.534	19	0.141	1.224	-0.059	-0.411	16	0.687	0.591
PA	0.044	0.339	17	0.738	0.555	-0.250	-1.207	19	0.242	0.927	0.325	2.282	15	0.038	0.570

OFHT Other-Focused Habitual Thoughts, OCT Other-Caring Thoughts, PBB Perceived Body Boundaries, SFoRC Spatial Frame of Reference Continuum, PA Positive Affect.

Valence

Contrary to our prediction, the group by time interaction for valence was not statistically significant, $F(2, 52) = 1.444$, $p = .245$, $\eta^2 = .053$. The main effect for time was statistically significant, $F(1, 52) = 22.174$, $p < .001$, $\eta^2 = .299$, indicating all three groups showed increased valence of state mind-wandering after the brief interventions based on inspection of means (Means and Standard Error for all three groups in pre and post stages were presented in Table 15, the mean difference between pre-test and post-test were presented in Table 17, same with the below measures). The main effect of group was not statistically significant, $F(2, 52) = .003$, $p = .997$, $\eta^2 = .000$.

Frequency

Similarly, the group by time interaction for frequency was not statistically significant, $F(2, 52) = 1.485$, $p = .236$, $\eta^2 = .054$. The main effect of time was statistically significant, $F(1, 52) = 56.921$, $p < .001$, $\eta^2 = .523$, indicating all groups decreased the frequency of state mind-wandering after the brief interventions. The main effect of group was not statistically significant, $F(2, 52) = 2.105$, $p = .132$, $\eta^2 = .075$.

Self-Focused Habitual Thoughts

Regarding the self-focused habitual thoughts of state mind-wandering, the group by time interaction was not statistically significant, $F(2, 52) = 1.138$, $p = .328$, $\eta^2 = .042$. The main effect of time was statistically significant, $F(1, 52) = 13.833$, $p < .001$, $\eta^2 = .210$, indicating all groups decreased in self-focused thought after the brief interventions. The main effect of group was not statistically significant, $F(2, 52) = 1.706$, $p = .192$, $\eta^2 = .062$.

Other-Focused Habitual Thoughts

Consistent with the hypothesis for other-focused habitual thought, there was a statistically significant group by time interaction, $F(2, 52) = 10.200$, $p < .001$, $\eta^2 = .282$. A within-subject

paired sample t-test (Table 17) indicated other focused habitual thoughts scores increased significantly after CM, $t(17) = -4.785$, $p < .001$, $d = 1.468$ with large effect size, decreased marginally in MM, $t(19) = 2.084$, $p = .051$, $d = 1.717$, and there was no significant change in AC, $t(16) = 1.292$, $p = .215$, $d = 2.365$. A between-group independent sample t-test for pre-post change in scores (Table 15) indicated no significant difference for CM compared to MM, $t(36) = -1.430$, $p = .161$, $d = 1.796$, and to AC, $t(33) = -.269$, $p = .790$, $d = 1.782$, and no significant difference between MM and AC, $t(35) = 1.093$, $p = .282$, $d = .1.864$. The main effect of time was not statistically significant, $F(1, 52) = .023$, $p = .881$, $\eta^2 = .000$. The main effect of group was not statistically significant, $F(2, 52) = 2.012$, $p = .114$, $\eta^2 = .072$.

Other-Caring Thoughts

Consistent with the hypothesis, there was a statistically significant group by time interaction for other-caring thoughts (as shown in Figure 15), $F(2, 52) = 8.852$, $p < .001$, $\eta^2 = .254$. A within-subject paired sample t-test comparing the pre-post change in other-caring thoughts in each group (Table 17) revealed a significant increase in CM, $t(17) = -7.652$, $p < .001$, $d = .747$, but no significant change in MM or AC (all $ps > .1$), suggesting only CM increased by post-test for other-caring thoughts. A between-group independent sample t-test of pre-post change (Table 16) indicated a significantly higher score in CM than MM, $t(36) = 4.011$, $p < .001$, $d = .962$, and a higher score in CM than AC, $t(33) = 3.770$, $p < .001$, $d = .995$, but no significant difference was found between MM and the AC, $t(35) = .041$, $p = .967$, $d = 1.159$. The main effect of time was statistically significant, $F(1, 52) = 12.898$, $p < .001$, $\eta^2 = .199$. The main effect of the group was statistically significant, $F(2, 52) = 3.390$, $p = .041$, $\eta^2 = .115$.

Perceived Body Boundaries (PBB)

As predicted, there was a statistically significant group by time interaction for PBB (as shown in Table 15), $F(2, 50) = 3.638$, $p = .033$, $\eta^2 = .127$. A within-subject paired sample t-test

comparing pre-post change (Table 17) in PBB in CM revealed marginally decreased PBB, $t(17) = 2.095$, $p = .051$, $d = .92$, and no significant effects for MM or AC (all $ps > .1$). A between-group independent sample t-test of pre-post change (Table 16) revealed a significantly lower score in CM than MM, $t(34) = -2.569$, $p = .015$, $d = .960$, and a partial significant lower score in CM than AC, $t(33) = -1.927$, $p = .063$, $d = .916$, but no difference between MM and AC, $t(33) = .698$, $p = .490$, $d = .955$. The main effect of time was not statistically significant, $F(1, 52) = .018$, $p = .894$, $\eta^2 = .000$. The main effect of group was not statistically significant, $F(2, 52) = 1.571$, $p = .218$, $\eta^2 = .059$.

Spatial Frame of Reference Continuum (SFoRC)

The group by time interaction for the SFoRC was marginally significant (as shown in Table 15), $F(2, 52) = 3.111$, $p = .053$, $\eta^2 = .107$. A within-subject paired sample t-test comparing pre-test and post-test change (Table 17) in the SFoRC revealed a marginal increase in CM, $t(17) = -1.971$, $p = .065$, $d = .574$, no significant change in MM, $t(19) = 1.534$, $p = .141$, $d = 1.224$, or AC, $t(16) = -.411$, $p = .687$, $d = .591$. A between-group independent sample t-test of pre-post change (Table 16) revealed a significantly higher score in CM than MM, $t(36) = 2.172$, $p = .036$, $d = .973$, but no difference between CM and AC, $t(33) = 1.056$, $p = .299$, $d = .582$, or MM and AC, $t(35) = -1.472$, $p = .150$, $d = .986$. The main effect of time was not statistically significant, $F(1, 52) = .071$, $p = .791$, $\eta^2 = .001$. The main effect of group was not statistically significant, $F(2, 52) = 1.413$, $p = .253$, $\eta^2 = .052$.

Positive Affect

The group by time interaction for positive affect was marginally significant (as shown in Table 15), $F(2, 51) = 2.854$, $p = .067$, $\eta^2 = .101$. A within-subject paired sample t-test comparing pre-post change (Table 17) in positive affect in each group revealed a significant decrease in AC, $t(15) = 2.282$, $p = .038$, $d = .570$, but no significant change in CM or MM (all $ps > .1$). A

between-group independent sample t-test of pre-post change revealed no difference between CM and MM, $t(36) = -1.171$, $p = .249$, $d = .774$, CM and AC, $t(33) = 1.452$, $p = .156$, $d = .562$, but significant higher scores in AC than MM, $t(34) = 2.172$, $p = .037$, $d = .789$. The main effect of time was not statistically significant, $F(1, 52) = .164$, $p = .687$, $\eta^2 = .003$. The main effect of group was not statistically significant, $F(2, 52) = 1.418$, $p = .252$, $\eta^2 = .053$.

Negative Affect

Contrary to our prediction, the group by time interaction for negative affect was not statistically significant, $F(2, 51) = .817$, $p = .447$, $\eta^2 = .031$. The main effect of time was statistically significant, $F(1, 51) = 21.474$, $p < .001$, $\eta^2 = .296$, suggesting a decreased negative affect across groups after practice as indicated by mean difference (Table 15). There was a non-significant main effect of group, $F(2, 51) = 1.952$, $p = .152$, $\eta^2 = .071$.

5.4 Discussion

This study addressed the Research Aim III (to understand if self-focused thoughts and other-focused thoughts can be differentially modified by brief mindful self-focused and caring other-focused meditation inductions and ways such changes relate to mind-wandering frequency and affect.) and answered the Overarching Research Question III (Do brief mindful self-focused and caring other-focused inductions impact self-focused thoughts and other-focused thoughts differently and if so how do such differences relate to changes in mind-wandering frequency and affect?) The main study result was that mindful self-focused meditation and caring other-focused meditation may have different mechanisms to improve affect as suggested by increased other-caring thoughts, increased other-focused habitual thoughts, and decreased body boundaries for the CM induction and decreased other-focused habitual thoughts for MM induction.

Specifically, this study examined mind-wandering and affectivity and particularly compared the impact of inducing mindful self-focused (cultivated by mindful self-focused induction) and caring other-focused thoughts (cultivated by caring other-focused meditation induction) on mind-wandering (its valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, and SFoRC of mind-wandering), positive affect and negative affect. This study investigated mind-wandering from both trait perspectives at the baseline stage (RQ1 and RQ2) and state perspectives by pre-post comparison (RQ3 and RQ4).

To briefly answer the research sub-questions, the study found that at the baseline, other-caring thoughts were positively correlated with positive affect but not with negative affect, and that habitual thoughts were unrelated to affect, regardless of whether the thoughts were other-focused or self-focused (RQ1). Other-caring thoughts predicted positive affect significantly, unlike self-focused or other-focused habitual thinking, while none of the self-other related thoughts (neither habitual way nor the caring-focus) predicted negative affect (RQ2). The study also found that compared to the AC, CM significantly increased other-caring thoughts and marginally decreased PBB, while MM did not change these variables (RQ3-1). Compared to MM, CM significantly increased other-caring thoughts, decreased PBB, and increased SFoRC (RQ3-2). However, compared to both MM and AC, CM did not alter positive affect or negative affect but only increased other-caring thoughts (RQ4). MM and CM did not make a significant difference in altering affect (RQ4). The effects on self-boundaries and other-caring thoughts could be early indicators of changes which might result in increased positive affect with longer interventions. The findings in response to each of the four research questions for this study will now be considered in more detail in relation to previous research.

5.4.1 RQ1

Is there a positive association between trait other-regarding thoughts and trait positive affect (at the baseline)?

RQ1 assessed the relationships between affectivity (positive affect, negative affect) with self-other related trait mind-wandering, including the habitual pattern of self-focused or other-focused thoughts and the other-caring thoughts that emphasise the loving and kindness quality of thoughts. This study found only the other-caring thoughts were significantly positively associated with positive affect. This finding is in line with the majority of previous studies showing that more loving and caring thoughts are related to better wellbeing (e.g., Gu et al., 2022). However, the present study didn't find any correlations between self-other-related habitual thoughts with affect, which contradicts with a previous study which found that altruistically motivated behaviour, a similar concept with other-focused thoughts, was related to reduced negative affect (Böckler et al., 2016).

5.4.2 RQ2

Does a higher frequency of caring other-focused mind-wandering thoughts predict positive affect better than a higher frequency of mindful self-focused thoughts (at the baseline)?

RQ2 compared which component(s) of mind-wandering thoughts can predict more positive affect (or less negative affect), and we found other-caring thoughts, i.e., the other-focused thoughts with qualities of love and kindness, significantly predicted more positive affect than self-focused habitual thoughts or other-focused habitual thoughts, i.e., the usual way of thinking about oneself or others. However, none of the self-other related thoughts predicted

negative affect. This finding is similar to the answer in RQ1 and could be due to the nature of the heterogeneity of mind-wandering as discussed in Chapter 2 Section 2.3.

It is noted that previous literatures seem to support that higher self-focus is related to lower other-focus when studying mind-wandering contents (e.g., Smallwood & O'Connor, 2011; Smith et al., 2018), but the hypothetical inverse relationship has not been further explored. Specifically, many studies implied that other-focused thoughts is positively related to empathy (e.g., Koopmann-Holm et al., 2020; Sirotna & Shchebetenko, 2020), where self-focused thoughts (e.g., self-criticism) could impair empathy (Leaviss & Uttley, 2015; Wakelin et al., 2022), suggesting a possible negative correlation between self-focused and other-focused thoughts.

In addition, excessive self-focus reduces social engagement, which is related to the consideration of others and a wider environment. For example, Daily diary methods show that self-critical rumination (i.e., as a self-focused thought) predicts next-day reductions in compassionate responding of others (i.e., as an other-focused thought) (Andrews-Hanna et al., 2014). The present study views self-focused and other-focused thoughts as two separates but connected mental processes, not opposites. Comparing self-other related thoughts in predicting affect is understudied in the research literature, and future studies should explore it further.

5.4.3 RQ3

RQ3-1: Will both CM and MM significantly reduce mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, SFoRC) in comparison to the AC condition?

RQ3-2: Will there be a difference between the CM and MM in reducing mind-wandering (valence, frequency, self-focused habitual thoughts, other-focused habitual thoughts, other-caring thoughts, PBB, SFoRC)?

The study results found time by group interaction effects of other-focused habitual thoughts, other-caring thoughts, PBB, and SFoRC of mind-wandering, however, there was no interaction effect of valence, frequency, and self-focused habitual thoughts of mind-wandering among CM, MM, and AC.

Specifically, for Other-Focused Habitual Thoughts, the study found that CM significantly increased other-focused habitual thoughts while MM significantly decreased them. In addition, for PBB, compared to AC, CM significantly reduced PBB. Compared to MM, CM also significantly reduced PBB and increased SFoRC. These findings suggested that CM is more effective in reducing the body boundaries of mind-wandering thoughts than the other two intervention groups. This finding confirms findings reported by Dambrun (2016), Hanley and Garland (2019), and Hanley et al. (2020) that meditation inductions could significantly alter participants' sense of boundaries. However, these results contradict Hanley et al. (2020) and Hanley and Garland (2019) studies that MM increased PBB; in contrast the present study found MM reduced PBB. This could be due to present study using brief meditation inductions, where the MM induction should induce M1 (cultivating to focus on the present moment) and M2 (cultivating towards a non-judgmental and non-criticized sensation) (Levit-Binnun et al., 2021). But it is possible that the induction only resulted in M1 experiences because M2 could take longer time to develop and have impacts. Therefore, MM in the present study might have only effectively cultivated the focus on the present, thus increasing the PBB.

5.4.4 RQ4

Will participants in the CM condition show a significantly higher increase in positive affect (or decrease in negative affect) and other-caring thoughts than participants in the MM and AC conditions?

CM induction significantly improved other-caring thoughts after the intervention, and the result is in line with the previous studies both with long-term meditators (Jazaieri et al., 2013; Jazaieri et al., 2015; Jazaieri et al., 2014; Kang et al., 2014; Kemeny et al., 2012; Kok et al., 2013) and as a result of brief meditation inductions (Hutcherson et al., 2008; Logie & Frewen, 2015). This difference was also significant in comparison to MM and AC, which is in line with previous meditation induction studies, e.g., Sirotna and Shchebetenko (2020), Hutcherson et al. (2008), and Seppala et al. (2014).

However, contrary to our prediction, caring other-focused meditation did not alter affect, which is contradicted by previous research that caring other-focused meditation decreased worry and emotional suppression (Jazaieri et al., 2014) and reduced negative affect (Perkins et al., 2022). The present analysis reveals a marginally significant Group $\times$ Time interaction ($p = 0.06$), but post-hoc tests only identify a significant difference between the MM and AC groups. A marginally significant interaction ($p < 0.10$ but > 0.05) suggests a trend-level effect where thought content may influence affect changes over time, but the evidence is not definitive. This could be possible that CM may require more time to result in affective changes which did not show immediate changes after the meditation induction (May et al., 2014). In addition, the present study found no significant difference between CM and MM in altering affect. This finding is in line with previous studies (Koopmann-Holm et al., 2013; Logie & Frewen, 2015)

that compassion and mindfulness do not make a significant difference in altering affect, possibly both meditations could alter affect if the interventions were longer.

5.4.5 Limitations and Future Research

This section discusses three limitations with possible future research directions. First, brief inductions may not be sufficient to impact change in affect immediately after the intervention. As discussed in Chapter 2 Sections 2.3 and 2.4, mindful self-focused meditation induction aims to cultivate M1 (cultivating to focus on the present moment) and M2 (cultivating a non-judgmental attitude towards experiences), and caring other-focused meditation induction aims to cultivate M3 (cultivating prosocial trait and mental state). Especially in the case of M2, it can be difficult to cultivate the non-judgemental attitude through a brief induction. However, both meditation inductions had an impact on self-boundaries and CM had impact on other-caring thoughts, which suggests that even short meditation inductions may change thought patterns which could translate into changes in affect if the inductions were longer. Future research could use longer interventions and evaluate this hypothesis.

Second, the affective measure may have not been sensitive enough. This study used the short version of the PANAS, which is an affective measure with 10 items, including 5 positive affect adjectives and 5 negative affect adjectives. Future studies could use the original 20-item PANAS or the psychophysiological measure of heart rate variability (HRV) discussed in Chapter 3, Section 3.7 as more reliable indicators.

Third, the study was conducted on a university campus, and most of the participants were students. Therefore, the sample was not representative of the entire population. Future studies

could use a more diverse sample to evaluate if the findings of this study hold up across age groups and education levels.

Fourth, the present study was also first to use TSP in a randomized controlled study as an innovative method to investigate mind-wandering contents (Andrews-Hanna et al., 2013). The present thesis found TSP can be used in a lab environment to capture daily-life thoughts and experiences, to compensate for the limitation of using Experience Sampling in capturing insufficient thoughts (see Section 3.4). This thesis contributes to the existing literature that TSP can be a good tool to examine mind-wandering and affect, especially to examine thoughts in detail. Although the qualitative data of TSP (i.e., the thought contents collected from participants) were not analysed in this thesis yet, these thoughts are planned to be analysed further after the thesis submission. Through initial observation, I noticed participants in the CM group have improved positive affect even for the same thought after the practice. For example, a participant was worrying about her/his relationships in the pre-test and feeling relieved after the practice.

5.4.6 Conclusion

Caring other-focused meditation and mindful self-focused meditation have been compared in previous studies (e.g., Sirotina & Shchebetenko, 2020) in predicting emotion. The present study provided new insights into how such brief interventions may modify mind-wandering thoughts, particularly their self-other-related content, in relation to changes in affect and self-boundaries. Both mindful self-focused and caring other-focused meditation altered the sense of self-boundaries albeit in different directions and other-focused meditation also increased

other-caring thoughts. These changes could be early indicators suggesting that shifts in affect would follow with longer inductions.

Chapter 6 Discussion

With roots in both Western and Eastern historical and spiritual traditions, the ethically-grounded humanity-oriented wellbeing has been increasingly investigated and developed with educational and clinical interventions towards better mental health (Shonin et al., 2015; Waters et al., 2015). The present study explored self-regulation and mind-wandering from the perspective of self-other aspects of wellbeing.

To explore this topic, this thesis first introduced relevant psychological constructs and reviewed relevant previous psychological research (Chapter 2). The theoretical considerations translated into research aims and research questions were then evaluated in a cross-sectional study (Study I Chapter 4) which investigated the relationships between self-regulation, mind-wandering, humanity-oriented other-focused trait, and self-related psychological wellbeing and then evaluated the role of humanity-oriented trait in a model with self-regulation and a model with mind-wandering in predicting better wellbeing. Based on the results from Study I, a randomized controlled study (Study II Chapter 5) specifically compared the impact of caring other-focused meditation and mindful self-focused meditation on mind-wandering and explored the mechanistic differences in terms of changes in self-other related thoughts and other-caring thoughts.

Chapter 1 stated three overarching aims of the thesis (see Chapter 1 Section 1.2 Research Aim). The responses to the research questions and sub-questions developed from the three aims were considered in Chapters 2, 4, and 5. This chapter reviews the findings in relation to the three overarching aims of the thesis and considers contribution of research in this thesis to academic knowledge. Finally, this chapter discusses its limitations and elaborates on implications of this research for current and future practice.

6.1 Research Aim I

To understand how self-other aspects of wellbeing have so far been considered and researched in relation to self-regulation, mind-wandering and different types of wellbeing.

Chapter 2 explored the relationship of self-regulation, mind-wandering and wellbeing in the research literature. It started with the discussion of widely used theories of wellbeing (e.g., Keyes's structure of wellbeing, Ryff's psychological wellbeing, and eudemonic wellbeing and hedonic wellbeing), and proposed the innovative construct of self-other aspects of wellbeing that helps us to understand the interrelated nature of one's wellbeing with others' wellbeing.

Chapter 2 also examined self-regulation models and theories that have been extensively studied in relation to wellbeing, and the negatively associated concept of mind-wandering that has been explored in research in recent years. This chapter discussed the limited considerations of how a person's thoughts and experiences can influence others, especially in the context of current social crises where individual behaviour can easily influence others (e.g., pandemic). To expand the self-other aspect of wellbeing, Chapter 2 introduced the mindful self-focused thoughts and caring other-focused thoughts that can be cultivated by meditation inductions and discussed that both meditations can improve positive affect but could do so through different mechanisms. As a related concept to the caring other-focused thoughts, this chapter proposed the humanity-oriented trait and considered theoretically the role of humanity-oriented trait in compensating for the negative impact of excessive self-regulation and mind-wandering associated with negative affect in order to predict greater wellbeing. This chapter also introduced the sense of self-boundaries and suggested it can be a protective factor when cultivating caring other-focused thoughts.

6.2 Research Aim II

To explore the relationship between self-regulation and mind-wandering in relation to a broader construct of self- and other-related wellbeing.

Research Aim II was addressed by conducting a cross-sectional study in Chapter 4 to investigate self-regulation and mind-wandering in relation to the construct of the self-other aspects of wellbeing. The results suggested that both self-regulation and mind-wandering have a self-focused side in relation to wellbeing: self-focused self-regulation could harm others through the behaviour undermining wellbeing of others, and self-focused mind-wandering thoughts are associated with more negative affect on oneself.

Chapter 4 examined that although self-regulation was widely considered to have positive impacts on wellbeing, self-focused self-regulation can be used as a tool with negative impacts to harm others. This led to the hypothesis that a less self-focused and a more other-focused humanity-oriented trait could mitigate such negative effects. This negative side of self-regulation has been discussed previously but has limited empirical evidence. The present study approached this issue from a positive perspective, it suggested that to improve the wellbeing of both oneself and others, the humanity-oriented trait should be cultivated in addition to self-regulation to enhance psychological wellbeing of oneself. In addition, mind-wandering which is associated with negative affect is often self-focused. Under the self-other aspects of wellbeing, Chapter 4 also suggested the negative affect related to more mind-wandering could be mitigated by greater scores on the other-focused humanity-oriented trait.

Chapter 4 provided empirical evidence to the literature that enhancing eudemonic/psychological wellbeing can be achieved by cultivating humanity-oriented trait in

addition to self-regulation. Besides the main research findings, Chapter 4 also validated the Chinese version of the Light Triad Scale (LTS-C) among Chinese participants to measure other-focused humanity-oriented thoughts and experiences. This scale contributes to the literature by providing a tool to quantify humanity-oriented trait in empirical studies for Chinese participants.

6.3 Research Aim III

To understand if self-focused thoughts and other-focused thoughts can be differentially modified by brief mindful self-focused and caring other-focused meditation inductions and ways such changes relate to mind-wandering frequency and affect.

To further explore humanity-oriented trait as it relates to caring other-focused thoughts, mind-wandering has been studied as a main variable in a randomized controlled study in Chapter 5, considering its association with affect (Killingsworth & Gilbert, 2010). To reduce the negative affect, growing studies found that both mindful self-focused thoughts (Turkelson & Mano, 2022) and caring other-focused thoughts (Jazaieri et al., 2015) can be cultivated through practising meditations to reduce the frequency of mind-wandering and improve wellbeing.

Chapter 5 found that other-caring thoughts had a significant effect on predicting positive affect at the baseline. The habitual way of thinking was not significant in predicting positive affect. Chapter 5 also expanded the theoretical classification of mindful self-focus and caring other-focused meditation introduced in Section 2.4 and Section 2.5 with empirical evidence. The study contributed to the literature by demonstrating that both mindful self-focused meditation (MM) and caring other-focused meditation (CM) have different mechanisms: MM increases body boundaries while CM decreases body boundaries and increases other-caring thoughts. These findings can be considered as early indicators suggesting possible affect change at a later

time (with longer inductions), which is in line with previous literature that mindful self-focused and caring other-focused aspects each have unique contributions with a long-term effect on eudaimonic wellbeing (Verhaeghen, 2021).

6.4 Limitations and Future Research

The present thesis conducted a cross-sectional study and a randomized controlled study. This section describes the limitations to this research and implications for future research.

6.4.1 Towards a Balanced Study Design and Conduct

First, further studies should replicate our findings with diverse participant samples. Chapter 4 focused on Chinese students and Chapter 5 focused on native English speakers, and future studies could recruit participants with other language, ethnic and educational backgrounds. Although humanity-oriented trait can be traced back to both ancient Eastern and Western philosophy, cultural backgrounds, religion, and language could influence interpretations of the self-report questions and brief interventions by participants. Second, this study was the first to use the Thought Sampling Paradigm to assess state mind-wandering in a pre-post study design. Such use of the Thought Sampling Paradigm can be further explored and replicated in further research on state mind-wandering changes with interventions. Third, Chapter 3 (Section 3.7) discussed the psychophysiological indexes of self-regulation and mind-wandering, especially with smartphone-based HRV using PPG techniques. Future studies can explore such application of these methods and assess self-regulation and mind-wandering in relation to affect by comparing self-report questionnaires with psychophysiological indexes.

6.4.2 Towards a Critical Perspective

First, this study discussed in theory the negative impact of excessive self-regulation that may cause harm to others but designed empirical study to assess whether the humanity-oriented trait could mitigate these effects. Future research could further assess the negative impacts of self-regulation and explore other protective factors of these undesirable consequences of self-regulation. Second, we have expanded the classification of mind-wandering (Section 2.4) with a focus on the self-other aspect. Future studies could explore this aspect of mind-wandering further and test the consistency of our findings. Third, we demonstrated the importance of the sense of self-boundaries as a protective factor in cultivating other-focused thoughts, future studies can explore and examine the role of the sense of self-boundaries, design interventional studies that could cultivate healthy self-boundaries and explore to what extent they are a protective factor when practising caring other-focused meditation.

6.4.3 Towards a Synthesized Framework

First, we proposed the construct of the self-other aspects of wellbeing and discussed the relation with the newly developed notion of Self-World Capacity (Section 2.4). Future studies could explore Self-World Capacity and expand its understanding with psychophysiological indexes and self-report questionnaires. We also provided an innovative psychophysiological method of HRV with PPG techniques which could enable recruitment of a large cohort of participants (Chapter 3 Section 3.7). Second, we adapted to the Mindfulness Map framework and identified the mixed uses of the ‘mindfulness’ term. Future studies should use clear definitions of mindfulness types and apply these to meditation interventions, with rigorous study designs, to enable better understanding of mindfulness meditation effects and mechanisms.

Chapter 7 Conclusion

The study examined both self-regulation and mind-wandering from the self-other aspects of wellbeing and highlighted the significance of developing humanity-oriented trait to compensate the negative impacts of excessive self-regulation on others and more mind-wandering associated with negative affect to the self. The study also compared mindful self-focused and caring other-focused thoughts in changing mind-wandering and affect. Given these research findings, I will conclude this thesis with the key implications in the education practice.

Education for sustainable development is advocated by UNESCO (UNESCO, 2018), aiming to develop an ecological system transforming lifestyles into habits of body and mindset (Gomez-Olmedo et al., 2020). Lots of research focused on elaborating the importance of developing self-regulation as a predictor of better academic performance, mental health and wellbeing, and physical health in the education field (Pandey et al., 2018; Woodward et al., 2017). More recently, research has been focusing on reducing the mind-wandering and related negative affect in education (Gomez-Olmedo et al., 2020). Recognizing the negative side of overly self-focused self-regulation is important in developing a wholesome personality and this has been neglected previously. The present thesis contributes to the education field by indicating the important role of the humanity-oriented trait (Chapter 4) in balancing possible negative impacts of self-regulation to enhance the wellbeing of both oneself and other people (Chapter 5).

This thesis discussed the link between self-regulation and mind-wandering using the concept of relational wellbeing, whereby excessive thinking about other people experiencing suffering may produce mind-wandering with more negative affective and this can indirectly prevent oneself from exercising self-regulation. The thesis supported the point and provided a more complete framework of the self-other aspect of self-regulation and mind-wandering in

relation to wellbeing. Through the application of relational wellbeing, the connection between self-regulation and humanity-oriented trait was established, thus suggesting possible ways of integrating them, and based on the integration of the different theories presented in Chapter 2, a more nuanced applications can be further proposed in the education field. Such applications would combine a focus on improving self-regulation with a focus on cultivating humanity-oriented trait from a broader interdependent wellbeing perspective.

Appendixes

Appendix 1: Information Sheet and Consent Form for Study I



Dear Participant,

My name is Qi Wang, I am a doctoral student in the Department of Education at the University of York. One of the research topics I investigate is about student's well-being associated with self-regulation, distractions or mind-wandering, and the way we think of other people. You have been invited to take part in the following research project.

All of the data collected for this study will be anonymous. We will not ask for your name or any other identifying information. The data will be stored in a password protected file and will only be accessible to the researchers involved in the project. The anonymous data may be used in presentations, online, in research reports, in project summaries or similar. In addition the anonymous data may be used for further analysis. Your individual data will not be identifiable but if you do not want the data to be used in this way please do not complete the questionnaire. If you think that completing questions about well-being could be psychologically challenging for you, it might be best if you don't participate in this study. Completing the questionnaires will take you approx. 15 minutes, all questions need to be completed in one session.

At the end of the online survey we will ask if you would like to enter into a prize draw to win 100 RMB or 10 GBP JD/Amazon vouchers? If you would like to enter, you will need to share with us your email address so that we can contact you if you win. Your email address will be collected and stored separately from the responses you provide in the survey and your data will remain anonymous.

If you do agree to complete the questionnaire you are free to leave any questions unanswered or to stop completing the questionnaire altogether at any point. Once the questionnaire is submitted the data cannot be withdrawn as it is anonymous so there will be no way to identify your data. The data will be kept indefinitely.

Please note that, the survey includes questions about wellbeing.. If answering questions about your wellbeing may cause you distress, please do not take part in this study. If you would like advice or support, please visit <https://www.nhs.uk/conditions/stress-anxiety-depression/mental-health-helplines/> or contact the Samaritans (call 116 123 from any phone or email

jo@samaritans.org) in UK and visit <http://www.hope9995.com/> or contact the 24-Hour Hope Line (call 400-161-9995) in China.

This research has been approved by the Department of Education, University of York Ethics Committee. If you have any questions or complaints about this research please contact Qi Wang (qw1050@york.ac.uk), or Chair of the Ethics Committee (education-research-admin@york.ac.uk).

By clicking on the 'Next' button, you are agreeing to all of the points above.

Many thanks for your help with this research !

亲爱的参与者，

我叫王奇，是英国约克大学教育系的博士生。我的课题的方向之一是研究学生对于自我调节、分心或走神有关的幸福感，以及看待他人的方式。我们希望邀请您参与此研究项目。

本研究将匿名收集所有数据。我们不会询问您的姓名或任何其他可识别您身份的信息。数据将存储在受密码保护的文件中，并且只有参与该项目的研究人员才能访问。匿名数据可用于演讲、线上、研究报告、项目摘要等。此外，匿名数据可用于进一步研究分析。您的数据不会透露您的身份，但如果您不希望数据被以上述方式使用，请不要填写问卷。如果您认为完成有关幸福感的问题可能会给您带来心理上的挑战，建议您最好不参与本研究。完成问卷大约需要您 15 分钟，所有问题需要一次性完成。

在线调查结束时，我们会问您是否想参加抽奖以赢取 100 元人民币或 10 英镑京动或亚马逊代金券。如果您想参与抽奖，您需要输入您的电子邮件地址，以便我们在您获奖时与您联系。您的电子邮件地址将与您在调查中提供的回复分开收集和存储，您的数据将保持匿名。

如果您同意参与调查问卷，您可以随时中止回答任何问题，或完全停止完成调查问卷。一旦提交问卷，数据将无法撤回，因为匿名，我们将无法识别您的数据。数据将无限期保存。

请注意，该调查包括有关幸福感的问题。如果回答有关您的幸福感的问题可能会让您感到困扰，请不要参与本研究。如果您需要建议或支持，在英国请访问

<https://www.nhs.uk/conditions/stress-anxiety-depression/mental-health-helplines/>或联系 Samaritans（通过任何电话拨打 116 123 或发送电子邮件至

jo@samaritans.org)，在中国请访问 <http://www.hope9995.com/> 或拨打 24 小时希望热线（400-161-9995）。

该研究已获得英国约克大学教育学院伦理委员会批准。如果您对本研究有任何问题或投诉，请联系 Qi Wang (qw1050@york.ac.uk) 或伦理委员会主席 (education-research-admin@york.ac.uk)。

单击“下一步”按钮，即表示您同意上述所有要点。
非常感谢您对本研究的帮助！

Appendix 2: Questionnaire for Study I (Chapter 4)

Demographic

Age 您的年龄是?

Gender 您的性别是?

- 男 (1)
- 女 (2)
- 其他 (3)
- 不想透露 (4)

Grade 您当前的年级是?

- 普通高中 (e.g., 高一、高二、高三) (1)
- 职业高中、中专学校、技工学校 (e.g., 高一、高二、高三) (2)
- 高等教育本科 (e.g., 大一、大二、大三、大四) (3)
- 高等教育专科 (e.g., 大一、大二、大三) (4)
- 硕士研究生 (5)
- 博士研究生 (6)

Region 您当前学校所在国家是?

- 中国 (1)
- 英国 (2)
- 其他 (3)

Lang 您的母语是?

- 中文 (1)
- 英文 (2)
- 其他 (3)

Hometown 您的家乡是哪里? (省份或地区, 例如: 浙江, 重庆, 北京, 香港...)

Self-regulation (Tangney et al., 2004; Fung et al., 2019)

以下是关于自控特征的问卷, 所涉项目内容无对、错之分。请用 1 - 5 为量尺, 指出下列每条描述在多大程度上反映了你的情况, 如果跟你的情况非常不符合, 请选择“非常不符合”, 如果非常符合, 则选择“非常符合”, 如果不确定是符合还是不符合, 则选择“不确定”, 以此类推。

看懂即可回答, 不必过分思量, 按第一印象回答往往是最准确的。请一一作答, 不要有遗漏。

非常不符合 (1) 不符合 (2) 不确定 (3) 符合 (4) 非常符合 (5)

1. 我能很好的抵制诱惑。

2. 对我来说改掉坏习惯是困难的。
3. 我很懒。
4. 我经常会说一些不合时宜的话。
5. 只要我觉得好玩的事，就算是对我有害也照做不误。
6. 人们说我能严格自律。
7. 休闲娱乐有时会妨碍我完成工作任务。
8. 我很难集中精力/注意力。
9. 我能为了长远目标而有效地工作/学习。
10. 有时我会忍不住去做一些事情，即使我知道那样做是错的。
11. 做事时，我经常不进行全面考虑就采取行动。

Mind-wandering (Mrazek et al., 2013; Luo et al., 2016)

请根据您的实际情况在每个条目后面选择一个恰当的选项。

几乎从来没有 (1) 比较不经常 (2) 有点不经常 (3) 有些经常 (4) 非常经常 (5) 几乎总是 (6)

1. 我很难在简单或重复的任务上集中注意力。
2. 看书的时候，我发现我有时没有想着书本而想其他的事情去了，所以又重新读了一遍。
3. 我没有付出全部的注意力来做事情。
4. 我发现自己一边在听别人说话，一边在想一些其他的事情。
5. 我在上课或者听报告的时候会走神。

Light Triad (Kaufman et al., 2019)

请仔细阅读下面的题目。根据自己目前的情况，选择符合自己情况的选项。你的回答没有对与错，好与坏。我们承诺，对你的回答给以保密。谢谢你的合作！

非常不符合 (1) 不符合 (2) 不确定 (3) 符合 (4) 非常符合 (5)

1. 我往往能看到他人最好的品质。
2. 我往往能相信他人会公平地对待我。
3. 我相信人大多时候是善良的。
4. 我能很快原谅伤害过我的人。
5. 我往往能够欣赏他人。
6. 我往往能够为他人的成就而喝彩。
7. 我往往相信他人都是有价值的。
8. 我喜欢倾听来自不同领域人们的故事。
9. 相较于魅力这个品质，我更喜欢诚实。
10. 我不喜欢操控别人来达到自己的目的。
11. 即使会毁坏我的声誉，我也想要保持真实。
12. 跟他人交流时，我不会想能从他们那里索取什么。

Self-transcendence (Reed, 2008; Zhao et al., 2018)

请您选出您内心真正的感受，并在相应方框中打勾。同时请注意该问卷每个条目均无正确与否之分，您不用担心对错问题，请如实填写。

完全不符合 (1) 仅有一些符合 (2) 较多符合 (3) 完全符合 (4)

1. 我有喜爱的兴趣和爱好。
2. 当我成年时我能接受现在的自己。
3. 我尽可能参与到人群或社区中。
4. 我可以调整好现在的生活状况。
5. 当我成年时我能接受身体机能及外表的改变。
6. 我能与其他人分享我的特殊技能与经验。
7. 我能够从过去的经历中发现有意义的东西。
8. 我能够用某种方式帮助其他人。
9. 我有不断学习新事物的兴趣。
10. 我能放下我曾经认为重要的人或事。
11. 我能够坦然接受生活中不可避免的困难。
12. 我能从我的精神信仰中发现生命意义。
13. 当我需要帮助的时候，我乐意接受别人的帮助。
14. 我很享受我现在的的生活节奏。
15. 我能放下过去的烦恼。

Satisfaction with Life (Diener et al., 1985; Diener et al., 2015; Sachs, 2003)

以下是您可能同意或不同意的五个陈述。

使用以下 1-7 的尺度，勾选适当的选项，以表明您对每个项目的同意程度。请在答复时保持公开与诚实的心态。

非常不赞成 (1) 不赞成 (2) 稍微不赞成 (3) 既不赞成也不反对 (4) 稍微同意 (5) 同意 (6) 非常同意 (7)

1. 在大多数情况下，我的生活接近我的理想。
2. 我的生活条件非常好。
3. 我对自己的生活感到满意。
4. 到目前为止，我已经获得了生活中想要的重要事物。
5. 如果我能过上自己的生活，我几乎什么都不会改变。

Psychological Wellbeing (Ryff, 2014; Li, 2014)

请仔细阅读下面的题目。根据自己目前的情况，选择符合自己情况的选项。你的回答没有对与错，好与坏。我们承诺，对你的回答给以保密。谢谢你的合作！

完全不符合 (1) 相当不符合 (2) 有点不符合 (3) 有点符合 (4) 相当符合 (5) 非常符合 (6)

1. 总的来说，我认为我能够把握自己的生活。
2. 每当我回顾自己的过去时，我对那些经历和结果都感到满意。
3. 总括来说，我对自己是肯定的，并对自己充满信心。
4. 我很喜欢与家人或朋友作深入的沟通，彼此了解。

5. 我对于日常生活中许多职责都处理得很好。
6. 我认为，获得新经验是十分重要的。这些经验可以挑战我们对自己和对世界的既定看法。
7. 一般来说，我能妥善处理个人财政及个人事务。
8. 我喜欢为将来定下计划并努力去实践。
9. 人们认为我是一个肯付出并且愿意和他人分享自己的时间的人。
10. 即使与人们的观点相悖，我仍然坚信自己的观点。
11. 我能积极主动地完成自己制定的计划。
12. 有些人生活没有目标，但我不是这样的人。
13. 对我来说，生活是一个不断学习、变化和成长的过程。
14. 我和我的朋友都认为我们之间是可以互相信任的。
15. 我不是那种会因社会压力而改变自己思想或行为的人。
16. 我很高兴看到自己的思想有所改变并日趋成熟。
17. 当我把自己和朋友、熟人相比时，我的自我感觉良好。
18. 我不是按别人的标准，而是按自己认为重要的标准来衡量自己。

Appendix 3: Information Sheet and Consent Form for Study II



Information Page

Investigating the Short-term Effects of Meditation on Wellbeing

Dear Participant,

My name is Qi Wang, and I am a doctoral student in the Department of Education at the University of York. I am currently carrying out a research project examining the immediate effects of short meditation practices. I would like to invite you to take part in this research project.

Before agreeing to take part, please read this information sheet carefully and let us know if anything is unclear or you would like further information.

Please also read the information about General Data Protection Regulation (GDPR) that is provided on a separate sheet.

Purpose of the study

The study is designed to investigate changes in mind-wandering and affect resulting from brief meditation. We also want to understand how these changes link to your wellbeing and the way you think of others.

What would this mean for you?

You will be randomly assigned to a group to do one of three different meditation practices. Before the meditation practice you will first complete a brief questionnaire asking about your basic demographics, your mind-wandering, wellbeing, and mindfulness. In addition, before and after the meditation will ask you a brief set of questions about your affect (i.e., emotions, feelings, life satisfactions) and your thoughts. The entire research session will last approximately 30 minutes. The study will be conducted in a classroom or meeting room at the University of York in the afternoon on weekdays. In recompense for your time, you will receive a £5 Amazon voucher. I will collect your email address on a separate sheet, and the finance office in Department of Education will send you the £5 Amazon voucher after we complete the data collection. You will also be invited to enter your email into a prize draw to have a chance to win an additional £20 Amazon voucher.

Participation is voluntary

Participation is optional. If you do decide to take part, you will be given a copy of this information sheet for your records upon request and will be asked to complete a consent form. If you change your mind at any point during the study, you will be able to withdraw your participation without having to provide a reason.

Anonymity and confidentiality

The data that you provide (e.g., test results) will be stored by code number. You are free to withdraw from the study at any time during data collection. Once your responses are collected, the data cannot be withdrawn as it is anonymous, so there will be no way to identify your data.

Storing and using your data

Data will be stored in secure filing cabinets and on a password-protected computer. Data will be fully anonymised and kept indefinitely. I am practising Open Science, and anonymised data will be managed professionally and stored indefinitely with the University's Research Data York service.

The data that I collect (your responses) may be used in an anonymous format in different ways (e.g., publications, presentations and online). Please indicate on the consent form enclosed with a tick if you are happy for this anonymised data to be used in the ways listed.

Please note: the survey includes questions about wellbeing. If answering questions about your wellbeing may cause you distress, please do not take part in this study. If you would like advice or support, please visit <https://www.nhs.uk/conditions/stress-anxiety-depression/mental-health-helplines/> or contact the Samaritans (call 116 123 from any phone or email jo@samaritans.org) in the UK.

Questions or concerns

If you have any questions about this participant information sheet or concerns about how your data is being processed, please feel free to contact Qi Wang by email at Qi.wang@york.ac.uk, or the Chair of Ethics Committee via email education-research-admin@york.ac.uk. If you are still dissatisfied, please contact the University's Data Protection Officer at dataprotection@york.ac.uk.

I hope that you will agree to take part. If you are happy to participate, please complete the form enclosed and return it to me when you are finished.

Thank you for taking the time to read this information.

Yours sincerely

Investigating the Short-term Effects of Meditation on Wellbeing

Please tick each box if you are happy to take part in this research.

Statement of consent	Tick each box
I confirm that I have read and understood the information given to me about the above-named research project, and I understand that this will involve me taking part as described above.	
I understand that participation in this study is voluntary and that if I wish to withdraw, I can do so at any time during data collection.	
I understand that my data will not be identifiable, and the anonymous data may be used in publications, presentations and online.	
I confirm that I have read the information about GDPR	

Name:

Signature:

Date:

Appendix 4: Questionnaire for Study II (Chapter 5)

Section I

Code (for staff only) _____.

Arm (for staff only) _____.

1. Demographic Questions (circle your choice(s)).

1. What is your age? _____.
2. What is your gender?
 - A. Female
 - B. Male
 - C. Other
 - D. Prefer not to say
3. What is the highest degree or level of education you have completed?
 - A. Up to GCSE or equivalent
 - B. Further education (e.g., A-levels, BTEC, NVQ, sixth form)
 - C. Bachelor's degree
 - D. Postgraduate degree
4. Have you practised meditation before?
 - A. Yes. If so, describe: _____.
 - B. No
5. What type of meditation do you practice? (Multiple choice)
 - A. Not applicable
 - B. Journaling
 - C. Yoga
 - D. Mindfulness
 - E. Taichi
 - F. Other type: _____.
6. How often do you practice meditation?
 - A. Everyday
 - B. A few times a week
 - C. Once or twice a week
 - D. Once in a couple of weeks
 - E. About once a month
 - F. Very occasionally
 - G. Never
7. Have you practiced meditation in the last seven days?

- A. Yes
- B. No

8. Did you practice meditation today?

- A. Yes. If so, describe: _____.
- B. No

2. Trait Mind-Wandering (Mrazek et al., 2013)

Instructions: The following questions are about how much you mind-wander during daily tasks. For the 5 questions, choose from 1 to 6, from almost never to almost always. **Please use the last 2 weeks** as the timeframe to consider each item.

1. I had difficulty maintaining focus on simple or repetitive work.					
Almost never	Very infrequently	Somewhat infrequently	Somewhat frequently	Very frequently	Almost always
2. While reading, I found I wasn't thinking about the text and therefore had to read it again.					
Almost never	Very infrequently	Somewhat infrequently	Somewhat frequently	Very frequently	Almost always
3. I did things without paying full attention.					
Almost never	Very infrequently	Somewhat infrequently	Somewhat frequently	Very frequently	Almost always
4. I found myself listening with one ear, thinking about something else at the same time.					
Almost never	Very infrequently	Somewhat infrequently	Somewhat frequently	Very frequently	Almost always
5. I mind-wandered during lectures or presentations or meetings.					
Almost never	Very infrequently	Somewhat infrequently	Somewhat frequently	Very frequently	Almost always

3. Trait Mindfulness (Walach et al., 2006)

Instructions: The purpose of this inventory is to characterise your experience of mindfulness. **Please use the last 2 weeks** as the timeframe to consider each item. Provide an answer for every statement as best you can. Please answer as honestly and spontaneously as possible. There are neither 'right' nor 'wrong' answers, nor 'good' or 'bad' responses. What is important to us is your own personal experience.

Items	Rarely	Occasionally	Fairly often	Almost always
1. I was open to the experience of the present moment.	1	2	3	4
2. I sensed my body, whether eating, cooking, cleaning, or talking.	1	2	3	4

3. When I noticed an absence of mind, I gently returned to the experience of the here and now.	1	2	3	4
4. I was able to appreciate myself.	1	2	3	4
5. I paid attention to what's behind my actions.	1	2	3	4
6. I saw my mistakes and difficulties without judging them.	1	2	3	4
7. I felt connected to my experience in the here-and-now.	1	2	3	4
8. I accepted unpleasant experiences.	1	2	3	4
9. I was friendly to myself when things went wrong.	1	2	3	4
10. I watched my feelings without getting lost in them.	1	2	3	4
11. In difficult situations, I could pause without immediately reacting.	1	2	3	4
12. I experienced moments of inner peace and ease, even when things get hectic and stressful.	1	2	3	4
13. I was impatient with myself and with others.	1	2	3	4
14. I was able to smile when I noticed how I sometimes make life difficult.	1	2	3	4

4. Well-Being (WHO, 1998)

Instructions: Please put a circle on each of the five statements which is closest to how you have been feeling **over the last two weeks**. Notice that higher numbers mean better wellbeing.

Over the last two weeks	All the time.	Most of the time.	More than half of the time.	Less than half of the time.	Some of the time.	At no time.
1. I felt cheerful and in good spirits.	5	4	3	2	1	0
2. I felt calm and relaxed.	5	4	3	2	1	0
3. I felt active and vigorous.	5	4	3	2	1	0
4. I woke up feeling fresh and rested.	5	4	3	2	1	0
5. My daily life was filled with things that interest me.	5	4	3	2	1	0

Section II – Pre-test

5. Thought Sampling Paradigm

Instructions: Please record five different thoughts that are on your mind **RIGHT NOW** in a few words on the five stickers provided below (e.g., “My college GPA”, “Climb Pike’s Peak”). Please note it’s your thoughts instead of your feelings).

(Five stickers were prepared and stuck here for each participant.)

Instructions: For the following 11 questions, please evaluate each of the 5 thoughts you just recorded and circle responses that apply to each thought.

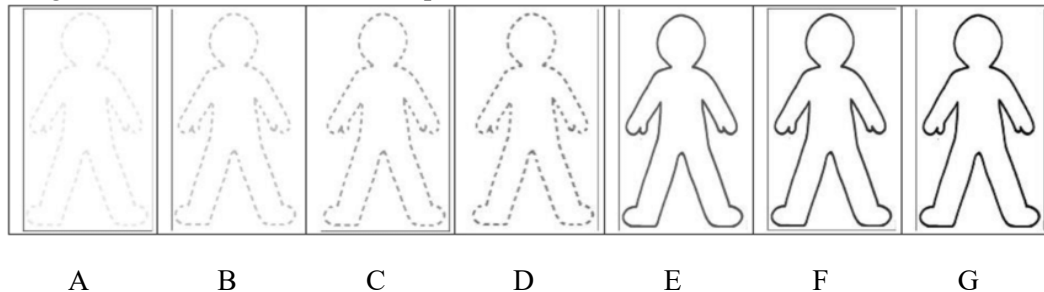
(An example of using the Thought Sampling Paradigm in Study II. The same “Evaluation of Thought” below were shown five times in the pre-test and five times in the post-test.)

5.1. Evaluation of Thought 1

Please place the sticker with your 1st thought here:

	Very Negative ←————→ Very Positive									
1. My own emotions pertaining to this thought are:	1	2	3	4	5	6	7	8	9	10
	Strongly Disagree ←————→ Strongly Agree									
2. Lately, it seems that this thought has been on my mind a great deal:	1	2	3	4	5	6	7	8	9	10
3. I consider this thought to concern other people:	1	2	3	4	5	6	7	8	9	10
4. I consider this thought to be mostly about me:	1	2	3	4	5	6	7	8	9	10
5. The thought has an element of caring emotions towards other people:	1	2	3	4	5	6	7	8	9	10
6. I was thinking about how other people are nice to me:	1	2	3	4	5	6	7	8	9	10
7. I was thinking that a person/people are mostly good:	1	2	3	4	5	6	7	8	9	10
8. In my thought, I manipulated people to do something I want:	1	2	3	4	5	6	7	8	9	10
9. In my thought, I was getting or thinking about what I want from people:	1	2	3	4	5	6	7	8	9	10

10. The following instruction still pertains to your thought: **How strong is the boundary between yourself and the world, regarding this thought?** Please find below several bodies that are more or less salient. A body high in salience is a body in which one feels enclosed, that is highly distinct from the bodies of others, and that sets a marked boundary between you and the rest of the world. Conversely, a body low in salience is strongly connected to its surroundings; it is a kind of permeable envelope, without any marked boundaries. Please indicate which of the bodies presented below best represents your current body state. If the boundaries of your body are extremely salient, you should circle the image on the extreme right. If the boundaries of your body are almost imperceptible, you should circle the image on the extreme left. You can indicate an intermediate state by circling an image somewhere between the two poles.



11: **How far does your self extend into the world in this thought?** Using the letters and images below, please indicate how much you feel that your SELF extends beyond your physical body regarding this thought. “A” represents yourself stopping at your physical body. “F” represents yourself extending into everything (for example, the entire Universe). The letters in-between “A” and “F” represent different levels of self-extension. The rings are symbolic and do not represent actual distances. Please circle one letter.



Your Answer is _____.

6. Positive and Negative Affect (PANAS; Thompson, 2016)

(PANAS was shown here in the pre-test and will be present again in the post-test after the TSP.)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way RIGHT NOW .					
Items:	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
1. Upset	1	2	3	4	5
2. Hostile	1	2	3	4	5
3. Alert	1	2	3	4	5
4. Ashamed	1	2	3	4	5
5. Inspired	1	2	3	4	5
6. Nervous	1	2	3	4	5
7. Determined	1	2	3	4	5
8. Attentive	1	2	3	4	5
9. Afraid	1	2	3	4	5
10. Active	1	2	3	4	5

Section III –Guided Attention Practice

Please put down this paper, relax, and get ready for your intervention task.

Section IV – Post-Test

Code (for staff only) _____.

Arm (for staff only) _____.

7. Did you fall asleep during the guided attention practice?

- A. Yes
- B. No

8. Thought Sampling Paradigm

(see “5. Thought Sampling Paradigm” for detail)

9. Positive and Negative Affect

(See “6. Positive and Negative Affect” for detail.)

10. Are you a native English speaker?

- A. Yes
- B. No

11. Would you like to share some thoughts about your experience of doing the guided attention practice (optional)?

End of the experiment

Thank you so much for your participation. Please hand this material to the researcher.

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