

**Exploring the relationship between mindfulness and the abilities of mixed martial arts
fighters: A cognitive approach.**

by

ANDLEY (I-TA) WU

A mini-dissertation submitted in partial fulfilment of the requirements for the degree

MASTERS IN RESEARCH PSYCHOLOGY

in the

DEPARTMENT OF PSYCHOLOGY

at the

UNIVERSITY OF PRETORIA

FACULTY OF HUMANITIES

SUPERVISOR:

Prof. David Maree

June, 2016

Abstract

As mindfulness is often synonymous with equanimity, the intensity of competitive mixed martial arts serves as an ideal domain in exploring the underlying cognitive process of mindfulness in enhancing performance. Within the past two decades, interest has peaked in the positive outcomes that mindfulness produces in alleviating negative symptoms in health and clinical settings. Little research exists however in exploring the cognitive processes involved in producing the potential benefits of performance enhancement. The aim of the study was to gain a better understanding of the underlying cognitive processes involved in the workings of mindfulness; exploring whether increased levels of mindfulness would be positively correlated with increased martial arts ability. Using correlational analysis and standard multivariate regression, the participating fighters' (n=46) levels of mindfulness were analysed in relation to their mixed martial artist's ability. Results from correlational analysis showed that overall mindfulness was positively correlated with mixed martial arts ability, as a result confirming the study's primary hypothesis. Results from standard multivariate regression further identified a fighter's age as being a significant predictor for mixed martial arts ability.

Key Terms

Mindfulness, Cognition, Mixed martial arts, Performance enhancement, Five Factor Mindfulness Questionnaire

Acknowledgements

Firstly, I would like to express my most heartfelt appreciation for my supervisor Prof David Maree for the countless times he has supported and encouraged me throughout my academic career. Without his patience and guidance I would not be where I am today.

Secondly, I would like to thank all the fighters and all the martial arts gyms for participating in the current study. Hopefully you have all learned as much from me, as I have from you. Especially Master Kru Maria da Silva, Kru Joanne Riley, Kru Jonathon Lee and Kru Scott Randall from my own gym - Tiger Dragon Muay Thai Boran Academy.

Last but not least, the completion of this dissertation would not have been possible without the love and patience from my family (especially my mother) and friends. Thank you all for your unconditional support.

Table of Contents

Abstract.....	ii
Acknowledgements.....	iii
List of Tables	viii
List of Figures	ix
Chapter 1: Introduction.....	1
1.1 Introduction.....	1
1.2. Aims of Study	2
1.3 Operationalising Mindfulness and Mixed Martial Arts.....	3
1.4 Motivation for Research	5
1.5 Outline of Remaining Chapters	8
Chapter 2: Literature Review.....	9
2.1 Introduction.....	9
2.2 The Cognitive Approach.....	9
2.1.1 Cognitive Approach to Mindfulness.....	12
2.3 Historical Ties between Mindfulness and Martial Arts	15
2.4. Mindfulness and the Abilities of Mixed Martial Artists.....	17
2.4.1 The Essential Cognitive Processes Affecting Athletic Performance	17
2.4.2 Mindfulness Training on Cognitive Functioning (Training on Cognition)	22
2.4.3 Mindfulness and Cognitive Rigidity	25
2.4.4 Mindfulness and Affect Regulation	27
2.5. Mindfulness and Physiological Functioning.....	28

2.5.1 Mindfulness and Physiology.....	28
2.5.2 Mindfulness and Arousal Regulation.....	30
2.5.3 Mindfulness and the Regulation of Pain.....	32
2.5.4 Effect of Age and Gender on Mindfulness	33
2.6. Summary.....	34
Chapter 3: Research Methodology.....	36
3.1. Introduction.....	36
3.2. Research Design.....	36
3.3. Sampling	37
3.4. Data Collection	37
3.5. Instrumentation	38
3.5.1 Freidburg Mindfulness Inventory (FMI)	39
3.5.2 Mindfulness Attention Awareness Scale (MAAS).....	39
3.5.3. Kentucky Inventory of Mindfulness (KIMS)	40
3.5.4 Cognitive and Affective Mindfulness Scale Revised (CAMS-R)	41
3.5.5. Toronto Mindfulness Scale (TMS)	41
3.5.6 Southampton Mindfulness Scale (SMQ)	42
3.5.7 Philadelphia Mindfulness Questionnaire (PHLMS)	43
3.5.8 Five Facet Mindfulness Questionnaire (FFMQ).....	43
3.6. Validity and Reliability of the Five Facet Mindfulness Questionnaire	45
3.7. Measure of Mixed Martial Arts Ability	48

3.8. Research Hypothesis	48
3.9. Statistical Analysis Procedure.....	49
3.10. Ethical Considerations	50
3.11. Summary	51
Chapter 4: Results	52
4.1. Introduction.....	52
4.2. Description of Sample.....	52
4.3. Description of Test Results	55
4.3.1 Test of Normality	57
4.4. Reliability of the Five Facet Mindfulness Questionnaire	58
4.5. Relationship between Variables.....	59
4.5.1 Standard Multiple Regression.....	60
4.6. Non-Significant Results	64
4.6.1 Comparison between the Five Facets of Mindfulness with Various Age Groups ..	64
4.6.2 Comparison of Overall Mindfulness Score between Genders	65
4.7 Summary of Results	67
Chapter 5: Discussion of Results	68
5.1. Summary of the Study	68
5.2. Results in Relation to Hypothesis	68
5.2.1 The Relationship between Mindfulness and Martial Arts Ability	68
5.2.2 Mixed Martial Arts Training and the Facets of Mindfulness	69

5.3. Results in Context of Current Literature.....	69
5.4. Mindfulness Differences across Age Groups, Genders, and Ethnicities	73
5.5. Practical Implications of Research Findings.....	74
5.6. Researcher’s Experiences	75
5.7. Limitations	76
5.8. Recommendations for Future Research	78
5.9. Conclusion	80
References.....	82
Appendix A: Information sheet, Informed Consent Form and Demographics Questionnaire	94
Appendix B: Five Facet Mindfulness Questionnaire.....	99
Appendix C: P-P and Scatter Plots	104

List of Tables

Table 5.1: Gender of Participants	53
Table 5.2: Ethnicity of Participants	53
Table 5.3: Home Language of Participants.....	54
Table 5.4: Educational Background of Participants	54
Table 5.5: Marital Status of Participants.....	55
Table 5.6: Means, Standard Deviation, Skewness and Kurtosis values of Variables.....	56
Table 5.7: Test of Normality.....	57
Table 5.8: Internal consistency of reliability of the FFMQ	58
Table 5.9: Non-Parametric (rho) Correlation between Fight Ratio, Duration of Training, Overall Mindfulness and the Five Facets of Mindfulness	60
Table 5.10: ANOVA.....	61
Table 5.11: Model Summary	61
Table 5.12: Evaluation of Independent Variables.....	62
Table 5.13: Age Group and Mindfulness.....	64
Table 5.14: Correlation between Age groups and Mindfulness	65
Table 5.15: Difference in Mindfulness between Genders	66
Table 5.16: Gender and Mindfulness.....	66

List of Figures

Figure 2.1. A cognitive model of mindfulness	14
Figure 2.2. Duck or rabbit?	26

Chapter 1: Introduction

1.1 Introduction

The ability to master and manifest martial arts techniques into physical actions requires dedicated psychological and physical training involving the use of cognitive systems such as one's executive functions (which includes attention, working memory, affect control, mental imagery, problem-solving, planning, and execution) (Moran, 2012). Many martial artists, however, find great difficulty in persevering over an opponent due to their inability to adapt their strategies and techniques when they encounter 'superior' martial artists (Lee, 2011). This is often misinterpreted as the inferiority of one's style or strategy in comparison to one's opponents, however, more often than not, the shortcoming arises due to the 'fixed' notions one has of one's own abilities and strategies that result in the defeat. The focus of the present study is thus to explore the relationship between the possible enhancements to one's cognitive processes achieved through mindfulness, and how this may possibly equate to enhancing the ability of a mixed martial artist.

It is suggested by Lee (2011) that removing the unnecessary components in one's martial arts abilities (such as negative affect, inattention, etc.) and improving the adaptability (i.e. through enhancing one's executive functions) to one's opponent and situation, will likely be the most efficient way to increase the chances of victory in competitive mixed martial arts. The process of mindfulness and the cognitive enhancements that follow as a result of its practice forms the primary variable under investigation in this study.

Mindfulness is said to allow one to 'decenter' oneself, which is to remove or distance oneself from negative/problematic emotions and thoughts (such as the inability to

persevere/overcome an opponent). This reduction in reactivity to negative experiences and the possible accompanying negative emotional mood states such as distress, fear or anxiety, allows better access to the thoughts, emotions, and necessary information that would help circumvent the thought and emotional patterns which in turn give rise to the negative cognitive sets which force one to remain cognitively rigid (Chambers, Lo, & Allen, 2008; Greenberg, Reiner, & Meiran, 2012). Cognitive rigidity refers to one's inability to change their personal habits, beliefs, and attitudes, as well as developing a tendency to persevere in using behavioural/mental sets (Greenberg et al., 2012). Thus, the ability to be non-reactively aware of one's thoughts and emotions allows for all experiences and thought processes to be examined in a neutral manner and for the naturally accompanying emotional responses to diffuse. By using this line of reasoning, the effects of mindfulness are recognised as possibly the best way to enhance a mixed martial artists' cognitive processes, such as executive functions, which are vital in securing and processing the information necessary to direct one's actions to attain victory during competition.

1.2. Aims of Study

The aim of this study is to investigate how a fighters' level of mindfulness may influence their mixed martial arts skills and abilities. The construct of mindfulness will be primarily explored from a cognitive approach so that better understanding of the underlying cognitive processes involved in the workings of mindfulness can be better understood. To gain a more holistic understanding of the variables being studied, various other approaches (such as, but not limited to, neuropsychology, clinical psychology, physiology etc.), that have explored mindfulness will be incorporated in this study to further understand its likely benefits.

The current study examined forty-six mixed martial artists' levels of mindfulness, acquired from their scores obtained from the Five Facet Mindfulness Questionnaire (FFMQ) and sought to explore the correlation with their mixed martial arts ability (operationalised as the number of fight wins divided by total number of fights). As a result, the researcher has hypothesised that increased levels of mindfulness would be positively correlated with increased levels of martial arts ability.

1.3 Operationalising Mindfulness and Mixed Martial Arts

According to Kabat-Zinn (1990), mindfulness can be described as the ability to allocate and maintain attention to moment by moment experiences. This simple definition, though possibly true, is insufficient to explore the multiple dimensions of mindfulness in the context of this study. Therefore, the two-component model of mindfulness proposed by Holas and Jankowski (2012) has been chosen as the operational definition of mindfulness to guide the present study. Holas and Jankowski (2012) conceptualise mindfulness,

as a unique state of meta-awareness (awareness of being aware) that is evoked and maintained by cooperation between the executive functions and attentional processes, and secondly as a state that is marked by “an open and accepting stance toward the present moment experience. (p. 3)

Bearing the above definition in mind, the researcher of the present study recognises that the working components of mindfulness rely on the cognitive processes of perception, attention and working memory (executive functions). It is further understood that through mindfulness meditation practices, one can increase one's ability to focus and sustain attention and reduce

proneness to distraction (Moore & Malinowski, 2009) – skills essential in combat situations in mixed martial arts.

Mixed Martial Arts, or MMA as it is more commonly known, is a full contact sport which allows both striking and grappling techniques (Little, 2000). As the name suggests, fighters in this sport combine various techniques from all disciplines of martial arts so that they can, as quickly and swiftly as possible, neutralise their opponents (Lee, 2011; Little, 2000).

The ability of a mixed martial artist to perceive and be attentive to their opponent is of utmost importance in combat situations. In other words, being mindful of one's opponents' actions, as well as one's own, is an underlying principle of any combat situation. Environmental monitoring and cognitive control are essential to a fighter's ability to maintain mindfulness in high stress and high-speed oppositional situations (Maier, 2004b). As a result, mindfulness, directly or indirectly, has been central to the fundamental teachings of all forms of martial arts (Little, 2000).

The difference between MMA and more traditional forms of Martial Arts such as Tae Kwan Do, Karate, Brazilian Jujitsu, and Judo, lies in the lack of persistent rigid structures in fighting techniques, and the psychological/theoretical approach of Martial disciplines as a whole (Lee, 2011). For example, Karate and Tae Kwan Do, focus heavily on 'correct' standing postures and stand-up fighting techniques, however completely disregard combat elements such as wrestling and submissions (submissions refer to the ability to disable an opponent either via chokes or the hyperextension of vulnerable joints on the human body). The opposite is true for Martial Art styles such as Brazilian Jujitsu and Judo, where its teachings focus solely on grappling, wrestling, and submissions. The ideology behind MMA is to remove the rigidity

behind the diversity in styles of fighting briefly touched on above, and instead, combine the most effective techniques from them to overcome one's opponent as efficiently as possible.

It should be noted that due to the diversity of styles that can be found in the field of martial arts, the researcher has specifically identified Mixed Martial Artists to serve as the sample for this study. This is done to minimise the possible confounding variables that may exist as a result of the unique nature of the differing styles of martial arts. MMA and its' all-encompassing nature has therefore been selected as the best representation for all martial arts disciplines.

1.4 Motivation for Research

Research and academia appear to be drawn towards fields of study where written and verbal materials can be easily generated. Due to the seemingly physical nature that is innate to the field of martial arts, it has resulted in the field not receiving the academic or research attention that some of its activities and ideas deserve (Maier, 2004b).

A primary factor contributing to the lack of written records in martial arts is its need for secrecy. Martial arts are skills used in overcoming an opponent. Thus, in ancient times, preventing the secrets of martial arts escaping has led to countless battles, as well as countless lives being lost (Lorge, 2011). Secrecy, surprise, and misdirection are innate to most competitive challenges, including military, business, and political efforts; thus records of such efforts are often kept to a minimal level.

A second possible reason for the lack of written records is the difficulty in producing a verbal representation of a non-verbal physical activity. The majority of the knowledge in martial arts styles is preserved in the mechanics of performance. Much like dance, there is not

an accurate system of notation for the superficial movements and positions thereof. As such, there has been a lack of scientific research in the field of martial arts in relation to its cognitive origins. Even though mindfulness has been the subject of study in psychology, no research has been conducted examining its relevance to what quite possibly may be one of its oldest traceable roots: the teachings of Buddhist martial arts (Hyams, 1982; Mann, 2012). Thus, a further aim of this research study is to explore what seems to be the inherent, but often overlooked, or even disregarded relationship between the cognitive processes of mindfulness and the practice of MMA.

Within both the South African and international psychological domains, primary focus on mindfulness has been directed at the effects of Mindfulness-Based Interventions (MBI's) in clinical settings, as a result little is still known about what mindfulness as a psychological process entails (Holas & Jankowski, 2012). Mindfulness, as a construct, has rarely been approached from a cognitive perspective, and to an even lesser degree has its relationship with the field of martial arts been explored.

Concerning the growing sport of MMA, even less academic research has been conducted in this field. One possible reason could be the result of the sport still being in its adolescent stage. As such, the less informed audience, who merely glance at its surface, tend to only see the physical aspect of the sport and possibly miss the underlying cognitive advances that are made through dedicated training regimes. The continued rise in the popularity of MMA tournaments/organisations such as The Ultimate Fighting Championship (UFC) and the South African based, Extreme Fighting Championship (EFC) serves as an incentive of the necessity for more studies to be conducted in this domain. As such, by taking a cognitive approach to

explore the relationship between mindfulness and a mixed martial artists abilities, one is able to gain further insight into both mindfulness (as a cognitive process) and the cognitive processes of a mixed martial artist.

The relevance and findings of the proposed study will likely be applicable in broader fields such as sports, clinical, and educational psychology, and will not be limited to the domain of martial arts. The ability of mindfulness to enhance one's attention may be of great value in the education setting as this may aid learners in achieving more desirable outcomes. Furthermore, mindfulness training regimes, such as the Mindfulness-Acceptance-Commitment approach (MAC) to performance enhancement (Gardner & Moore, 2007), have already been incorporated in a variety of sports, although focus has been placed on the results of mindfulness meditational practices rather than the possible changes in the cognitive processes that produce those results. Similar focus occurs in the clinical setting, such as in the case of Dialectical Behaviour Therapy (DBT) that involves teachings of mindfulness (DBT aims at assisting people to change their behaviours which are likely to lead to self-harm) (Teasdale et al., 2000). To address questions dealing with how the benefits of mindfulness are achieved, it is required of the researcher to investigate the processes of change that lead to these mental enhancements. According to Holas and Jankowski (2012), one's ability to identify and explore their cognitive processes is considered one of the best ways to further investigate the underlying mechanisms of mindfulness, hence, its choice to be the primary guide for this study.

Further insight into the cognitive processes (i.e. executive functions) involved in the processes of mindfulness may possibly aid in developing or enhancing new or existing strategies to produce better results required in domains ranging from and beyond those mentioned prior. For example, studies done by Brown et al. (2007) confirm the enhancements

in executive functions/cognitive ability due to mindfulness meditational practices and thus give support to its possible applicability in the educational domain. If these mindfulness practices were to be included in the learners' curriculum, they could be afforded the added opportunity to truly fulfil their potential. For adults, increased cognitive abilities could mean increased ability to perform optimally at their jobs. Thus, the focus of this study, to further explore the impact of methods that train one's cognition, contains great theoretical relevance in the field of cognition and potentially beyond.

Whether it is psychological stress caused by daily living routines, physical stress caused by strenuous training regimes, or a combination of the two, further insight into processes of mindfulness may serve to alleviate those stressful hindrances while simultaneously contributing towards mindfulness theory from a cognitive standpoint.

1.5 Outline of Remaining Chapters

The remaining chapters of this mini-dissertation will be as follows: chapter two will focus on providing further insight into the cognitive approach to mindfulness, as well as exploring the core concepts utilised in this study as they have been explored in various studies and literary sources. Once the primary concepts and arguments have been acknowledged, chapter three will highlight the research methodology used to explore the variables in question. Chapter four will provide the findings of the study. Finally, chapter five will centre its discussions on the research findings in relation to current literature, as well as draw relevance to real world applications. Furthermore, the limitations of the study and the relevant recommendations for future research will be presented in this final chapter.

Chapter 2: Literature Review

2.1 Introduction

The gradual advancement in regular mindfulness meditation practices produces a range of positive cognitive, emotional, behavioural, and interpersonal effects (Brown et al., 2007). For a mixed martial artist, any enhancements to their executive functioning and hence the actions that follow, may well be the difference between victory and defeat. The benefits of the cognitive ability of being increasingly aware of visual stimuli or the ability to encounter and accept with openness the possible negative emotions encountered in the intensity of combat situations can all contribute to the correct physical manifestation of one's thoughts and strategies. As such, it has been theorised that being mindful in combat situations is of utmost importance for the mixed martial artist.

Within this chapter insight will be provided into the cognitive approach to mindfulness which serves as the theoretical underpinning of the present study. Insight into the nature and the origins of mindfulness, as well as its development and links with martial arts will then be addressed, followed by what has been identified as the essential cognitive processes utilised by mixed martial artists during combat. The researcher will then direct the reader's attention to past studies done which explore, connect, and confirm the multitude of beneficial effects that can be achieved through mindfulness on (but not limited to) one's cognition.

2.2 The Cognitive Approach

Cognitive psychology centres its focus on understanding the internal processes of the mind. The literal translation of cognition can be understood as the mental process of knowing (Eysenck & Keane, 2010). From this approach, psychologists study cognition as those mental

acts or processes by which knowledge can be acquired. Cognitive psychology focuses on the way humans' process information by examining how incoming information or stimuli is treated, and how this treatment influences particular responses. In other words, they are interested in the psychological process that mediates the stimulus/input and response/output interaction (Robinson-Riegler & Robinson-Riegler, 2011). The internal processes of central concern for the present study are the executive functions, which include perception/attention, mental imagery, working memory, and thinking/problem solving (Robinson-Riegler & Robinson-Riegler, 2011).

In the past, researchers in the field of cognitive psychology have given very little attention to the field of sports (and even less so to martial arts) in their attempt to understand how the mind operates. This omission is largely due to cognitive psychology's limiting focus on the information-processing paradigm that has restricted its scope of understanding and application (Moran, 2012). In more recent times, however, with the surfacing of the embodied approach to cognition (an approach in that postulates that the nature of the mind is highly influenced by physical form and postures of the body) (Anderson, 2003), the field of physical activities such as that of martial arts, has become a natural and dynamic environment for further research in exploring the relationship between one's thoughts and actions to be carried out. The direction of this study aims to focus on this relationship, as the practice of martial arts is believed by the researcher as being one of the purest forms in which one's thoughts and actions may interact with one another, in producing a desired outcome.

When looking at the fundamentals of thoughts, versus that of actions, one could easily assume that these two constructs may lie on different ends within the range of human behaviour (Moran, 2012). This is due to assumptions that thoughts are unobservable and private, whereas actions are visible to any and all observers. Taking into consideration the rudimentary argument

against behaviourism (a psychological perspective that believes that behaviour can be observed and studied systematically without taking into account one's internal mental states) (Eysenck & Keane, 2010). This supposed detachment between a person's thoughts and actions has however become problematic in the field of cognitive psychology, as the psychological and the physical cannot be understood to their fullest extent without one another (Anderson, 2003; Shapiro, 2010).

Since the 1970s, cognitive psychology further focused its understanding of the mind by treating it as a computer (Moran, 2012). This proposed that the mind was an all-purpose, abstract thinking machine; which understandably garnered its own critique (Casey & Moran, 1989). This view of the mind according to Moran (2012) had three important implications for the exploration of the mental processes of thought. Firstly, it suggests that how one thinks is a type of computation in which conscious knowledge is orchestrated symbolically according to fixed schematics or programs in one's mind. Thoughts or thinking was adjudged to be comparable to how a computer is programmed for analysis (Casey & Moran, 1989; Moran, 2012). Secondly, the metaphor suggesting that the processes of the mind are similar to the processing abilities of a computer assumed that the motor and the cognitive systems of the mind worked independently of one another. This implied that research on cognitive processes such as one's thought processes could be conducted independently from the study of one's sensory-motor processes and mechanisms (Maouene, 2011; Moran, 2012). Lastly, this metaphor gave an impression that somehow one's motor actions were less important than one's thought processes, as if it were merely the unimportant consequence, or by-product of one's cognitive processes (Moran, 2012).

The limitations of this disembodied approach to cognitive psychology were raised by the development of both theoretical and empirical findings over the last fifteen years. From a theoretical standpoint, the emergence of the embodied approach to cognition at the beginning

of the new millennium purported that cognitive representations are not only founded in, but also created through sensory motor activity (Moran, 2012; Slepian, Weisbuch, Rule, & Ambady, 2011). This means that the circuitries in one's mind, which are responsible for abstractions, are also linked to those that process sensory experience. Empirically, research has shown that cognitive simulation processes - such as mental imagery - share certain neural structures, representations, and theoretical mechanisms with those similar to perception, motor preparation, and execution (Moran, 2012).

One's thoughts, or the ability to think and be self-aware (which is defined by Eysenck and Keane (2010) as the internal psychological processes involved in making sense of the environment, and deciding what actions might be appropriate for the context), allows one to explore in detail the underlying mechanisms of mental processes by studying one's thoughts in action. Thus, the cognitive approach serves as an ideal theoretical framework to guide the present study. A martial artist's cognitive processes may be enhanced through the effects of mindful practices, and as such, mindfulness in terms of the present study, can be recognised as, a particular way of cognitive processing which in turn enhances a mixed martial artist's capabilities. It is important to note at this point that the study does not seek to measure all cognitive processes of a mixed martial artist, but rather, only their levels of mindfulness, and to identify whether these measures have significant correlations with their martial arts capabilities, operationalised as a high versus low win/fight ratio.

2.1.1 Cognitive Approach to Mindfulness

To approach mindfulness from a cognitive perspective, the model of mindfulness proposed by Holas and Jankowski (2012) has been used to inform the present study. Within this model, emphasis is placed on the role of cognitive processes such as awareness and meta-awareness interacting with one's executive functions and attentional processes, which then

initiate and maintain a state of mindfulness (Holas & Jankowski, 2012). This proposed model of mindfulness (Figure 2.1) furthermore identifies certain elements, which cannot be described as states of mindfulness on their own but are seen as dispositional qualities of mindfulness that are necessary to its evoking. One of these principle elements/systems has been coined the Meta-cognitive System Promoting Mindfulness (MSPM).

According to Holas and Jankowski (2012), regular mindfulness meditation practices are fundamental to the ability to evoke a state of mindfulness and furthermore contribute to the mindfulness promoting meta-cognitive knowledge contained in the MSPM. The set of knowledge and beliefs about how to manage, organise, and process the information that is a requisite for a state of mindfulness to be induced and be sustained, is said to be stored in this MSPM. Thus, the MSPM can be understood as containing the procedures governing one's cognitive processes, which include one's thoughts, attentional processes (by regulating where attention should be focused), and emotional processes (by ascertaining the relevant attitudes to one's rising thoughts and other internal events such as mental images, bodily sensations, and memories). Thus, it plays an important role in promoting and maintaining the state of mindfulness through its interactions with other essential cognitive processes involved in the proposed model.

The state of mindfulness according to Holas and Jankowski (2012), is thus achieved and maintained through the interacting cognitive processes of meta-awareness, basic awareness and tacit monitoring - the process by which undesired content of consciousness is detected - with one's executive functions and attentional processes. It is also noted by Holas and Jankowski (2012), that personality, as well as situational factors might play a role in one's ability to evoke mindfulness. For example, 'openness to experience,' one of the traits of the five-factor personality model, which suggests some people are innately more open to

experiences than others, may influence their ability to be mindful, since openness to experience is a principle component of being mindful (McCrae & Costa, 2003).

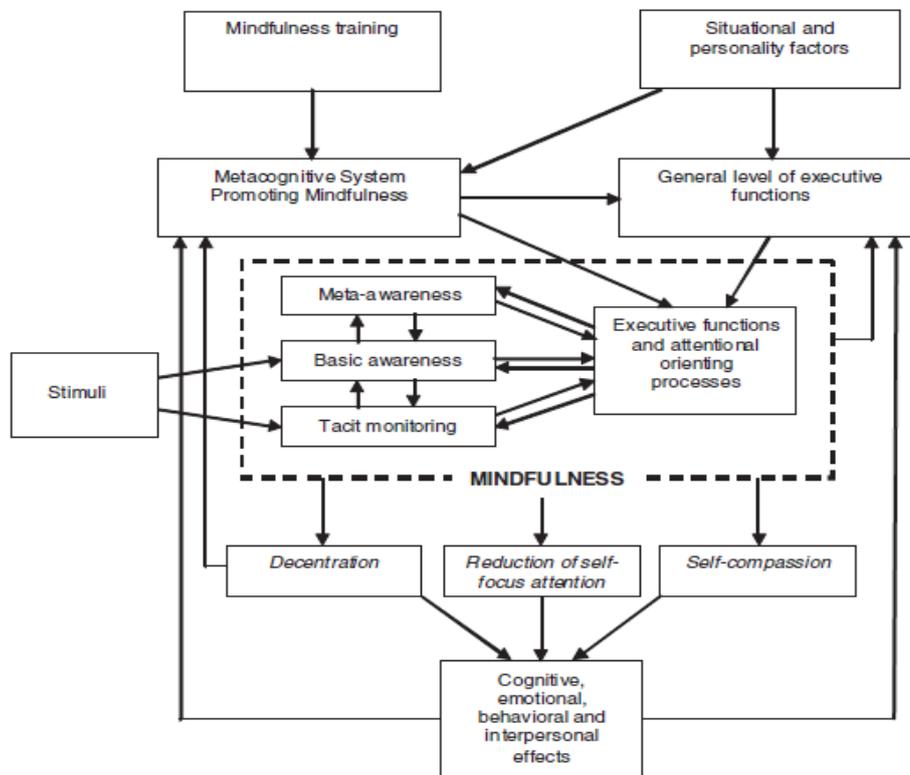


Figure 2.1. A cognitive model of mindfulness states (broken line) together with its determinants, direct, and indirect effects. (Holas & Jankowski, 2012)

The ability for one to reduce self-focused attention, increase self-compassion, and possess the enhanced ability to decenter oneself (and to understand how others see the world, as well as how their understanding differs from ours), can be achieved through the interaction of processes highlighted above. Through this model, Holas and Jankowski (2012) believe that mindfulness enables one to change one's perceptions or understanding of their internal experiences by reducing one's self-focused attention. By doing so, one can take a more compassionate stance towards oneself.

People with high levels of mindfulness are able to perceive more clearly the content of their experiences while simultaneously realising that they do not have to be immersed in the thoughts or emotions of an experience (Holas & Jankowski, 2012). One becomes a ‘witness’ of one’s internal and external events, allowing for a non-evaluative manner of observing and describing the moment-to-moment changes occurring in one’s cognitive processes (Holas & Jankowski, 2012). This non-evaluative method of cognitive processing, in turn, has the ability to enhance cognitive, emotional, and interpersonal effects, as well as physical/behavioural outcomes (Brown & Ryan, 2003; Brown et al., 2007; Gardner & Moore, 2007; Greenberg et al., 2012; Holas & Jankowski, 2012; Moore & Malinowski, 2009).

2.3 Historical Ties between Mindfulness and Martial Arts

Origins of mindfulness and ways in which one can develop the ability to evoke the benefits thereof is said to originate in the eastern spiritual traditions, especially those linked to Tao and Zen Buddhism (Kabat-Zinn, Davidson, & Houshmand, 2013). Since its origins, Taoism has centred its focus on creating a balanced relationship between the world and the people who inhabit it through the understanding of oneself in relation to the world (Didonna, 2009). This so-called system of living contemplation, and the method of achieving harmony with oneself and the world, are all terms by which the Chinese term ‘Tao’, can be understood. Directly translated, the Mandarin word ‘Tao’ can be understood as ethics/ethical, and from this perspective, Tao Buddhist traditions advocate an ethical way of life. Taoism’s most popularly-known contributions to mindfulness practice are Qì Gong (energy work exercises) and the martial art Tàì Jí Quan (Knight, 2009). Both of these are movement-based systems of meditation which promote mindfulness, among other things. Further mindfulness meditation techniques of the Buddhist tradition centre on practices grounded in an attempt to directly perceive and understand one’s bodily sensations, feelings,

emotions, and consciousness (awareness, attention and thoughts), as objectively and compassionately as possible.

According to Tao and Zen Buddhist practitioners, mindfulness can be cultivated through regular meditational practices, such as the different forms of martial practices. In turn, these practices may result in the increase of positive qualities such as equanimity, attention and awareness, compassion (directed towards the self and the world), insight, and wisdom (Kabat-Zinn et al., 2013). With this understanding in place, it is evident that the aims of mindfulness, from both the cognitive and martial arts perspectives, highlight the importance of one's mental processes (i.e. working memory, attention, perceptions), to achieve an equanimous state of mind.

Martial arts and Buddhism - and the inherent mindful teachings thereof - have been said to be inseparable and were made to meld into one another, as "if a sword fitting perfectly into its sheath" (Deshimaru, 1992, p. 4). Behind Buddhist philosophy lays the unending quest for personal development, understanding, and enlightenment. This is said to be only attainable through the mindful reflection of one's true nature of mind and actions (Deshimaru, 1992; Hyams, 1982; Mann, 2012). This quest for the understanding of the mind and body led to the development of martial practices whereby thoughts could take physical form as gestures and movements.

One of the monks credited with developing martial arts in the Buddhist temples of the time was known as Bodhidharma, the founder of Zen (Bodhidharma, 1989). The new meditative practices of martial arts training were quickly adopted by the monks. One of the main reasons for this was so they could defend themselves from hostile outsiders. Another,

possibly more important reason, was that through this intense meditation practice they could prepare themselves for the strenuous demands of their daily lives. The martial arts they practiced were a means of physical exercise while still being rooted deeply in their philosophical beliefs of peace through mindful reflection (Bodhidharma, 1989).

Although the origins of mindfulness may be philosophical, the positive effects of being mindful on one's cognition and overall psychological wellbeing cannot be overlooked (Brown & Ryan, 2003; Gardner, 2007; Moore & Malinowski, 2009). By understanding the origins of mindfulness and the ways it may be cultivated through martial arts training, one is able to further appreciate the processes behind the concept of mindfulness.

2.4. Mindfulness and the Abilities of Mixed Martial Artists

In this section, focus will be directed towards the essential cognitive processes utilised by athletes that enhance their abilities, followed by a multitude of studies that have examined the salutary effects associated with mindful practices on one's overall health. For the martial artist, both mental and physical preparation should be of importance when training for an upcoming fight. As a result, the studies below will shed light on both cognitive and physical benefits achievable through the practice and processes of mindfulness.

2.4.1 The Essential Cognitive Processes Affecting Athletic Performance

Mixed martial artists are in essence competitive athletes, and as such, the cognitive processes most influential to their success are similar to other competitive athletes participating in mainstream sports such as rugby, soccer, or basketball. According to Moran (2012), cognitive sports psychology has highlighted several cognitive processes deemed essential in enhancing the abilities of athletes that equate to increased success in their discipline. Bearing this in mind, together with the studies to be explored in the following section highlighting the

benefits of mindfulness training, it will become evident that these benefits are able to enhance the essential cognitive processes identified herein.

Through the studies conducted by Robinson-Riegler and Robinson-Riegler (2011) and Moran (2012), the essential cognitive processes identified for this study are:

- Mental/visuomotor imagery;
- Attention, awareness, and perception;
- Working memory.

Primary focus has been directed towards the above due to their fundamental importance in both the process of mindfulness and athletic performance.

2.4.1.1 Mental/visuomotor Imagery

Mental/visuomotor imagery refers to the ability to imitate actions and experiences of real world situations in an individual's mind (Moran, 2009). Within the realm of athletic performance, mental imagery is often used as a strategy for acquiring or optimising one's knowledge and abilities in the absence of sensory stimulation (Moran, 2009). Similarly, visualisation techniques have been recommended for the development of other cognitive skills such as concentration (Morris, Spittle, & Watt, 2005).

Studies that employed neuroimaging have shown that cognitively simulated and physically executed actions utilised similar neural pathways (de Lange, Roelofs, & Toni, 2008). According to Moran (2009), these simulations and actions activated many common areas in the brain such as the supplementary, pre-motor, and posterior parietal motor cortex - brain regions responsible for planning, controlling, and executing movement. Within the study, the researchers studied the duration of time between imagined and actual movements of gymnasts.

They observed that the total duration of time needed to imagine and perform a complex gymnastic movement was essentially the same.

Another study, conducted by Blaser and Hökelmann (2009), found that when one activates the process of mental imagery one can observe increased muscular and cardiovascular activity. As a result, studies have shown that athletes such as dancers, who are much like martial artists in their physical manifestations of thoughts into bodily actions, use mental imagery to memorise complex movements and strategies, construct new movements/combinations, and enhance the efficiency of existing movements and combinations (Golomer, Toussaint, Bouillette, & Keller, 2009).

Mindfulness therefore plays a role, as it enables the increased clarity of these mental images and lessens the viscosity of fixating on the processes where irrelevant or unhelpful imagery may arise (Kozhevnikov, Louchakova, Josipovic, & Motes, 2009). According to Young (2009), the mindful monitoring of mental/visuomotor images can be a productive and powerful experience when one is in training to enhance both psychological and physical abilities.

2.4.1.2 Perception, Attention, and Awareness

Perception and attention are processes that are often closely linked when the subject of athletic performance is studied (Memmert, Simons, & Grimme, 2009). It is important however, to distinguish the role that these cognitive processes play when facilitating an athletes' decision-making abilities. Visual perception or observation provides the sensory input which allows for many other cognitive processes to be primed for activation and as a result the utilisation of this information would vary accordingly within differing contexts and situations. It is worthwhile to mention at this stage that multiple studies have shown that the visual

perceptual abilities of an individual cannot account for differing levels of expertise or the rate of success of an athlete throughout the various sporting disciplines (Memmert et al., 2009).

Goldstein (2008) defines attention as “the process of concentrating on specific features of the environment or on certain thoughts or activities” (p. 100), and is considered fundamental to cognitive sports psychology by the researcher of this study. The ability to regulate one’s attention during situations where anxiety and stress are at their peak has been recognised as one of the most essential aspects of an athletes’ success (Mellalieu & Hanton, 2010). That being so, it can be said that it is attention, not fundamental visual processes such as colour perception or acuity, that plays a significant role in affecting an athletes’ overall performance.

This ability to exert mental effort effectively, enabling one to regulate one’s behaviour accordingly is recognised by the researcher of the present study as one of the most important aspects of a mixed martial artist’s cognitive arsenal, as it ties in with the fundamental effects of mindfulness. For example, if a martial artist has a momentary lapse in attention during competition they may miss the oncoming advances (i.e. punches, kicks, elbows or knees, etc.) thrown by an opponent. Being easily distracted or having the inability to be attentive to these advances may deter a martial artist from correctly adjusting their movements and strategies, negatively affecting the outcome of the competition.

2.4.1.3 Working Memory

One’s working memory is a cognitive system that is closely interrelated with attention (Jha, Krompinger, & Baime, 2007). It can be understood as the capacity to direct, maintain, and control goal-specific information without becoming absent-minded or distracted by irrelevant stimuli over short periods of time (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010). Studies exploring Working Memory Capacity (WMC) of participants have shown that individuals with less WMC appear to have increased difficulty in affect regulation (Chambers

et al., 2008). In line with this reasoning, it has also been found that these individuals are more prone to anxiety disorders, are more susceptible to post-traumatic stress disorder, and have higher incidences of substance abuse and anti-social behaviour (Jha et al., 2010).

Research suggests that WMC plays a significant role in one's ability to control and guide one's behaviour while simultaneously overcoming affective and cognitive distractions. Studies have also shown that WMC can become reduced or depleted by tasks that require high cognitive demands (Conway et al., 2005). Although WMC may become depleted while engaging in cognitively strenuous tasks, recent studies have shown that WMC can be improved through mindfulness training (Jha et al., 2010). In a study conducted by Jha et al., (2010), the researchers administered the Operations Span Task (OSPAN) to an experimental and control group in which the participants in the experimental group had undergone mindfulness training. The findings of the study showed that the participants in the control group demonstrated significant degradation of OSPAN scores over time, whereas the experimental group showed modest improvements over the same period (Jha et al., 2010). Furthermore, the study also found that an increased duration of time spent on mindfulness training was positively correlated with greater WMC.

WMC is therefore, a crucial component in directing one's thoughts, emotions, and behaviour when certain goals need to be attained. In terms of competitive athletes, specifically MMA, very few sports come close to testing their participants' cognitive capacity and physical capabilities in the way that martial combat does. The ability to maintain attention, remain undistracted by irrelevant stimuli, and to regulate correct emotions are all crucial aspects of overcoming an opponent during competition - all systems managed, if not controlled, by one's WMC. Accordingly, the ability of mindfulness training to enhance one's WMC can be recognised to be of importance for any competitive athlete wishing to enhance their cognitive

abilities. Improvements to an athlete's cognitive arsenal would likely result in improved physical manifestation of their planned actions and strategies.

2.4.2 Mindfulness Training on Cognitive Functioning (Training on Cognition)

Originating from the traditional spiritual practices of Buddhist's meditation techniques, the primary objective of being mindful was to achieve a state of 'enlightenment' that would alleviate personal suffering (Bishop, 2004; Hyams, 1982; Mann, 2012; Simon, 2012). As such, clinicians of psychology took a keen interest in the possible benefits of mindfulness practices to deal with a variety of psychological disorders such as depression, self-mutilation, and suicidal intent (Bishop, 2004).

The interest from the field of clinical psychology in applying mindfulness to treating patients in a clinical setting since the 1970s, has somewhat overshadowed the possible benefits that could be gained from using mindfulness practices in other psychological domains. It is only in the past ten years that researchers started to notice the potential applicability of mindfulness to not only alleviate suffering in clinical disorders but to increase cognitive functioning in the everyday person (Gardner & Moore, 2007; Shapiro & Carlson, 2009). Consequently, fields such as cognitive psychology and neuropsychology have taken initiative in exploring with rather great success, highlighted below, the abilities of mindfulness training to increase one's cognitive functioning (Cahn & Polich, 2006; Greenberg et al., 2012; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010).

Studies have demonstrated that extensive mindful meditation training has shown improvements in cognitive performance (Cahn & Polich, 2006; Zeidan et al., 2010). Long-term practices in mindfulness meditation have been proven to enhance attentional and visual-

spatial processes (Lutz et al., 2009; Moore & Molinowski, 2009; Short et al., 2010; Slagter, Lutz, Greischar, Nieuwenhuis, & Davidson, 2009). For example, a study conducted by Lutz et al. (2009), explored whether three months of attention-focused meditation training can enhance attentional stability, as well as reduce resource allocation or cortical engagement. The study administered the dichotic listening task, whereby different auditory stimuli are presented to each ear of the participant to which they have to selectively attend, to its participants and recorded their neural responses by use of electroencephalography (EEG). The study found that mindful meditation training was related to increases in phase consistency of theta-band oscillatory neural responses over anterior scalp regions to the presented target stimuli. Phase consistent neural oscillation is linked with cognitive functioning such as memory, motor control, information processing, and the transfer of information (Lutz et al., 2009). As a result, this increase in cortical signal stability produced a reduction in reaction variability to the relevant stimuli. This implies that exposure to mindfulness training allows increased focus and attention on target stimuli, and as a result reduces distracters and enhances target processing. The study also confirmed that mindful meditation training minimised cortical engagement, which was seen via a reduction in event-related desynchronisation (ERD) to target tones in the beta frequency band (Lutz et al., 2009). Thus, the findings of this study confirm that one's attentional processes can be enhanced through regular mindful meditation practices, especially in relation to one's auditory function.

In another study conducted by Slagter et al., (2009), the attentional blink paradigm was used to highlight the limited availability of attentional resources. According to these authors, a major weakness of the information processing capacity of the human mind concerns the inability to process two temporally close stimuli. The attentional blink deficit refers to this inability of the mind to detect a second salient target (T2) occurring in succession if it is presented between 200–500th of a millisecond after the first target (T1) (Slagter et al., 2009).

The study found that the attentional blink deficit is minimised when measures are implemented to reduce the overinvestment of attentional resources in the processing of stimuli. The findings of the study confirmed that three months of intensive mindfulness meditation training was able to reduce brain-resource allocation to T1 and had improved the detection ability of T2, without any hindrances in ability to detect T1 (Slagter et al., 2009). According to the study, this is achieved through the cultivation of a new form of awareness that is non-reactive in nature through regular mindfulness meditation. Mindfulness meditation trains its practitioners to be attentive to moment by moment experiences of feeling, sensation or thought (Bodhi, 2003). Furthermore, it teaches one to be non-judgemental and consequently less reactive to those experiences. By doing so, the practitioner who initially reacts and ‘clings on’ to an experience/stimuli, using all available resources to process information can eventually develop a mindful state of awareness that is ‘non-clinging’ and can consequently be more attentive to all content in one’s moment to moment experiences; essentially enhancing one’s mental processing capacity (Slagter et al., 2009).

In another experiment, Moore and Malinowski (2009) found that self-reported mindfulness was positively correlated with sustained attention in experienced Buddhist meditation practitioners, when compared to a control sample. Long-term meditation practice has been found to reduce attentional blink in older adults when compared to both age-matched and younger adults (Moore & Malinowski, 2009; van Leeuwen, Müller, & Melloni, 2009). Similarly, in another study employing neuro-imaging (Short et al., 2010), extensive mindful meditation training heightened activation in executive attention networks that was correlated with improvements in sustained attention and error monitoring. These findings provide growing evidence of mindfulness meditation’s promotion of one’s cognitive processing

abilities, especially facets relating to conflict monitoring and cognitive control processes (McClure, Botvinick, Yeung, Greene, & Cohen, 2007).

2.4.3 Mindfulness and Cognitive Rigidity

One's experiences are often said to blind one from their ability to see obvious solutions to an existing problem (Greenberg, Reiner, & Meiran, 2012). For example, research has shown that medical practitioners often overlook a simple diagnosis simply because it does not match with previous experience (Greenberg et al., 2012). In the same fashion, people often choose the more tedious way to solve a simple puzzle over a shorter and more convenient solution, because it is more familiar and comfortable for them. The formulation of fixed mental or behavioural sets causes one to become 'cognitively rigid'. According to Greenberg et al. (2012), mindfulness is considered to be the key in reducing cognitive rigidity.

For example, in a Stroop task experiment consisting of a sample of mindful Zen meditation practitioners, Stroop interference decreased in relation to the control group (Moore & Malinowski, 2009; Wenk-Sormaz, 2005). The task highlights one's inability to avoid reading the words, instead of the colour of the word, reflecting one's automaticity and habitual mental sets. Therefore, the decrease in Stroop interference found among the meditation practitioners' supports the notion that mindfulness improves cognitive flexibility.

In similar studies conducted by Hodgins and Adair (2010), the researchers explored how mindfulness meditation may influence the numerous aspects of one's visual attentional processing, for example change blindness, sustained in-attentional blindness, visual concentration, perspective-shifting, and selective attention. The researchers of the study used the 'flickering task', which is an experiment designed to alternate between two similar but

different versions of static visual stimuli in which respondents are asked to indicate as quickly as possible once a difference is noted. This task is used to explore one's change blindness, which is a perceptual phenomenon highlighting the inability of a person to notice major differences within an image when it is flickered on and off. Secondly, the now famous "gorilla experiment" was used to explore sustained inattention blindness (failure to detect unexpected changes in a scenario where one's attention is directed elsewhere). This experiment requires respondents to count the number of passes a team wearing white shirts makes with a basketball. However, during the passes a person dressed as a gorilla walks between the team and is rarely identified by the observing respondents (Chabris & Simons, 2010). Thirdly, perceptual attentional tasks involving an ambiguous image (Figure 2.2 below) were used to explore how quickly one had the ability to shift between perspectives. Lastly, in the same study, selective attention (the ability to limit incoming information to focus on processing specific stimuli) was explored via the Posner cueing task, which was an experiment exploring a respondents' reactions to cues containing information preceding upcoming stimuli are either corresponding to the cues or not (Posner, 1987).

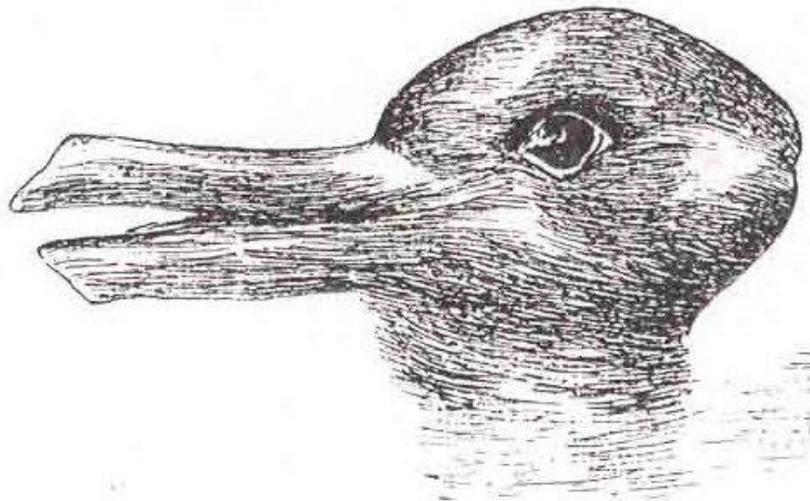


Figure 2.2. Duck or rabbit? (McManus, Freegard, Moore, & Rawles, 2010, p. 161)

The study found that persons having undergone mindful meditation practices exhibited an increased ability to identify multiple perspectives in an image and showed less interference from invalid cues in a visual selective attention task (Hodgins & Adair, 2010). Furthermore, among the meditation practitioners, the effects of change blindness was reduced and the ability to maintain longer periods of concentration was improved (Hodgins & Adair, 2010). No differences were found, however, on measures of sustained in-attentional blindness. The study once again confirms that the cognitive processes of attention and awareness are further enhanced by mindfulness meditation practices.

2.4.4 Mindfulness and Affect Regulation

The process of being mindful has been acknowledged to facilitate positive emotional regulation (Chambers et al., 2008; Lalot, Delplanque, & Sander, 2014; Short et al., 2010). In a study conducted by Chambers et al. (2008), the impact of mindfulness meditation training on one's emotional regulation and executive cognition was assessed. The study compared the results of self-reported measures of mindfulness between participants who underwent a ten-day mindfulness meditation course with a control sample. The results of the study demonstrated that the participants who had undergone the mindfulness meditation training had significantly lower self-reported depressive symptoms, reflective rumination, and negative affect in comparison to the control group (Chambers et al., 2008). Moreover, a reduction in the levels of anxiety was observed in the participants who underwent the mindfulness meditation training (Chambers et al., 2008).

Studies conducted by McCarthy (2011), have provided empirical evidence that enjoyment of sports activities and positive emotions have been positively correlated with increased sports performance (Vast, Young, & Thomas, 2010), improved reaction times and enhancements in attention. This leads to increased openness and attentional/mental flexibility,

resulting in an enhanced capacity to integrate and process relevant stimuli (Carver, 2003). Furthermore, optimism and hope were identified to be likely factors limiting burnout in athletes (Gustafsson, Hassmén, & Podlog, 2010).

As a result, mindfulness meditation training enabled one to be aware of their physiological (bodily) sensations and concomitantly this physiological arousal enabled them to recognise their affective/emotional states within the intensity of their daily lives. According to Chambers et al. (2008), being able to remain equanimously aware of such arousal prevents any reaction to unpleasant or unhelpful moods, which in turn facilitates problem-solving.

2.5. Mindfulness and Physiological Functioning

Within the philosophy of the practicing martial artist, one should acknowledge that the mind and the body are one and the same (Lee, 2011). By following this line of reasoning, it is assumed that by looking after the mind, it will naturally strive to look after the body, and vice versa (Lee, 2011). Competitive martial arts, as with most sports, is a physical pursuit striving for optimal performance. The studies explored in the section below will highlight the possible positive effects of mindfulness on one's physical wellbeing. As such, preparations for competing martial artists who are mindful of their emotions and actions, will likely serve well in enhancing their chances of success during competition.

2.5.1 Mindfulness and Physiology

In a study conducted by Davidson et al (2003), mindfulness meditation was found to not only improve the parts of the brain associated with positive cognition and emotions but also subsequently, bodily and immune functions. According to the study, activation in several left-sided anterior regions of the brain can be seen when certain forms of positive emotions are displayed, as well as in people who have a higher dispositional positive effect (Davidson et al.,

2003). Increasing one's positive emotions and decreasing negative emotions (such as anxiety, fear, stress, etc.) have proven significant in terms of what mindfulness meditation produces. Thus, according to the study, it has been successfully demonstrated that participants that took part in a short mindfulness meditation program showed increases in left-sided brain activation compared to those in the control group (Davidson et al., 2003). The relevance of this increased positive emotion and left-sided brain activity is its correlation with enhanced bodily and immune functions, of which the study demonstrated that the participants who took part in the mindfulness meditation program showed more significant increases in antibodies to viruses such as influenza than those in the control group (Davidson et al., 2003).

In a separate study, Grossman, Niemann, Schmidt and Walach (2004) undertook a meta-analysis of studies that used Mindfulness-Based Stress Reduction (MBSR) as a group-intervention programme to explore the success of mindfulness in alleviating suffering associated with physical, psychosomatic, and psychiatric disorders. The 20 studies identified consisted of persons with a broad category of medical illnesses that included depression, chronic pain, mixed cancer diagnoses, coronary artery diseases, anxiety, obesity, binge eating disorder, fibromyalgia, and other psychiatric disorders. The study reported that mindfulness meditation -more precisely MBSR - may have significant positive enhancements on a wide category of illnesses, both physical and psychological (Grossman et al., 2004). Enhancements in overall physical wellbeing, such as sensory pain, physical impairment, and quality of life estimates are reported outcomes of heightened mindfulness from MBSR interventions.

The results of the studies above show that not only does mindfulness meditation have a significant role to play in helping one regulate positive thoughts and emotions, as well as the correct emotions necessary for a martial artist to prepare for competition, but furthermore illustrates how it may enhance one's body and immune system through psychosomatic functioning. Even though the primary aim of this study focuses on the psychological aspect of

how mindfulness can further enhance a martial artist's ability, the physical benefits that occur should be recognised as well.

2.5.2 Mindfulness and Arousal Regulation

Behind the psychology of performance lies the notion that certain levels of optimal arousal are necessary for peak performance to be reached (Birrer & Morgan, 2010). Arousal, according to Birrir and Morgan (2010), can be operationalised as the somatic and cognitive reaction to both external and/or internal stimuli. As a result, one's state of arousal can be affected by the controllability of a situation, the variables at play within a specific context, and the variations in one's affective and cognitive experiences (Birrer & Morgan, 2010; Seiler, 1992). Fear and anxiety associated with failure play a significant role in these situations of performance (Tenenbaum & Eklund, 2007). The fear of failure may have significant effects on both physical and psychological performance. According to Birrer and Morgan (2010), this fear may minimise an athletes' motivation to compete and train, affect an athletes' emotional states, self-confidence levels, attentional and volitional skills, as well as inducing experiences of anxiety, thereby increasing muscle tension which could lead to loss of bodily control.

In sports, there are numerous techniques and strategies that athletes or 'performers' could utilise to control their states of arousal. An example of these practices that are intended to regulate the correct amount of arousal are: mental visualisations, positive self-talk, physical activity, breathing exercises to induce relaxation, warm-up routines, stress management, and mood enhancement practices (Birrer & Morgan, 2010). Studies of these types of practices and techniques have proven their ability to reduce anxiety and similar symptoms caused by the human fear response. However, according to Gardner and Moore (2007), none of those studies have shown a link between the 'warm-up' practices and an ability to enhance one's performance. A possible reason for this, as suggested by Birrim and Morgan (2010), is that

researchers are still unable to distinguish at which points the affective sensations of fear and anxiety produce levels of arousal that facilitate optimal performance, or conversely under which type of circumstances do the similar sensations result in the opposite, and cause the athlete or performer to be unable to perform.

In order for optimal performance to be achieved, researchers emphasise that athletes/performers need to know and understand what their performance facilitating state of arousal is, both prior and during competition. Furthermore, the athletes/performers need to be aware of their states of arousal to enable them to direct it in a manner resulting in the performance facilitating state (Birrer & Morgan, 2010; Gardner & Moore, 2007). The importance of the ideations for optimal performance mentioned above is that they both accentuate the importance of self-awareness and attention, which is where mindfulness plays a significant role. According to research conducted by Thomas, Maynard and Hanton (2007), one major obstacle that athletes encounter is their lack of control over their own cognitive processes. In the past, athletes and performers would be recommended to undergo cognitive behavioural treatments of sorts, however in more recent times, studies have found that mindfulness-based interventions, such as the mindfulness-acceptance-commitment approach (Gardner & Moore, 2007) have proven to be more effective and beneficial in both the short and long run (Birrer & Morgan, 2010). The ability of mindfulness practice to produce non-judging awareness and acceptance of one's psychological, physical, and environmental situation, which includes both internal and external process, have been found to facilitate and enhance performance (Chambers et al., 2008; Chiesa, Calati, & Serretti, 2011; Gardner & Moore, 2007; Greenberg et al., 2012; Kang, Gruber, & Gray, 2013; Kozhevnikov et al., 2009; Zeidan et al., 2010). Studies have confirmed that mindfulness therapies and approaches have been effective in enhancing the performance of athletes' who compete in high-intensity sports. As a result,

considering martial arts as one of the highest forms of high-intensity competition, mindfulness would be a pivotal, if not fundamental process in enhancing a fighter's abilities.

2.5.3 Mindfulness and the Regulation of Pain

Research regarding the control of the pain sensation through cognitive training has been in existence since the 1970s (Zeidan, Grant, Brown, McHaffie, & Coghill, 2012). The sensation of pain can be understood as the “unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such tissue damage” (International association for the study of pain, 2009). Bearing this definition in mind, the perception of the amount of effort to be exerted could be considered a painful experience. A study conducted by Noakes (2008), found that the perception of effort in physical activities may be used to predict outcomes of physical performance in sport. This perception of effort in reaction to how one sees hindering physical pain during sports performance has been seen by researchers as one of the ways mindfulness can intervene and enhance the abilities of athletes (Kaufman, Glass, & Pineau, 2012).

Pain, perceived or actual, which is likely to arise from intense physical activities such as combat sports, may be interpreted by the mind as a threat to one's wellbeing, and consequently activate the fight or flight response, increasing arousal and anxiety (Flor, 2011). This increased arousal and anxiety may in turn result in even more sensations of pain as the body stiffens and reduces movement further due to perceptions of increasing effort. This type of negative response can affect the decision-making abilities of an athlete during intense competitive situations.

Studies have shown that mindfulness is one of the most effective ways for one to alter one's cognitive responses to pain (Zeidan et al., 2012). Grant and Rainville (2009) conducted an experiment in which they compared the pain tolerance levels of long-term mindful

meditation practitioners with a control group. A verbal Numerical Rating Scale (NRS) and an electronic Visual Analogue Scale (VAS) measured respondent's level of pain induced by relevant painful stimuli during the study. They found that the pain threshold of the meditation group was significantly higher than that of the non-meditators. In a similar experiment, participants were asked to focus their attention on their sensation of pain to increased temperatures. The result of the experiment showed that the non-meditating control group reported that their pain levels had escalated as a result of an increase in awareness; in comparison, the pain experienced by the meditating group remained constant (Grant & Rainville, 2009).

2.5.4 Effect of Age and Gender on Mindfulness

Even though there has been an increasing interest in investigating the underlying mechanisms of mindfulness (Brown & Ryan, 2003), there have been no previous studies exploring its relationship with age (Baer et al., 2008). Shapiro and Carlson (2009), have, however, from a theoretical perspective attempted to explain that attaining mindfulness involves a shift in perspective on experience, and this should be regarded as the natural continuation of one's developmental process. Throughout development, a person evolves from a highly 'self-centered' perspective in childhood to an increasingly 'decentered' perspective in old age. The fundamentals of mindfulness capture this 'decentering', as it represents the capacity to separate oneself from one's internal and external experiences (Shapiro, Carlson, Astin, & Freedman, 2006). For this reason, it is theorised that as age increases, one's levels of mindfulness should also increase.

Concerning gender, there too has been very little research undertaken regarding its relationship with mindfulness. According to Lalot et al. (2014), being mindful and being anxious are considered to be on opposite sides of the same spectrum. On this account, it has

been theorised that women are likely to be less mindful than their male counterparts as females are more likely to develop mood and anxiety disorders (Lalot et al., 2014). However, according to a study conducted by Baer et al. (2008), by comparing the scores of mindfulness collected via the FFMQ, there has been no evidence that suggests a difference in the levels of mindfulness exists between males and female participants.

2.6. Summary

The above-mentioned origins of mindfulness and the studies that have highlighted the benefits thereof to one's cognition serve as an important foundation supporting the need for further research to be conducted on this under-researched domain. The studies highlighted above have supported how mindfulness meditation practice has the ability to enhance one's cognitive processes (especially mental/visuomotor imagery, perception/attention/awareness, and working memory), and physical wellbeing (Chambers et al., 2008; Davidson et al., 2003; Greenberg et al., 2012; Lutz et al., 2009; Slagter et al., 2009). The study conducted by Lutz et al. (2009) highlighted that the ability to be non-judgmental and non-reactive towards both external and internal stimuli is key to enhancing one's ability to be increasingly aware and attentive towards relevant stimuli.. Furthermore, as a result of one's increased ability to observe without judgment and reactivity, their ability to process stimuli, act accordingly with awareness and describe their experiences also become enhanced. Thus, the ability to observe, be non-judgmental, non-reactive, and to act and describe with increased attention and awareness become important mechanisms underlying the process of mindfulness. Based on the findings highlighted above, the primary aim of the current study seeks to explore whether the overall salutary effects of mindfulness may enhance the abilities of mixed martial artists. The

following chapter will highlight the research methodology employed in the present study to address the aforementioned objective.

Chapter 3: Research Methodology

3.1. Introduction

This chapter will provide insight into the processes undertaken to conduct the present research study. Understanding of the research design, sampling procedures, choice of measuring instruments, ethical considerations, the research hypothesis, and the methods of data analysis will be discussed.

3.2. Research Design

The study employed a quantitative research design by utilising a correlational research strategy. The goal of correlational research is to examine and describe the associations and relationships between variables (Gravetter & Forzano, 2011). Specifically, the purpose of a correlational study is to demonstrate that a relationship is present between two or more variables and to explain the nature of this relationship (Gravetter & Forzano, 2011). This approach was identified as most fitting for this study as the mechanisms underlying the construct of mindfulness are still yet to be clearly identified (Baer et al., 2008; Shapiro et al., 2006). The results of this study will seek to further contribute to the formalisation of the understanding of the mindfulness construct through the exploration of its underlying facets.

Within the study, MMA fighters' scores of mindfulness, which comprise of five facets: observe, describe, acting with awareness, non-judgment of experiences and non-reactivity to experiences, will be correlated with their fight records (win/fight ratio) while taking into consideration the possible influence of extraneous variables, such as one's total number of fights, duration of training, ethnicity, age and gender. The mindfulness scores of the martial artists will be measured by the Five Factors Mindfulness questionnaire (FFMQ) created by

Baer, Smith, Hopkins, Krietemeyer, and Toney (2006). The researcher of this study hypothesised that high scores in overall mindfulness (independent variable) will be positively correlated with a high win to overall fight ratio (dependent variable).

3.3. Sampling

Participants for the study were selected using non-probability convenience sampling. This sampling method obtains its sample by selecting individual participants on the basis of their willingness to respond and ease of access (Gravetter & Forzano, 2011). The sample of mixed martial artists who participated in this study varies indiscriminately between age, gender, and ethnicity. Participants for the study were recruited from various MMA gyms situated in Gauteng, South Africa. This was the most convenient and effective method for acquiring participants as the researcher is a member of one of these training institutions and has access to its members.

The selection of participants started with an initial screening that ensured the mixed martial artists had met the sole prerequisite of having participated in a competitive fight. This data was obtained from the gyms official records with the authorisation of the members. Once that was completed, the researcher then made contact with each participant and made verbal arrangements for their participation in the study.

3.4. Data Collection

The procedure for data collection involved the researcher gathering the data of the participants individually. By appointing a time and place to meet that was convenient for each individual, the likelihood of participation was increased. Furthermore, by using this process, the researcher could ensure all communication and instructions to the participants would be clear and concise. The same routine was followed throughout each individual meeting. This

routine was important so that any and all possible miscommunication or introduction of confounding variables could be minimised.

Data was collected via a general demographics questionnaire to identify their basic demographic information, such as age, gender, ethnicity, level of education, and occupation (please see Appendix A). To measure the mindfulness scores of the participants, the researcher utilised the Five Facet Mindfulness Questionnaire (Baer et al., 2006) (please see Appendix B).

3.5. Instrumentation

Presently, the two primary ways in which mindfulness can be measured is either through neuro-imaging or self-reported measures (Baer et al., 2006). Neuro-imaging was deemed unviable for the current study due to the inaccessibility of necessary equipment, as well as costs involved and overall time constraints. The advantages of self-report questionnaires, such as easy interpretability, practicality, participants willingness to report, and richness of information acquirable become the primary reason for choice of this measurement instrumentation (Robins, 2007).

Self-report measures of mindfulness could still be viewed as being in its developmental stages, as the first of its kind only appeared in 2001 (Neuser, 2010). A few years later, with the increase in interest and research directed towards mindfulness, many researchers have developed psychometric tests that measure one's levels of mindfulness. The construct of mindfulness, however, still lacks a unified operational definition in the psychological domain (Baer et al., 2008; Bishop et al., 2004) As a result, creating an instrument to measure this construct adequately has yet to be achieved (Baer et al., 2006; Bishop et al., 2004; Neuser, 2010).

Currently, there are eight predominant self-report measures of mindfulness that are widely accepted and used in mainstream psychology. To decide which of these measures were best suited for the current research study, a short discussion on each of these instruments will be provided. By doing so, the reader of this study can better follow the researcher's logic as to how the decision was made regarding the choice of instrumentation.

3.5.1 Freiburg Mindfulness Inventory (FMI)

The original FMI was developed in Germany in 2001 and was later translated into English in 2006 (Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006). The FMI was created to be a self-report measure of mindfulness in quantitative terms so it could be used in research studies to measure mindfulness levels before and after mindfulness meditation had taken place. This means that the FMI proposes that mindfulness is a cognitive state that can be developed or improved with time. The FMI is a 30-item instrument and consists of a four-factor structure that includes: an accepting attitude towards experience, mindful awareness, process orientated understanding towards experience, and present moment focus without being lost in thoughts. A study on the FMI sampled 115 individuals measuring their pre and post levels of mindfulness after attending a mindfulness retreat. The results of the study indicated that the FMI measured mindfulness reliably as it produced measures of internal consistency of Cronbach alpha =0.93/0.94 (Walach et al., 2006). The developers of the instrument, however, questioned the one-dimensionality of the instruments measure of mindfulness and thus believed that it should only be used on experienced meditators to ensure misinterpretation of the results would not occur.

3.5.2 Mindfulness Attention Awareness Scale (MAAS)

Brown and Ryan (2003), developed the MAAS (a 15-item instrument) based on individual differences in trait or state mindfulness. Trait can be explained as psychological

processes that are stable, long-lasting, and internally caused, whereas state is temporary, brief, and caused by external conditions (Chaplin, John, & Goldberg, 1988). The researchers conceptualised mindfulness as the open recognition of external and internal stimuli rather than as a particular type of cognitive approach. The focus of this instrument is on absence or presence of attention and awareness towards what is occurring within the present moment (Brown et al., 2007). A study conducted on the psychometric properties of the instrument based on a sample of university students (n=711) confirmed its single factor structure and produced good measures of internal reliability (Cronbach alpha=0.89), however no differences could be found when comparing the scores of experienced meditators with non-meditators' (MacKillop & Anderson, 2007). This lack of ability to distinguish between the two groups, according to the researchers, was attributed to the non-meditators' lack of experience towards meditation and mindfulness (Neuser, 2010). As a result, this instrument did not fit the criteria for the study at hand.

3.5.3. Kentucky Inventory of Mindfulness (KIMS)

The KIMS consists of 39 items that were developed to fit into four distinct factors of mindfulness based on Linehan's dialectical behavioural therapy (Baer, 2004). The four facets include: observing, acting with awareness, accepting without judgment, and describing (Baer, 2004). A study on a sample of English and German clinical patients (combined n=234) diagnosed with Axis 1 disorders (i.e. major depression, post-traumatic stress disorder, bipolar disorder, etc.) showed that the instrument had internal consistency measures on all four facets producing Cronbach alpha scores ranging from 0.78 to 0.89. The construct validity of a few of the facets on the instrument, however, produced incongruent results. According to Baer et al. (2004), this was due to the multifaceted nature of the items representing mindfulness.

Even though the KIMS showed promising results in measuring mindfulness across cultures and varying populations (i.e. university sample, clinical sample, etc.), an adapted version of the KIMS which later became the FFMQ (to be discussed below), was deemed suitable for this study.

3.5.4 Cognitive and Affective Mindfulness Scale Revised (CAMS-R)

The CAMS-R is a revised version of the CAMS whereby individual differences in mindfulness are measured. The original CAMS consisted of 18 items, however, upon further study of the instrument, despite showing adequate concurrent validity, a lack of internal consistency was found (Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). Consequently, in an attempt to improve the psychometric properties of the instrument, factor analysis was conducted, the results of which led to a decision to develop new items and reduce the total number of items to twelve. In terms of the CAMS-R, a study that sampled 298 participants produced adequate internal consistency of the four factors of mindfulness (Cronbach alpha =0.77). This instrument, however, lacks the ability to detect adequate changes in an individual's mindfulness levels, and as such was not chosen for the present study as it may affect the plans to pursue future research in this line of study (Feldman et al., 2007).

3.5.5. Toronto Mindfulness Scale (TMS)

The TMS is a measure of mindfulness based on two factors, namely curiosity and decentering. The instrument was developed by Lau et al. in 2006) and was based on the definition of mindfulness operationalised by Bishop et al. (2004). While many researchers view mindfulness as a trait-like quality, according to Bishop et al. (2004), mindfulness is a state-like condition that is only created when attention towards an experience is cultivated on purpose with an open and non-judging view/perception of that particular experience. As Lau et al., (2006) indicate, the TMS was based on the two-component definition of mindfulness:

The intentional self-regulation of attention to facilitate greater awareness of bodily sensations, thoughts, and emotions; and (b) a specific quality of attention characterized by endeavouring to connect with each object in one's awareness (e.g., each bodily sensation, thought, or emotion) with curiosity, acceptance, and openness to experience. (p. 1447)

The measure consists of 13 items that assess mindfulness as a state-like construct whereby participants are asked to describe or reflect on their experiences by rating how each of the statements describe the meditation sessions they have partaken in (Lau et al., 2006). In the study conducted by Lau et al., (2006), the researchers sampled 390 participants of which 176 were men, and 176 were women with a mean age of 40.8 years. The study indicated that the TMS produced good internal consistency with a Cronbach alpha score of 0.95. Although the TMS showed promise in measuring mindfulness, the limited focus of its scope to the two identified facets of mindfulness was deemed insufficient in meeting the demands of the present study.

3.5.6 Southampton Mindfulness Scale (SMQ)

The SMQ was developed to assess participants' mindful responses to distressing images and thoughts (Chadwick et al., 2008). The instrument features 16 items of which respondents indicate on a 7-point Likert scale (where 'strongly disagree'=0 to 'strongly agree'=7), to measure four factors of mindfulness, namely: letting go of cognition, decentered awareness, allowing attention to remain with unfavourable thoughts and cognitions, and acceptance of distressing imagery and thoughts. In the study conducted by Chadwick et al. (2008), the researchers sampled 256 participants that were made up of both clinical and non-clinical participants. The study found that the SMQ produced good internal consistency with a Cronbach alpha score of 0.89 (Chadwick et al., 2008). The instrument also displayed

concurrent validity when mindfulness scores were compared to the MAAS, however, the nature of the questions that focus on negative images and thoughts of participants was deemed unfitting for the current study.

3.5.7 Philadelphia Mindfulness Questionnaire (PHLMS)

The PHLMS created by Cardaciotto, Herbert, Forman, Moitra, and Farrow (2008), is a measure of mindfulness consisting of 20 items whereby respondents indicate on a five-point Likert-type scale (1=very poor, 2=poor, 3=fair, 4=good, and 5=very good). The self-report measure was created to assess two factors of mindfulness: acceptance and present-moment awareness (Cardaciotto et al., 2008). Internal consistency of the instrument was verified based on both a clinical sample of participants as well as an undergraduate student sample. The awareness sub-scale produced a Cronbach alpha score of 0.85 and the acceptance sub-scale produced a Cronbach alpha score of 0.87 (Cardaciotto et al., 2008). According to the developers, the scores obtained from these two samples differed significantly, and as a result, further research should be conducted on the clinical population, as well as a population with experience in meditation (Cardaciotto et al., 2008). In this way, insight into the discrepancies may be identified and necessary revision can be done. In terms of the current study, even though the PHLMS showed promise in measuring its two identified constructs, it does not provide enough scope to cover the other identified facets of mindfulness mentioned above (i.e. observe, describe, non-judgment, etc.), hence its exclusion.

3.5.8 Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ developed by Baer et al. (2006), yields five factors, through factor analysis, that represent mindfulness. The FFMQ contains items that are rated on a five-point Likert-type scale ranging from 1 (never or very rarely true) to 5 (very often or always true). The researcher of the present study found that the factors identified within this instrument were the best

representation of the model of mindfulness proposed by Holas and Jankowski (2012) mentioned above.

The notion of self-focused attention referred to by Holas and Jankowski (2012) conceptually matches the construct proposed by Baer et al (2006) of observing. This is the first identified facet of mindfulness and refers to the ability to perceive and be attentive to one's internal/external state or situation (Baer et al., 2006; Chiesa, Calati, & Serretti, 2011; Holas & Jankowski, 2012; Lutz et al., 2009).

The second facet identified by Baer et al (2006) is describing. According to the developers of the instrument, by describing, one is able to acknowledge and comprehend one's situation in further depth. This facet is likely to be consistent with the ability to be a 'witness' to one's internal and external events, that allowing for a non-judgmental ability to observe, describe and thus accept one's internal and external state or situation (Baer et al., 2006; Holas & Jankowski, 2012; Kee & Wang, 2008; Lutz et al., 2009).

The third facet identified by Baer et al (2006) is acting with awareness. This is defined as the ability to monitor and control one's actions as a result of the interaction between facet one (observing), facet two (describing), and facet four and five (non-judging of inner experiences and non-reactivity to inner experience), thereby allowing for the ability to act with awareness (Isenberg, 2009; Holas & Jankowski, 2012; Lutz et al., 2009; Shapiro & Carlson, 2009).

The fourth and fifth facets identified by Baer et al (2006) refer to the non-judging of inner experiences and non-reactivity to these experiences. These two facets are likely to be consistent with what Holas and Jankowski (2012) refer to the ability to be non-judgmental and

clearly see the contents of one's experiences, while simultaneously realising that one does not need to be immersed in them (Baer et al., 2006; Brown et al., 2007; Holas & Jankowski, 2012; Lutz et al., 2009; Moore & Malinowski, 2009). As a result of the associations that can be drawn between the concepts and factors of mindfulness proposed by Baer et al. (2006) and Holas and Jankowski (2012), the FFMQ was found to be the most suitable measure of mindfulness for the present study.

3.6. Validity and Reliability of the Five Facet Mindfulness Questionnaire

Within the scientific realm of psychology, any construct that is believed to exist and aid in the improvement of one's mental health needs to be scrutinised and evaluated. Mindfulness, and the related instruments (such as the FFMQ) that have been developed to measure this construct, need to indicate strong validity so that researchers can be certain that they are indeed exploring and measuring what they set out to explore and measure. In doing so, researchers can be certain that their findings are not attributed to chance or other confounding variables.

With regards to the reliability and validity of the FFMQ, studies conducted by Baer et al. (2008), Heeren, (2011), as well as Neuser (2010), have found that the FFMQ is reliable and not only has strong construct validity but good intercultural validity as well.

Cronbach alpha scores are used to identify the reliability – specifically the internal consistency – of the items on an instrument. A Cronbach alpha value of 0.7 or above indicates that the scale is reliable, however, values of 0.8 and above are preferable (Pallant, 2011, p. 97). Baer et al. (2006) reported alpha coefficients for each facet of mindfulness as follows: observe = 0.83, describe = 0.91, act with awareness = 0.87, non-judge = 0.87, and non-react = 0.75. As

such, all five facets of mindfulness contained in the FFMQ demonstrate good internal consistency with the exception of the non-react facet, which is adequate.

Furthermore, Baer et al., (2008) conducted a study investigating several aspects of the construct validity of the FFMQ between non-meditators and an experienced meditating comparison group. The researchers of the study examined the relationship between FFMQ scores, meditation experience, and psychological adjustment between the two groups. They tested the hypothesis that mindfulness facet scores would be positively correlated with meditation experience and meditators would score higher than non-meditators (Baer et al., 2008). The findings of the study confirmed their hypothesis and displayed significant differences in increased mindfulness scores over all facets, for meditators compared to their non-meditating counterparts. The study also confirmed the internal consistency of the FFMQ, as alpha coefficients for all mindfulness facets in their sample were adequate (ranging from 0.72 to 0.92) (Baer et al., 2008).

In a similar study conducted by Neuser (2010), confirmatory factor analysis validated the five-factor structure of the FFMQ, which was supported by a goodness of fit analysis of appropriate indices. Furthermore, the study found that higher levels of mindfulness were positively correlated with increased emotional intelligence, increased satisfaction with life scores, and minimal depressive symptoms (Neuser, 2010). These results provide further support to the construct validity of the FFMQ.

Confirmation of the cross-cultural validity of the FFMQ has also been demonstrated by a study conducted by Heeren (2011) who translated the FFMQ to French. The aim of their study was to explore the structural validity of the French version of the FFMQ and to test its psychometric properties. Two hundred and fourteen participants were tested using this French version of the FFMQ and through confirmatory factor analysis, the findings showed that the

translated FFMQ does indeed have good psychometric properties similar to that of the original FFMQ¹. Moreover, Cronbach alpha scores indicated good scale reliability with scores of 0.75 or higher. Furthermore, the FFMQ has recently been used effectively in the South African context whereby a research study was conducted correlating mindfulness and academic performance (Teodorczuk, 2013).

The studies mentioned above provide support that the FFMQ is the best choice of instrumentation to be utilised in the current study. The FFMQ has been referred to by researchers as being the most reliable and internally consistent measure of mindfulness (Heeren, 2011). This was found to be true even when translated into a foreign language and administered on a sample that differs to that for which it was originally designed.

In summation, the eight different instruments that seek to measure mindfulness mentioned above have all displayed varying understandings as to how mindfulness as a construct should be represented and measured. As such, there are seemingly inherent advantages and disadvantages to each instrument as explained above. Some instruments identify more facets of the mindfulness construct than others, and based on the necessities of the present study, the final instrument identified (the FFMQ) ultimately provided the best fit to the theoretical underpinnings of this study. Ergo, it was chosen to be utilised to measure the levels of mindfulness of the participants.

¹ Heeren, C. D. (2011). Cross-cultural validity of the Five Facets Mindfulness Questionnaire: Adaptation and validation in a French-speaking sample. *Revue Européenne de Psychologie Appliquée*, 61, 147–151.

3.7. Measure of Mixed Martial Arts Ability

For the present study, a mixed martial artist's ability was operationalised by their fight versus win ratio (fight ratio = total number of competitive fights participated in, divided by total number of competitive fights won). This information, which was stored on record at the various gyms of the participating fighters, was accessed by the researcher with prior consent from each individual participant.

3.8. Research Hypothesis

The primary objective of the present study was to determine the relationship between mindfulness (independent variable) and MMA ability (dependent variable). A secondary objective was to explore whether levels of mindfulness would be a good predictor of MMA ability and at the same time, investigating which of the facets of mindfulness identified would contribute to the predictability of MMA ability. Based on these objectives, the following hypotheses were created (with the level of significance set at $p \leq 0.05$):

- (a) There exists a positive relationship between mindfulness and MMA ability;
- (b) the facets of mindfulness can predict MMA ability.

For the purpose of statistical analysis, the null-and alternative hypotheses can be indicated as follows:

Null Hypothesis 1

H_{01} : There is no relationship between mindfulness and MMA ability.

Alternate Hypothesis 1

H_{A1} : There is a positive relationship between mindfulness and MMA ability.

Null Hypothesis 2

H₀₂: The five facets of mindfulness will not be an adequate predictor of MMA ability.

Alternate Hypothesis 2

H_{A2}: The five facets of mindfulness will be an adequate predictor of MMA ability.

3.9. Statistical Analysis Procedure

IBM's Statistical Package for the Social Sciences version 23 (SPSS) was utilised to analyse the data by obtaining descriptive information (i.e. measures of central tendency, standard deviations, sample size etc.) and conducting a correlational analysis. Correlational analysis is used to describe the strength and direction of a linear relationship between two variables and is achieved by calculating the Pearson's correlation coefficient (r) or Spearman's rank order correlation (ρ) (Pallant, 2011). The difference between the Pearson and Spearman correlation is that Pearson's correlation is appropriate for measurements received from an interval scale, while the Spearman is more suitable for measurements received from ordinal scales. Correlation is well suited to analyse the hypothesised relationship between the mindfulness facets, win/loss ratio and duration of MMA training, in addition to a martial artists' age. SPSS calculates two types of correlation. Firstly, it provides a bivariate correlation, which is a correlation between two variables. Secondly, it allows one to explore the relationship between two variables while controlling for a third variable, called a partial correlation (Pallant, 2011). This is useful when trying to analyse the possible interrelatedness between the variables of the study.

Lastly, standard multiple regression was conducted as it allows for a more sophisticated exploration of the interrelationship among variables (Pallant, 2011). This method of analysis allows one to assess how well a set of predictor variables predict or explain a continuous dependent variable. It gives one an indication of the degree to which variance within the dependent variable can be explained by the independent/predictor variables. It provides an

indication of the relative contribution of each independent/predictor variable or the interaction among one's predictor variables. Furthermore, it enables one to establish the statistical significance of the analysis, in respect to the model itself and the separate independent variables (Pallant, 2011).

3.10. Ethical Considerations

Participation in this research project was voluntary and thus no members of the various gyms were forced to partake. Furthermore, no incentives were offered to would-be participants. All person(s) were free to leave the study whenever they chose to, without consequence. All participants had to sign an informed consent form that states their agreement to participate in the research project and provides a declaration that they understood, to the full extent, their involvement in the study.

Confidentiality of the participants is of utmost importance and is protected through the use of either codenames or participant numbers. This issue was affirmed by informing participants that they were not required to disclose any information that would make them feel uncomfortable and that they may withhold personal information as they deemed necessary. The researcher had then taken all the necessary precautions in protecting the privacy and confidentiality of the information given by the participants, as prescribed by the American Psychological Association (APA) code of ethics (2010). Furthermore, confidential information was only discussed if it was deemed necessary for scientific or professional purposes. The study was furthermore approved by the University of Pretoria's ethics committee.

The obtained data was stored in a secure computer operated only by the researcher, increasing the privacy of the participants. Once the study is concluded and the various findings are available, the researcher will hold a debriefing session with all participants to inform them of the research findings.

3.11. Summary

This chapter highlighted the research methodology employed within the present research study. The research design, aims, procedures, instrumentations, research hypothesis, as well as data analysis procedures were discussed to facilitate a thorough understanding of how the study was conducted. In the following chapter, the results of the data analysis will be presented.

Chapter 4: Results

4.1. Introduction

In this chapter, the results of the analysed data will be presented. Firstly, descriptive statistics highlighting the demographics of the sample will be presented. Secondly, the description of the test results of the analysed data will be provided (frequencies, means, standard deviations, etc.) Thirdly, psychometric properties of the instrument used to measure the levels of mindfulness will be presented and discussed. Finally, the relationships between identified variables, such as a fighter's win/fight ratio, their duration of training, the total number of fights participated in, and so forth, will be explored with overall, as well as the individual facets of mindfulness. A brief summary surrounding analyses that yielded insignificant results will also be discussed.

4.2. Description of Sample

The sample consisted of 46 participants of which five were female and forty-one were male (See Table 5.1 below). The small number of female participants is seemingly reflective of the gender distribution found in competitive MMA within the South Africa context. According to Vertonghen and Theeboom (2010), the aggressive nature of competitive MMA seems to affect the inclination of female participants. Even though practices of martial art do not discriminate between genders, the participants selected for this study had to have competitive martial arts experience, which meant they had to have fought competitively previously. As a result, this decreased the availability of female mixed martial artists that fit the criteria of the research sample.

Table 5.1: Gender of Participants

		Frequency	Percent	Cumulative Percent
Valid	Male	41	89.1	89.1
	Female	5	10.9	100.0
Total		46	100.0	

Self-reported ethnicity (Table 5.2 below) reflected a multiracial sample where the majority of participants were white (n=38) and the rest were Asian (n=4), African (n=2), and coloured (n=2).

Table 5.2: Ethnicity of Participants

		Frequency	Percent	Cumulative Percent
Valid	Asian	6	13.0	13.0
	African	2	4.3	17.4
White		38	82.6	100.0
Total		46	100.0	

As is evident in Table 5.3 below, the majority of the respondents were native English speakers (n=25), followed by Afrikaans (n = 15), Korean (n=3) and Russian, Portuguese and Xhosa with one respondent respectively. Due to the diverse cultural and ethnic variation found within South Africa, the home languages of the respondents may be of importance as the study was conducted in English only. Having more than half of the research sample being native English speakers and the remaining respondents all having a firm grasp of the English language furthermore minimises the threats to validity that the language barrier may bring.

Table 5.3: Home Language of Participants

	Frequency	Percent	Cumulative Percent
Valid Afrikaans	15	32.6	32.6
English	25	54.3	87.0
Korean	3	6.5	93.5
Portuguese	1	2.2	95.7
Russian	1	2.2	97.8
Xhosa	1	2.2	100.0
Total	46	100.0	

Table 5.4 below identifies the educational background of the respondents illustrating that the majority of the sample have attended/completed tertiary education (n=30). Eleven respondents indicated that they had attended high school only. Three respondents indicated they had only attended ‘some’ high school, and one of the respondents did not attend school and therefore did not disclose an educational background.

Table 5.4: Educational Background of Participants

	Frequency	Percent	Cumulative Percent
Valid	1	2.2	2.2
High School	11	23.9	26.1
None	1	2.2	28.3
some high school	3	6.5	34.8
Tertiary	30	65.2	100.0
Total	46	100.0	

With regards to marital status (Table 5.5 below), the majority of the research participants were single (n=39). There were only five participants that indicated they were married and two who indicated they had been divorced.

Table 5.5: Marital Status of Participants

	Frequency	Percent	Cumulative Percent
Valid Divorced	2	4.3	4.3
Married	5	10.9	15.2
Single	39	84.8	100.0
Total	46	100.0	

4.3. Description of Test Results

The statistics used to describe the main tendencies of variables are called descriptive statistics (Pallant, 2011). The mean and standard deviations for the independent and dependant variable can be seen in Table 5.6 below.

The participants' ages ranged from 17 to 50 years with a mean age of 24.87 years and a standard deviation of 6.11 years. The duration of training for the participants ranged from 0.5 to 19 years with a mean duration of 3.05 years. The total number of fights participated in ranged from 1 to 54 competitive fights with a mean of 8.33 fights for the entire sample. With regards to the fight ratio (where total number of wins is divided by total number of competitive fights participated in), the mean score was found to be 0.63 for the overall sample. Overall mindfulness scores for respondents ranged from 2.3 to 4.8 (out of a possible 5), with the sample's mean score at 3.39 and a standard deviation of 0.53. For the breakdown of scores for each of the five individual facets of mindfulness, please see Table 5.6 below.

Table 5.6: Means, Standard Deviation, Skewness and Kurtosis values of Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	46	17	50	24.87	6.112	1.716	.350	5.096	.688
Duration of Training in Years	46	.50	19.00	3.0471	3.11773	3.375	.350	15.120	.688
Total number of fights	46	1	54	8.33	10.799	2.427	.350	6.672	.688
Fight ratio number	46	.00	1.00	.6285	.33512	-.739	.350	-.512	.688
Overall Mindfulness Score	46	2.3	4.8	3.393	.5310	.223	.350	.020	.688
Observe	46	1.0	5.0	3.602	.8734	-.480	.350	.453	.688
Describe	46	1.8	5.0	3.515	.9063	-.034	.350	-1.113	.688
Act	46	1.3	4.9	3.522	.8091	-.705	.350	.499	.688
Non-judgement	46	1.3	5.0	3.041	.7612	.096	.350	.013	.688
Non-reactivity	46	2.0	5.0	3.352	.6264	.094	.350	.042	.688
Valid N (listwise)	46								

4.3.1 Test of Normality

Preliminary analysis was undertaken using SPSS version 23 to assess normality of the acquired data for both the dependent and independent variables. Normality of the distribution of scores is indicated by a non-significant value (Sig. value of more than 0.05) (Pallant, 2011). As can be seen in Table 5.7 below, the data for the following variables: duration of training and overall mindfulness, as well as the observe, describe, and non-reactive facets are normally distributed with Significant values higher than 0.05. The data for the remaining variables (i.e. age, age started training, fight ratio, act, and non-judgement facets) produced Significant values less than 0.05 which indicated that they were not normally distributed. Since some of the data were not normally distributed only non-parametric statistical procedures could be undertaken to conduct the correlational analysis.

Table 5.7: Test of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Age	.152	46	.009	.857	46	.000
Age started training	.134	46	.039	.906	46	.001
Duration of Training in Years	.207	46	.000	.666	46	.000
Fight ratio number	.134	46	.038	.872	46	.000
Overall Mindfulness Score	.077	46	.200*	.989	46	.927

Observe	.068	46	.200*	.969	46	.260
Describe	.090	46	.200*	.959	46	.107
Act	.131	46	.046	.956	46	.080
Non-judgement	.133	46	.040	.981	46	.657
<u>Non-reactivity</u>	<u>.122</u>	<u>46</u>	<u>.085</u>	<u>.974</u>	<u>46</u>	<u>.400</u>

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

4.4. Reliability of the Five Facet Mindfulness Questionnaire

The five scales of the FFMQ has consistently shown good internal consistency with Cronbach alpha coefficients ranging from 0.75 to 0.92. The complete internal consistency correlations for the 39 items of the FFMQ completed by 46 participants of the current study are provided in the table below.

Table 5.8: Internal consistency of reliability of the FFMQ

Mindfulness Facet	Cronbach's Alpha
Observe	0.89
Describe	0.92
Act	0.91
Non-judgement	0.87
Non-reactivity	0.75

4.5. Relationship between Variables

As mentioned prior, non-parametric statistics had to be used to analyse the collected data. According to Pallant (2011), non-parametric procedures are ideal for analysing data that come from a small sample and are not normally distributed. Non-parametric procedures do not have such stringent requirements (i.e. shape of distribution) and do not make assumptions about the distribution of the variables in question, regarding underlying population. Due to the lack of parameters, these procedures are also commonly known as distribution-free or parameter-free methods (Pallant, 2011). However, despite the ‘leniency’ of this method of analysis, the researcher of this study does recognise its possible shortcomings. Non-parametric procedures are known to be ‘less sensitive’ and ‘less powerful’ as compared to parametric procedures of analysis. This may result in the failure to identify differences between the variables that are under study (Pallant, 2011).

Bearing the above in mind, the non-parametric process of analysis used was Spearman’s rho, which is the non-parametric counterpart of the regular Pearson product-moment correlation coefficient. Since the variables in this study were measured on ordinal and nominal scales, the non-parametric technique of Spearman’s rho was used for the analysis.

In terms of the correlation analysis, a significant correlation was found between duration of training, and the observe and non-reactivity facets of mindfulness (as can be seen in Table 5.9). Furthermore, a significant correlation was found to exist between the MMA Ability Ratio and overall mindfulness. Specifically, non-reactivity was found to have a significant correlation with MMA ability. Observe and describe facets also indicated a potential correlation (although the relationship was not significant).

Table 5.9: Non-Parametric (rho) Correlation between Fight Ratio, Duration of Training, Overall Mindfulness, and the Five Facets of Mindfulness

		Overall Mindfulness Score	Observe	Describe	Act	Non- judgement	non- reactivity
Fight Ratio	Correlation Coefficient	.397**	.283	.285	.193	.265	.306*
	Sig. (2- tailed)	.006	.056	.055	.199	.075	.038
Duration of training in years	Correlation Coefficient	.271	.374*	.141	.235	-.101	.358*
	Sig. (2- tailed)	.068	.010	.351	.116	.505	.014

4.5.1 Standard Multiple Regression

Multiple regression allows one to explore the predictive ability of sets of variables on a dependent variable. In this method, all independent/predictor variables are simultaneously inserted into the equation and each independent variable is assessed in terms of its predictive ability beyond those contributed by all the other independent variables combined (Field, 2013; Pallant, 2011). Furthermore, this method of analysis indicates how much variance in the dependent variable each of the predictor variables can explain.

For the current study, a standard multiple regression was utilised to explore whether duration of training, age, as well as the five facets of mindfulness (i.e. observe, describe, act, non-judgement and non-reactivity) have any significant influence on MMA ability, operationalised by the fight ratio.

In Table 5.10 below, the ANOVA indicated that a significance value of less than 0.05 was attained ($p=0.012$), indicating that the independent variables in the equation contributed significantly in influencing MMA ability.

Table 5.10: ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.826	7	.261	3.072	.012 ^b
	Residual	3.227	38	.085		
	Total	5.054	45			

a. Dependent Variable: Fight ratio number

b. Predictors: (Constant), Age, Duration of Training in Years, non-judgement, act, non-reactivity, describe, observe

In the model summary table below, one is able to identify, by looking at the R Square value, how much variance in the dependent variable is accounted for by the independent variable within the regression model (Field, 2013; Pallant, 2011). The current R Square value is 0.361 with an adjusted R Square value of 0.244. This means that the independent/predictor variables in the model explain 36.1% of the variance within the analysis, however given the relatively small sample of respondents, the adjusted R Square value is preferred.

Table 5.11: Model Summary

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.601 ^a	.361	.244	.29143

a. Predictors: (Constant), Age, Duration of Training in Years, non-judgement, act, non-reactivity, describe, observe

b. Dependent Variable: Fight ratio number

Table 5.12: Evaluation of Independent Variables

Coefficients ^a												
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Partial	Tolerance	VIF
1 (Constant)	.506	.376		1.345	.187	-.255	1.266					
Duration of Training in Years	.022	.015	.202	1.411	.166	-.009	.053	.331	.223	.183	.822	1.216
Observe	-.015	.079	-.038	-.185	.854	-.174	.145	.233	-.030	-.024	.397	2.518
Describe	.063	.069	.170	.910	.368	-.077	.202	.251	.146	.118	.484	2.068
Act	.053	.066	.127	.802	.428	-.080	.185	.213	.129	.104	.672	1.489
Non-judgement	.030	.076	.069	.398	.693	-.124	.185	.157	.064	.052	.559	1.790
Non-reactivity	.075	.091	.140	.823	.416	-.109	.258	.266	.132	.107	.584	1.713
Age	-.026	.008	-.468	-3.349	.002	-.041	-.010	-.397	-.477	-.434	.859	1.164

a. Dependent Variable: Fight ratio number

The coefficients table above (Table 5.12) allows one to identify which of the independent/predictor variables included in the model have shown significant predictive ability on the dependent variable (Field, 2013; Pallant, 2011). From the results of the analysis above, only the age variable contributed significantly to MMA ability.

4.5.1.1 Summary of Results from Standard Multiple Regression

Pallant (2011) suggests as a guideline that research conducted within the social sciences should aim to have 15 participants per independent/predictor variable for an equation to be reliable. It is important to recognise that due to the small sample size of the current study, the generalisability of the results from the standard regression analysis must be interpreted with caution (Pallant, 2011).

The collinearity diagnostic performed by SPSS (see Table 5.12 above) as part of the regression analysis has indicated no signs that multicollinearity exists between the variables. Furthermore, the variable under examination shows no major deviations from normality as can be seen on the Normal P-P plot (please see appendix C).

The Entry method, whereby all independent variables are entered into the equation simultaneously, was utilised in the regression analysis and found that the differences between the participants duration of training, age, and the five facets of mindfulness has explained a significant amount of variance in their MMA ability ($F(7, 38) = 3.07, p < .05, R^2 = 0.36, R^2_{\text{Adjusted}} = 0.24$). However, of all the independent predictor variables in the model only the variable age produced a significant ability to predict MMA ability ($\beta = -0.47, t(38) = 3.35, p < .05$).

4.6. Non-Significant Results

Due to the majority of the variables not being normally distributed, non-parametric methods of analyses were conducted. In the section below, the Kruskal Wallis one-way analysis of variance, as well as the Mann-Whitney U test was conducted to explore the relationship between participants' levels of mindfulness with their age, ethnicity, and gender.

4.6.1 Comparison between the Five Facets of Mindfulness with Various Age Groups

As was suggested in Chapter 2, there have been few studies that have thoroughly examined the relationship between age and level of mindfulness. As such, the analysis conducted in the present study (shown in Table 5.14) found no significant correlation between the various age groups of participants with that of overall mindfulness and its individual facets. This could be due to the fact that the majority of the sample were in similar life stages and only one participant's age deviated significantly (age=50 years). It is advisable that future research should explore the context of one's age and mindfulness as this may be beneficial when furthering one's development process.

Table 5.13: Age groups and Mindfulness

	Ranks		
	Age (Binned)	N	Mean Rank
Overall Mindfulness Score	<= 21	18	21.42
	22 – 26	13	22.77
	27+	15	26.63
	Total	46	
Observe	<= 21	18	22.25
	22 – 26	13	25.62
	27+	15	23.17
	Total	46	
Describe	<= 21	18	20.64
	22 – 26	13	24.92
	27+	15	25.70

	Total	46	
Act	<= 21	18	20.81
	22 – 26	13	21.62
	27+	15	28.37
	Total	46	
Non-judgement	<= 21	18	23.72
	22 – 26	13	22.23
	27+	15	24.33
	Total	46	
Non-reactivity	<= 21	18	22.47
	22 – 26	13	19.58
	27+	15	28.13
	Total	46	

Table 5.14: Correlation between Age groups and Mindfulness

	Test Statistics ^{a,b}					
	Overall	Mindfulness			Non-	non-
	Score	Observe	describe	act	judgement	reactivity
Chi-Square	1.296	.490	1.371	2.972	.180	3.030
Df	2	2	2	2	2	2
Asymp. Sig.	.523	.783	.504	.226	.914	.220

a. Kruskal Wallis Test

b. Grouping Variable: Age (Binned)

4.6.2 Comparison of Overall Mindfulness Score between Genders

Unlike with the age and ethnicity variables mentioned above, studies that have explored the differing levels of mindfulness between males and females have been conducted on numerous occasions. In these studies, however, no significant results were found. Similarly, in the present study (shown in Table 5.15), significant differences in the levels of mindfulness between females and males were not found.

Table 5.15: Difference in Mindfulness between Genders

	Test Statistics ^a					
	Overall	Mindfulness			Non-	Non-
	Score	observe	describe	Act	judgement	reactivity
Mann-Whitney U	88.000	79.500	83.500	59.000	102.000	73.000
Wilcoxon W	103.000	94.500	944.500	74.000	963.000	88.000
Z	-.513	-.813	-.672	-1.540	-.018	-1.046
Asymp. Sig. (2-tailed)	.608	.416	.502	.124	.986	.296
Exact Sig. [2*(1-tailed Sig.)]	.631 ^b	.428 ^b	.514 ^b	.132 ^b	1.000 ^b	.316 ^b

a. Grouping Variable: Gender

b. Not corrected for ties.

It is also important to note that the sample for the present study was largely skewed towards male participants (shown in Table 5.16 below, n=41) and as a result may have contributed to the outcomes of this analysis.

Table 5.16: Gender and Mindfulness

	Ranks			
	Gender	N	Mean Rank	Sum of Ranks
Overall mindfulness Score	Male	41	23.85	978.00
	Female	5	20.60	103.00
	Total	46		
Observe	Male	41	24.06	986.50
	Female	5	18.90	94.50
	Total	46		
Describe	Male	41	23.04	944.50
	Female	5	27.30	136.50
	Total	46		
Act	Male	41	24.56	1007.00
	Female	5	14.80	74.00
	Total	46		
Non-judgement	Male	41	23.49	963.00
	Female	5	23.60	118.00
	Total	46		
Non-reactivity	Male	41	24.22	993.00

Female	5	17.60	88.00
Total	46		

4.7 Summary of Results

The primary findings from this chapter has shown that a significant correlational relationship exists between mindfulness (namely the observe and non-reactivity facets) and the abilities of MMA fighters. The results of the standard multiple regression analysis has also indicated that a fighters' age is a significant predictor of their fighting ability. Furthermore, the psychometric properties of the FFMQ has proven to be consistent in measuring mindfulness of the current research sample. In line with current literary sources, no significant differences could be identified in the levels of mindfulness between male and female participants of the current research sample.

Chapter 5: Discussion of Results

5.1. Summary of the Study

The primary focus of the present study was to explore the relationship between fighters' levels of mindfulness and their MMA ability. The five cognitive facets representing mindfulness served as an entry point for the researcher to explore the cognitive aspects of a mixed martial artist. By exploring mindfulness (said to be inherent in all human beings) (Kabat-Zinn, 2006), and the underlying mechanisms thereof, the researcher wished to facilitate better understanding into how mindfulness can be used to enhance a fighters ability, as well as exploring whether training in martial arts can increase one's levels of mindfulness.

The main hypothesis of the study stated that higher scores in mindfulness achieved by participants would be positively correlated with higher levels of martial arts ability. The study therefore sought to answer questions surrounding whether mindfulness levels differed between martial artists who were of different genders, ethnicities, and age groups, as well as having varying durations of martial arts training. Lastly, the study sought to explore whether one's mindfulness levels would be a good predictor of a good MMA fighter.

5.2. Results in Relation to Hypothesis

5.2.1 The Relationship between Mindfulness and Martial Arts Ability

The study explored the relationship between fighters' levels of mindfulness and their MMA ability. The ratio obtained by dividing the total number of fight wins over the total number of fights participated in, served as a proxy for measuring MMA ability. The main hypothesis of the study was to confirm whether a relationship existed between martial artists' self-reported levels of mindfulness with that of increased levels of martial arts ability. The

findings of the data analysis confirm the main hypothesis of the study, by producing a significant, although medium relationship, between overall mindfulness scores and one's martial arts ability ($r=0.397$, $p<0.05$). As a result, the null hypothesis can be rejected and the alternate hypothesis of the study can be accepted, as increased levels of mindfulness are positively correlated with increased levels of a fighters' MMA ability.

5.2.2 Mixed Martial Arts Training and the Facets of Mindfulness

Of the five facets of mindfulness measured by the FFMQ, two had significant correlations with participation in martial arts training. Increased duration in martial arts training produced significant medium correlations with observe ($r=0.374$, $p<0.05$) and non-reactivity ($r=0.358$, $p<0.05$) facets of mindfulness. A fighters martial arts ability (the fight ratio) also had significant correlation with the non-reactivity facet of mindfulness ($r=0.306$, $p<0.05$). According to the findings of the study the non-reactivity facet of mindfulness has been identified to have the most important association with the ability of a mixed martial artist.

Further analysis conducted exploring the ability of the five facets of mindfulness in predicting MMA ability produced inconclusive results. The model of analysis only found that the age of the martial artist played a significant role in influencing his or her win/fight ratio.

5.3. Results in Context of Current Literature

It is often said that there are no limits to what the human mind is capable of, and although this may be true in some instances, for most people, there are limits to what they can do in a specific moment and context. The intensity of physical combat can be considered a situation where one's cognitive processing abilities are pushed to the limit. As the literature suggests, mindfulness as a cognitive process allows a mixed martial artist to push these limits even further.

Taking into consideration the findings of the study conducted by Lutz et al., (2009), for the mixed martial artist, the enhancement of auditory processing skills, serves as an advantage. The mixed martial artists are able to be selectively attentive and focused on the instructions provided by their coaching staff amidst the noise of supporting crowds, giving them an advantage over their opponents. Similarly, mindfulness's ability to increase attention and awareness, and decrease levels of attentional blink deficit (Slagter et al., 2009), can be vital to a competing mixed martial artist. Attentional blink performance relates to the ability to register quick successions of visual stimuli presented by an opponent, thus this becomes an ability that can be paramount in securing the information necessary to carry out offensive or defensive tactics needed to overcome an opponent during a competitive fight.

Similarly, cognitive rigidity is another obstacle that was found to be reduced by the mindfulness process. Cognitive rigidity can be a great hindrance for mixed martial artists as it becomes an unintended but self-imposed obstacle in reaching one's goals. Mixed martial artists are often taught to train themselves to treat an opponent as a 'puzzle' that needs to be solved (Little, 2000; Lorge, 2011; Silva, Krauss, & Cordoza, 2008). Every opponent presents a unique challenge, bringing different variables that a fighter must analyse and evaluate before he or she can overcome that opponent. As such, during times of high-speed oppositional tasks such as in combat situations, much of one's cognitive resources may become depleted (Maier, 2004a). The allocation of cognitive resources such as perception/attention, producing mental imagery and working memory as a result becomes increasingly difficult (Lutz et al., 2009; Maier, 2004b). This depletion of mental resources worsened by the shortcomings of being cognitively rigid increases the inability of a mixed martial artist to perform his or her planned movements and strategies.

Thus, the ability produced by mindfulness to recognise and evaluate problems in novel ways becomes significant, if not key, in overcoming an opponent (Greenberg et al., 2012). If martial artists persist in the same offensive strategies towards their opponent and fails, or their actions are countered, the ability to not remain rigid in the same offensive tactics becomes increasingly important. This means that the fighter has the mental awareness (mindfulness) to evaluate and adapt to their opponent/problem by trying new offensive tactics that may increase their chances of overcoming and solving the problem represented by the opponent

The ability to regulate one's emotions adequately is another advantage produced by mindfulness (Chambers et al., 2008; Lalot, Delplanque, & Sander, 2014; Short et al., 2010). For mixed martial artists, the importance of training is to focus on learning to control their emotions and thoughts, which later on may become actions. Fighting/combat, due to its visual nature, is often considered absent-minded and violent (which in a way it is), but it is within this 'violence' that the ability to remain mindful and controlled becomes the most challenging, and is only achievable by the most well trained mixed martial artists.

The ability to step into a combat situation with the correct emotional state of mind, or possessing the ability to not be overwhelmed by one's emotions (usually negative) during a combat situation is of utmost importance (Chu, 2003; Hyams, 1982; Lee, 2011). The correct emotions, be it positive or negative, could likely determine the outcome of a fight. Overwhelmingly positive emotions could possibly lead a martial artist to become overconfident and lose focus in their initial strategies. This careless abandonment of one's own strategy could lead the mixed martial artist to underestimate their opponent, causing their own

defeat. Being overwhelmed by negative emotions (such as anxiety and fear) on the other hand, could likely result in the martial artist giving up and losing the fight before it has even begun.

Regulating pain is another advantage that mindfulness produces. Essentially, in competitive MMA, the goal of competition is to neutralise one's opponents through the delivery of physical force. The ability to endure pain is thus one of the fundamental aspects of fighting/combat. The ability to prepare oneself for the possibility of experiencing pain has been found to decrease negative arousal, reduce insecurity, and the experiencing of competitors as threats (Birrer & Morgan, 2010). Hence, mindfulness can once again be seen as an ideal way to enhance the cognition of a martial artist in facilitating their preparations for an impending fight. Fighters' levels of mindfulness can do well in regulating their pain threshold and the responses thereof, before, during and even after the intensity of physical combat. Furthermore, due to the nature of physical combat, the results of a fight (if negative may cause psychological distress), accompanied by the physical damage to the body may result in rumination and anxiety related issues to occur. Increased WMC as a result of mindfulness training has found to limit these issues (Jha et al., 2010), for this reason, the interrelation between WMC and mindfulness is another key component in its capacity to enhance a mixed martial artists abilities before, during, and post competitive martial art bouts.

During a fight, a martial artist needs to consider their emotions, physical condition, strategies, and the actions they are to take while simultaneously being aware of all possible actions presented by the opponent. The time allowed for decision making, in contrast to the amount of both internal and external stimuli needing to be processed during a fight places significant amounts of strain on one's cognitive processing abilities.

The ability to be non-judging and non-reactive is one of the primary concepts of mindfulness (Kabat-Zinn et al., 2013; Kee & Wang, 2008; Mrazek, Franklin, Phillips, Baird,

& Schooler, 2013; Shapiro et al., 2006), and the results of the present study indicate that the non-reactivity factor of the FFMQ has significant correlation with a mixed martial artists ability. This may be surprising for some as one does not usually associate non-reactivity with combat/fighting. However, for non-martial arts practitioners, it is important to realise that the underlying philosophy of martial arts is the emphasis on control. Martial arts, in its purest form, is about control and not the lack thereof (Lee, 2011). Non-reactivity and control go hand-in-hand, as both concepts are concerned with a degree of processing and judgment. As literature suggests, being non-reactive and non-judging allows for a reduction in cognitive load. This reduction in cognitive load allows for increased processing capacity and frees up WMC to be utilised during intense combat situations that can lead to quicker and more precise manifestations of thoughts into physical actions.

5.4. Mindfulness Differences across Age Groups, Genders, and Ethnicities

Participants' age groups, gender, and ethnicities were also factored into the analysis to determine whether these variables had any correlation with the five facets of mindfulness. The results of the analysis however showed no significant correlations between these variables and both overall and individual facets of mindfulness. The results furthermore, need to be interpreted with caution as the sample from which these variables were derived from were skewed towards participants who were white and male. The participants who were categorised under the African and Asian ethnicity did not meet the numbers for adequate analysis to take place, however, the researcher briefly explored this variable as it shows promise for future studies to take place in this direction.

The notion that one's levels of mindfulness could vary between race and ethnicities might seem improbable, but different ideation about the self might play a role in facilitating

the ability to be mindful. For example, the western versus Eastern/African cultures differ, whereby western ideation of oneself is based on achieving a certain status as an individual, as compared to the self being defined as part of a larger community in the Eastern/African cultures. Western ideals of the self might be understood as being more 'self-centred', compared to Eastern and African ideations of the self (Triandis & Suh, 2002). One might consider this 'self-centredness' to become a hindrance to developing mindfulness. More research however needs to be conducted to test whether this theory may carry any substance.

5.5. Practical Implications of Research Findings

The importance of overall mindfulness, especially concerning the non-reactive and observe facets (which were found to have significant correlation with increased martial arts ability) appear to be of key importance. Cognitive rigidity, which may lead to automaticity, is a hindrance that often occurs outside the conscious awareness of most individuals. From believing what may appear to be facts, to what may appear to be the best ways to traverse one's daily strenuous lives, to how one experiences every living moment, can be improved by being more mindful. Being able to encounter events in one's life while being mindful, allows one to free oneself of unwanted, pre-programmed negative ideations. Experiencing any life event with increased awareness accompanied by an innocent curiosity, may facilitate an improved quality of existence.

If being mindful allows for increased abilities of martial artists during instances of intense physical and psychological strain, it stands to reason that it can very well increase the abilities of everyday individuals. Mindfulness can therefore potentially enhance the output of individuals comprehensively from - and not exclusively to - the organisational or the educational setting, but in addition to in one's personal endeavours.

5.6. Researcher's Experiences

To better understand what mindfulness entails, it is insufficient for one to merely learn about its processes and possible benefits by reading about them. As with any form of skill one wishes to acquire, one needs to continuously practice before one can master it. The researcher of the present study has hence, committed himself to the practice of mindfulness throughout the research process so he could not only understand the theory underlying its principles but also simultaneously develop the practical understanding of the mindfulness process. Moreover, the researcher, having been a competitive martial artist himself, also facilitated a deeper understanding of how mindfulness can benefit and enhance one's martial arts abilities.

The understanding and practice of mindfulness that the researcher has developed throughout the course of the study can be illustrated by drawing close comparisons to the Butterfly Effect. The Butterfly Effect, first coined by Edward Lorenz in 1983, refers to the properties of chaotic systems by which small changes in initial conditions can lead to large-scale and unpredictable variation in the future states. Bearing this definition in mind, the practice of mindfulness and the effects it produce can be seen as the subtle changes or initial conditions that may lead to vast systematic changes in one's abilities and actions. Human beings are comprised of complex systems that are constantly interacting with one another. The ability of mindfulness to be fostered through one's cognitive systems, and have its positive effects ripple through almost all aspects of one's functioning, is a fundamental process of mindfulness that needs to be explored and highlighted more regularly.

For a martial artist, if one slight change in their presence of being can result in changes in their overall ability, this may likely be the difference between victory and defeat during competition. As was highlighted in earlier chapters, there are already multitudes of studies that have scientifically confirmed the benefits of mindfulness. One, however, needs to recognise

that cultivating the benefits of mindfulness is not something that happens overnight. The ability to be mindful is something that needs to be constantly nurtured and developed in order to fully reap its benefits.

Mindlessness or being absent minded, the opposite of mindfulness, was an experience the researcher also encountered during the process of the present study. Mindlessness in this regard refers to the automaticity and/or the lack of attention paid when experiencing one's daily life. Being absent minded resulted in the researcher experiencing a multitude of negative emotions, such as increased anxiety, lack of motivation, and increased passivity. What is of interest regarding these experiences is that they all manifested at times of heightened stress, both psychological and physical, as well as during periods of time when mindfulness meditation practices were reduced. Once aware, the researcher made sure to continue his mindful practices on a daily basis, and within a period of a week's time, even when the same stressors were present, the negative emotions encountered were seemingly minimised. The researcher recognises that many possible variables could have caused the negative emotions to dissipate, however being mindful has undoubtedly played a part in the alleviation of the negative emotions encountered. This first-hand experience further affirmed the researcher's personal belief in the benefits of practicing mindfulness.

5.7. Limitations

There are several limitations that could have affected the outcomes of the study, which will be discussed in this section. First and foremost, through the review of the literature, it is evident that there has been little to no research conducted exploring the relationship between one's levels of mindfulness and one's martial arts ability. This becomes a limitation in its own, as it is not possible to compare the results derived from the present study with studies conducted

in the past. As a result, comparisons and validation of present findings could not be conducted with any previous studies.

The second limitation involves the utilisation of convenience sampling. Although this method allowed the researcher to obtain a large sample inexpensively, external validity was compromised and therefore did not allow for the generalisability of results. This process involved enlisting participants at the convenience of the researcher, which comprised of mixed martial artists from the researchers own gym, as well as gyms situated in and around Pretoria and Johannesburg. By recruiting participants in this way, a bias may have been introduced in the sample that may not have been an accurate or equal representation of gender and age, as well as a fair representation of all martial artists’.

The third limitation involves the FFMQ, which is a self-report measure utilised to assess the martial artists’ levels of mindfulness. The limitation of self-report instruments is that it relies on the potentially erroneous answers from the participants. Participants may display non-response errors by not fully completing the questionnaire, they may respond with unintentionally incorrect answers if they do not fully understand the items, or they may have a distorted outlook about who they are (Foxcroft et al., 2009). Participants may tend towards response bias, which involves a propensity to respond to a range of items on some basis other than the specific item content (Paulhus, 1991). In an attempt to present themselves in a favourable light, a respondent may provide socially desirable answers. Further response bias can come into play as a respondent may consistently answer questions in the extreme or respond in agreement with all statements (Foxcroft et al., 2009). Considering these mentioned limitations, the researcher remains cautious in drawing conclusions about the relationship between mindfulness and martial arts ability.

The understanding of mindfulness from a western perspective, and the innate epistemological questions that come with it may be considered limitations. As behavioural sciences view mindfulness as a consciousness discipline found in the meditative traditions (Kabat-Zinn, 2006), the crossing over of mindfulness studies into other disciplines such as the medical or clinical context might result in a clash of paradigms. This could consequently lead to a multitude of errors that cause one to unknowingly misinterpret, dismiss, or totally ignore some of the most subtle, yet deepest attributes, of which mindful meditation practices are comprised. Due to these possible limitations, researchers exploring mindfulness may draw incorrect conclusions.

According to Kabat-Zinn (2006), the best way to approach mindfulness and the disciplines that have explored it, is in a way similar to which a “respectful anthropologist would treat an encounter with an indigenous culture or a different epistemology” (Kabat-Zinn, 2006, pg. 146). Only through a close and personal relationship with such cultures and traditions can one truly understand, evaluate, and preserve the fundamental, yet vital, elements of the all-encompassing dimensions of mindfulness and its practices. For this reason the researcher of this study has immersed himself into these traditions, cultures, and meditative practices (to the best of his ability) to try and grasp, as best as possible, an understanding of what mindfulness entails.

5.8. Recommendations for Future Research

The present study recruited martial artists who were most conveniently located to the researcher. It is proposed that by recruiting a broader, more representative sample of martial artists from gyms across the country, or world, one may gain a fuller understanding of the relationship between mindfulness and martial arts ability and may allow the findings to be more generalisable.

Furthermore, the current study measured trait-like mindfulness through the utilisation of a self-report measure. Previous studies have demonstrated the benefit of mindfulness-based exercises and interventions, whereby levels of mindfulness were significantly increased after completion of the mindfulness-based programs. No research has been found that reported on measures of mindfulness before and after intervention programs with regard to its effect on martial arts ability. While one's levels of mindfulness do contribute significantly towards martial arts ability, it may prove beneficial to introduce a mindfulness-based intervention program with self-report measures of mindfulness administered before and after the programs. This combined method of increasing and measuring levels of mindfulness pre and post intervention may provide a better understanding of the relationship between mindfulness and martial arts ability.

It is further suggested that a better proxy that can more accurately represent martial arts ability to be found. The fight ratio used in the present study provides a very limited indication of one's martial arts ability. If one could utilise fight statistics such as the average number of successful punches/kicks landed in a fight, the percentage of successful takedowns achieved in a fight, or even the percentage of damage absorbed in a fight, a better assessment of one's martial arts ability could be obtained.

Finally, within the study, the researcher made an effort to explore if there were any significant differences between the levels of mindfulness of male and female participants. However, the results of the analysis showed that no significant differences were found. Similarly, no differences were found between the mindfulness levels of the participants of different age groups. Further research into the possible pre-existing differences that may be present between these groups could shed light on how mindfulness develops between those who practice martial arts and those who do not.

5.9. Conclusion

The study has confirmed that high levels of overall mindfulness are positively correlated with martial arts ability. As suggested by literature, the practice and implementation of mindfulness techniques have the capability to cognitively enhance a martial artists' skill. Specifically, the non-reactive facet of mindfulness is predictive of martial arts ability. It seems counterintuitive to consider a good martial artist as being non-reactive, however, being in control and accepting of one's thoughts and emotions unlocks cognitive resources, allowing attention to be available to process other stimuli. It is this facet of mindfulness, along with the observe facet, that increases through prolonged martial arts training. Both of these skills allow for increased attention and awareness of one's internal and external stimuli and thus allow for increased cognition (i.e. executive functions) to occur. This increased cognitive ability as discussed, is thus able to facilitate improved functioning throughout one's overall psychological and physical functioning.

The increasing interest in mindfulness across varying disciplines of study should be recognised as a positive step towards promoting and furthering one's understanding of the mindfulness process. Although being taught how to be mindful and incorporating its practice into one's daily life may take some time before it enters into the mainstream; it would do well for one to acknowledge its benefits due to its readily available nature. Even though the understandings of mindfulness rise from eastern spiritual traditions, mindfulness itself should not be viewed as something only attainable by the people who ascribe to these specific traditions. Mindfulness as a psychological process is naturally inherent in all human beings, and as such, all those who are willing to dedicate time and effort to achieve it can attain its benefits (Brown & Ryan, 2003; Kabat-Zinn, 2006). In this light, mindfulness can be viewed as an increase in the quality of presence in one's lives. Similarly to the known health benefits of

jogging, the overarching benefits of practicing mindfulness should be recognised and promoted for all. In summation, the following quote illustrates the researcher's understanding of how, by being mindful, one may allow oneself to experience an increasingly balanced life.

“All phenomena are preceded by the mind. When the mind is comprehended, all phenomena are comprehended. In this way, when one brings the mind under control, all things are brought under control” (Wallace, 1999, p. 185)

References

- Anderson, M. L. (2003). Embodied cognition: a field guide. *Artificial Intelligence, 149*(1), 91–130. doi: 10.1016/S0004-3702(03)00054-7
- American Psychological Association. (2002). Ethical principles of psychologists and code of conduct (including 2010 amendments). *American Psychologist, 57*, 1060-1073.
- Baer, R. A. (2004). Assessment of mindfulness by self-report: the Kentucky Inventory of Mindfulness Skills. *Assessment, 11*(3), 191–206. doi: 10.1177/1073191104268029
- Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., ... Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment, 15*(3), 329–342. doi: 10.1177/1073191107313003
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45. doi: 10.1177/1073191105283504
- Birrer, D., & Morgan, G. (2010). Psychological skills training as a way to enhance an athlete's performance in high-intensity sports: PST in high-intensity sports. *Scandinavian Journal of Medicine & Science in Sports, 20*, 78–87. doi: 10.1111/j.1600-0838.2010.01188.x
- Bishop, S. R. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3). 230- 241.
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230–241. doi: 10.1093/clipsy.bph077

- Blaser, P., & Hökelmann, A. (2009). Mental reproduction of a dance choreography and its effects on physiological fatigue in dancers. *Journal of Human Sport and Exercise*, 4(2), 129–141. doi: 10.4100/jhse.2009.42.06
- Bodhi, B. (2003). *A comprehensive manual of Abhidhamma* (Buddhist Publication Society, Sri Lanka edition). Seattle: Pariyatti Publishing.
- Bodhidharma. (1989). *The Zen teaching of Bodhidharma*. (R. Pine, Trans.). North Point Press.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822–848. doi: 10.1037/0022-3514.84.4.822
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, 18(4), 211–237. doi: 10.1080/10478400701598298
- Cahn, B. R., & Polich, J. (2006). Meditation states and traits: EEG, ERP, and neuroimaging studies. *Psychological Bulletin*, 132(2), 180–211. doi: 10.1037/0033-2909.132.2.180
- Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment*, 15(2), 204–223. doi: 10.1177/1073191107311467
- Carver, C. (2003). Pleasure as a sign you can attend to something else: Placing positive feelings within a general model of affect. *Cognition & Emotion*, 17(2), 241–261. doi: 10.1080/02699930302294
- Casey, G., & Moran, A. (1989). The computational metaphor and cognitive psychology. *The Irish Journal of Psychology*, 10(2), 143–161. doi: 10.1080/03033910.1989.10557739
- Chabris, C. F., & Simons, D. J. (2010). *The invisible gorilla: and other ways our intuitions deceive us*. New York: Crown.

- Chadwick, P., Hember, M., Symes, J., Peters, E., Kuipers, E., & Dagnan, D. (2008). Responding mindfully to unpleasant thoughts and images: Reliability and validity of the Southampton mindfulness questionnaire (SMQ). *British Journal of Clinical Psychology, 47*(4), 451–455. doi: 10.1348/014466508X314891
- Chambers, R., Lo, B. C. Y., & Allen, N. B. (2008). The impact of intensive mindfulness training on attentional control, cognitive style, and affect. *Cognitive Therapy and Research, 32*(3), 303–322. doi: 10.1007/s10608-007-9119-0
- Chaplin, W. F., John, O. P., & Goldberg, L. R. (1988). Conceptions of states and traits: Dimensional attributes with ideals as prototypes. *Journal of Personality and Social Psychology, 54*(4), 541–557. doi: 10.1037/0022-3514.54.4.541
- Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31*(3), 449–464. doi: 10.1016/j.cpr.2010.11.003
- Chu, F. J. (2003). *The martial way and its virtues: tao de gung*. Boston, Mass: YMAA Publication Center.
- Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic Bulletin & Review, 12*(5), 769–786. doi: 10.3758/BF03196772
- Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S., ... Sheridan, J. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*(4), 564–570. doi: 10.1097/01.PSY.0000077505.67574.E3
- de Lange, F. P., Roelofs, K., & Toni, I. (2008). Motor imagery: a window into the mechanisms and alterations of the motor system. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 44*(5), 494–506. doi: 10.1016/j.cortex.2007.09.002

- Deshimaru, T. (1992). *The Zen way to martial arts: A Japanese master reveals the secrets of the Samurai*. (N. Amphoux, Trans.) . Penguin Books.
- Didonna, F. (Ed.). (2009). *Clinical handbook of mindfulness*. New York, NY: Springer.
- Eysenck, M. W., & Keane, M. T. (2010). *Cognitive psychology: A student's handbook* (6th ed.). New York: Psychology Press.
- Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J-P. (2007). Mindfulness and emotion regulation: the development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment*, 29(3), 177–190. doi: 10.1007/s10862-006-9035-8
- Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Los Angeles: Sage.
- Flor, H. (2011). Some thoughts on trauma, pain, posttraumatic stress disorder and traumatic brain injury. *Journal of Clinical Psychology in Medical Settings*, 18(2), 205–206. doi: 10.1007/s10880-011-9241-8
- Foxcroft, C., Abrahams, F. R., Wolfaardt, J. B., Bruin, D. de, Kanjee, A., Griessel, L. (2009). *Introduction to psychological assessment* (3rd ed.). Cape Town: Oxford University Press
- Gardner, F. L., & Moore, Z. E. (2007). *The psychology of enhancing human performance: the mindfulness-acceptance-commitment approach (MAC): a practitioner's guide*. New York: Springer Pub.
- Goldstein, B. E. (2008). *Cognitive psychology: Connecting mind, research, and everyday experience* (2nd ed.). Belmont: Wadsworth Cengage Learning.
- Golomer, E., Toussaint, Y., Bouillette, A., & Keller, J. (2009). Spontaneous whole body rotations and classical dance expertise: how shoulder-hip coordination influences supporting leg displacements. *Journal of Electromyography and Kinesiology: Official*

- Journal of the International Society of Electrophysiological Kinesiology*, 19(2), 314–321. doi: 10.1016/j.jelekin.2007.08.004
- Grant, J. A., & Rainville, P. (2009). Pain sensitivity and analgesic effects of mindful states in Zen meditators: a cross-sectional study. *Psychosomatic Medicine*, 71, 106–114.
- Gravetter, F. J., & Forzano, L.A. B. (2011). *Research methods for the behavioral sciences* (4th ed.). Belmont: Wadsworth Publishing.
- Greenberg, J., Reiner, K., & Meiran, N. (2012). “Mind the Trap”: Mindfulness practice reduces cognitive rigidity. *PLoS ONE*, 7(5). doi: 10.1371/journal.pone.0036206
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research*, 57(1), 35–43. doi: 10.1016/S0022-3999(03)00573-7
- Gustafsson, H., Hassmén, P., & Podlog, L. (2010). Exploring the relationship between hope and burnout in competitive sport. *Journal of Sports Sciences*, 28(14), 1495–1504. doi: 10.1080/02640414.2010.521943
- Heeren, C. D. (2011). Cross-cultural validity of the Five Facets Mindfulness Questionnaire: Adaptation and validation in a French-speaking sample. *Revue Européenne de Psychologie Appliquée*, 61, 147–151.
- Hodgins, H. S., & Adair, K. C. (2010). Attentional processes and meditation. *Consciousness and Cognition*, 19(4), 872–878. doi: 10.1016/j.concog.2010.04.002
- Holas, P., & Jankowski, T. (2012). A cognitive perspective on mindfulness. *International Journal of Psychology*, 1–12. doi: 10.1080/00207594.2012.658056
- Hyams, J. (1982). *Zen in the martial arts*. New York: Bantam.
- Isenberg, L. (2009). *Mindfulness: Life with attention and awareness - test-retest reliability of the FFMQ for Dutch fibromyalgia patients*. University of Twente.

- Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective & Behavioral Neuroscience*, 7(2), 109–119.
- Jha, A. P., Stanley, E. A., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion*, 10(1), 54–64. doi: 10.1037/a0018438
- Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. Delta.
- Kabat-Zinn, J. (2006). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, 10(2), 144–156. doi: doi.org/10.1093/clipsy.bpg016
- Kabat-Zinn, J., Davidson, R. J., & Houshmand, Z. (2013). *The mind's own physician: a scientific dialogue with the Dalai Lama on the healing power of meditation*. Oakland, California: Mind & Life Institute/New Harbinger Publications.
- Kang, Y., Gruber, J., & Gray, J. R. (2013). Mindfulness and de-automatization. *Emotion Review*, 5(2), 192–201. doi: 10.1177/1754073912451629
- Kaufman, K. A., Glass, C. R., & Pineau, T. R. (2012). *Mindful sport performance enhancement: a treatment manual for long-distance runners*.
- Kee, Y. H., & John Wang, C. K. (2008). Relationships between mindfulness, flow dispositions and mental skills adoption: a cluster analytic approach. *Psychology of Sport and Exercise*, 9(4), 393–411. doi: 10.1016/j.psychsport.2007.07.001
- Knight, L. (2009). *Mindfulness: History, technologies, research, applications*. Pepperdine University.
- Kozhevnikov, M., Louchakova, O., Josipovic, Z., & Motes, M. A. (2009). The enhancement of visuospatial processing efficiency through Buddhist Deity meditation. *Psychological Science*, 20(5), 645–653. doi: 10.1111/j.1467-9280.2009.02345.x

- Lalot, F., Delplanque, S., & Sander, D. (2014). Mindful regulation of positive emotions: a comparison with reappraisal and expressive suppression. *Frontiers in Psychology*, 5. doi: 10.3389/fpsyg.2014.00243
- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., ... Devins, G. (2006). The toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology*, 62(12), 1445–1467. doi: 10.1002/jclp.20326
- Lee, B. (2011). *Tao of Jeet Kune Do: new expanded edition*. Los Angeles: Black Belt Communications.
- Little, J. (2000). *Ultimate martial arts nyclopedia*. Lincolnwood, Ill: McGraw-Hill.
- Lorge, P. A. (2011). *Chinese martial arts: from antiquity to the twenty-first Century*. New York: Cambridge University Press.
- Lutz, A., Slagter, H. A., Rawlings, N. B., Francis, A. D., Greischar, L. L., & Davidson, R. J. (2009). Mental training enhances attentional stability: neural and behavioral evidence. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience*, 29(42), 13418–13427. doi: 10.1523/JNEUROSCI.1614-09.2009
- MacKillop, J., & Anderson, E. J. (2007). Further psychometric validation of the Mindful Attention Awareness Scale (MAAS). *Journal of Psychopathology and Behavioral Assessment*, 29(4), 289–293. doi: 10.1007/s10862-007-9045-1
- Maier, H. N. (2004a). Measurement of cognitive load dynamics in a high-speed oppositional task. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 48(3), 562–566. doi: 10.1177/154193120404800361
- Maier, H. N. (2004b.). *Measuring cognitive load management in a traditional martial arts training model*. Texas A&M University.
- Mann, J. K. (2012). *When Buddhists attack: the curious relationship between Zen and the martial arts*. Tokyo: Tuttle Publishing.

- Maouene, J. (2011). *Cognition, brain, behavior. A special issue on embodiment and development*. Retrieved from http://www.academia.edu/2638001/Cognition_brain_behavior._A_special_issue_on_embodiment_and_development
- McCarthy, P. J. (2011). Positive emotion in sport performance: current status and future directions. *International Review of Sport and Exercise Psychology*, 4(1), 50–69. doi: 10.1080/1750984X.2011.560955
- McClure, S., Botvinick, M., Yeung, N., Greene, J., & Cohen, J. (2007). *Conflict monitoring in cognition-emotion competition*. *Handbook of Emotion Regulation*, 204–226. New York: Guilford Press.
- McCrae, R., & Costa, P. (2003). *Personality in adulthood: a five-factor theory perspective*. New York: Guilford Press.
- McManus, I. C., Freegard, M., Moore, J., & Rawles, R. (2010). *Science in the Making: Right Hand, Left Hand . II: The duck–rabbit figure*. *Laterality: Asymmetries of Body, Brain and Cognition*, 15(1–2), 166–185. doi.org/10.1080/13576500802564266
- Mellalieu, S., & Hanton, S. (Eds.). (2010). *Advances in applied sport psychology: a Review*. New York: Routledge.
- Memmert, D., Simons, D. J., & Grimme, T. (2009). The relationship between visual attention and expertise in sports. *Psychology of Sport and Exercise*, 10(1), 146–151. doi: 10.1016/j.psychsport.2008.06.002
- Posner, M. (1987). Structures and Functions of Selective Attention. *Clinical neuropsychology and brain function: Research, measurement, and practice*. 7(2), 173–202 doi:10.1037/10063-005.
- Moore, A., & Malinowski, P. (2009). Meditation, mindfulness and cognitive flexibility. *Consciousness and Cognition*, 18(1), 176–186. doi: 10.1016/j.concog.2008.12.008

- Moran, A. (2009). Cognitive psychology in sport: Progress and prospects. *Psychology of Sport and Exercise*, 10(4), 420–426. doi: 10.1016/j.psychsport.2009.02.010
- Moran, A. (2012). Thinking in action: Some insights from cognitive sport psychology. *Thinking Skills and Creativity*, 7(2), 85–92. doi: 10.1016/j.tsc.2012.03.005
- Morris, T., Spittle, M., & Watt, A. P. (2005). *Imagery in sport*. Champaign, IL: Human Kinetics.
- Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science*, 24(5), 776–781. doi: 10.1177/0956797612459659
- Neuser, N. (2010). *Examining the factors of mindfulness: a confirmatory factor analysis of the Five Facet Mindfulness Questionnaire*. Oregon: Pacific University.
- Noakes, T. D. (2008). Rating of perceived exertion as a predictor of the duration of exercise that remains until exhaustion. *British Journal of Sports Medicine*, 42(7), 623–624.
- Pallant, J. (2011). *SPSS survival manual* (4th ed.). Berkshire, England: Open University Press.
- Priest, G., & Young, D. A. (Eds.). (2010). *Martial arts and philosophy: Beating and nothingness*. New York: Open Court.
- Robins, R. W. (Ed.). (2007). *Handbook of research methods in personality psychology*. New York: The Guilford Press.
- Robinson-Riegler, B., & Robinson-Riegler, G. L. (2011). *Cognitive psychology: Applying the science of the mind* (3rd ed.). Pearson.
- Seiler, R. (1992). Performance enhancement - a psychological approach. *Sport Science Review*, 1(2), 29–45.
- Shapiro, L. (2010). *Embodied cognition*. New York: Routledge.

- Shapiro, S. L., & Carlson, L. E. (2009). *The art and science of mindfulness: Integrating mindfulness into psychology and the helping professions*. Los Angeles: American Psychological Association.
- Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*(3), 373–386. doi: 10.1002/jclp.20237
- Short, B., Kose, S., Mu, Q., Borckardt, J., Newberg, A., George, M. S., & Kozel, F. A. (2010). Regional brain activation during meditation shows time and practice effects: an exploratory fMRI study. *Evidence-Based Complementary and Alternative Medicine: eCAM*, *7*(1), 121–127. doi: 10.1093/ecam/nem163
- Silva, A., Krauss, E., & Cordoza, G. (2008). *Mixed martial arts instruction manual: striking*. Auberry, Calif.: Victory Belt.
- Simon, A. (2012). *To float like clouds, to flow like water: Tai Chi as a Zen path to mindfulness*. Al J. Simon Inc.
- Slagter, H. A., Lutz, A., Greischar, L. L., Nieuwenhuis, S., & Davidson, R. J. (2009). Theta phase synchrony and conscious target perception: impact of intensive mental training. *Journal of Cognitive Neuroscience*, *21*(8), 1536–1549. doi: 10.1162/jocn.2009.21125
- Slepian, M. L., Weisbuch, M., Rule, N. O., & Ambady, N. (2011). Tough and tender: embodied categorization of gender. *Psychological Science*, *22*(1), 26–28. doi: 10.1177/0956797610390388
- Teasdale, J. D., Segal, Z. V., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology*, *68*(4), 615–623. doi: 10.1037/0022-006X.68.4.615
- Tenenbaum, G., & Eklund, R. C. (Eds.). (2007). Front Matter. In *Handbook of Sport Psychology* (pp. i–xxi). Hoboken, N.J: John Wiley & Sons, Inc. Retrieved from <http://0->

onlinelibrary.wiley.com.innopac.up.ac.za/doi/10.1002/9781118270011.fmatter/summary

- Teodorczuk, K. (2013). *Mindfulness and academic achievement in South African university students*. University of Johannesburg.
- Thomas, O., Maynard, I., & Hanton, S. (2007). Intervening with athletes during the time leading up to competition: Theory to practice II. *Journal of Applied Sport Psychology*, 19(4), 398–418. doi: 10.1080/10413200701599140
- Triandis, H. C., & Suh, E. M. (2002). Cultural Influences on Personality. *Annual Review of Psychology*, 53(1), 133–160. doi.org/10.1146/annurev.psych.53.100901.135200
- van Leeuwen, S., Müller, N. G., & Melloni, L. (2009). Age effects on attentional blink performance in meditation. *Consciousness and Cognition*, 18(3), 593–599. doi: 10.1016/j.concog.2009.05.001
- Vast, R. L., Young, R. L., & Thomas, P. R. (2010). Emotions in sport: Perceived effects on attention, concentration, and performance. *Australian Psychologist*, 45(2), 132–140. doi: 10.1080/00050060903261538
- Vertonghen, J., & Theeboom, M. (2010). The social-psychological outcomes of martial arts practise among youth: a review. *Journal of Sports Science & Medicine*, 9(4), 528–537.
- Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, 40(8), 1543–1555. doi: 10.1016/j.paid.2005.11.025
- Wallace, A. (1999). The Buddhist Tradition of Samatha: Methods for Refining and Examining Consciousness. *Journal of Consciousness Studies*, 6, 175–187.
- Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Alternative Therapies in Health and Medicine*, 11(2), 42–58.

Zeidan, F., Grant, J. A., Brown, C. A., McHaffie, J. G., & Coghill, R. C. (2012). Mindfulness meditation-related pain relief: Evidence for unique brain mechanisms in the regulation of pain. *Neuroscience Letters*, *520*(2), 165–173. doi: 0.1016/j.neulet.2012.03.082

Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: evidence of brief mental training. *Consciousness and Cognition*, *19*(2), 597–605. doi: 10.1016/j.concog.2010.03.014

Appendix A: Information sheet, Informed Consent Form and Demographics Questionnaire



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Department of Psychology

RESEARCH STUDY: Mindfulness and MMA

There are two parts to this informed consent form:

- An information sheet (to provide information about the study)
- A consent form (to sign if you choose to participate)

You will receive a copy of the information sheet.

Part 1: Information sheet

The purpose of the study

The researcher who is affiliated with The University of Pretoria is conducting a research study aimed at investigating how the practices of mindfulness influences the skill and ability of mixed martial arts fighters. The construct of mindfulness, referring to the ability to remain constantly aware of ones' situation, will be explored from a cognitive approach so that better

understanding of the underlying mental processes involved in the workings of mindfulness can be brought to light and hence serve to possibly enhance ones' martial arts ability.

Participation

Should individuals agree to partake in the research study, each individual participant will be agreeing to completing a questionnaire measuring their levels of mindfulness and will be giving permission to the researcher to access their fight log book containing their fight records. The questionnaire will take between fifteen to twenty five minutes to complete. Your participation will be kept anonymous, which means that neither your name nor any other identifying details will be shared with anyone. If you wish to remain informed on the results of the study, you may contact the principal researcher for further information (contact details provided below).

The information gathered during the course of the research process will only be used for the purpose of the research study and will thereafter be stored in a safe location at the University of Pretoria for 15 years for archiving purposes.

If some of the words or concepts contained within this document are not familiar to you, or if you do not understand some or any of the information provided, please inform the researcher of this so that they may provide a clearer explanation. Furthermore, your participation in this study is voluntary, which means that you may withdraw at any time without having to offer an explanation and without any consequences to you.

Any further questions regarding the research study may be directed to its principal investigators:

Andley Wu

0836360797

andleywu@hotmail.com

Clare Schur (supervisor)

0793993293

clare.schur@up.ac.za

RESEARCH STUDY: Mindfulness and mixed martial arts

Part 2: Consent to participate

I hereby confirm that I have been informed about the nature and procedures, of the study. I also give permission that the information stored in my fight log book may be used, as explained in the information sheet. I am aware that the information will only be used for research purposes, and that my confidentiality will be protected. I agree to voluntarily participate in the study and I am aware that I can withdraw at any time without offering any explanation or suffering any consequences.

Participant name and signature _____

Date _____

Researcher signature _____

Date _____

Thank you for your participation!

Please complete in full.

General demographic information

Gender

- Male
- Female

Age

Ethnicity

- African (Black)
- White
- Coloured
- Asian
- Other (specify) _____

Home language:

- English
- Afrikaans
- Tswana
- Zulu
- Other (specify) _____

Education level:

- None
- Some high school
- Completed high school
- Further Education (specify) _____

Occupation

Marital Status:

- Married
- Single
- Divorced
- Separated
- Other (specify)_____

Appendix B: Five Facet Mindfulness Questionnaire

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1. Never or very rarely true
2. Rarely true
3. Sometimes true
4. Often true
5. Very often or always true

_____ 1. When I'm walking, I deliberately notice the sensations of my body moving.

_____ 2. I'm good at finding words to describe my feelings.

_____ 3. I criticize myself for having irrational or inappropriate emotions.

_____ 4. I perceive my feelings and emotions without having to react to them.

_____ 5. When I do things, my mind wanders off and I'm easily distracted.

_____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.

_____ 7. I can easily put my beliefs, opinions, and expectations into words.

_____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

_____ 9. I watch my feelings without getting lost in them.

_____ 10. I tell myself I shouldn't be feeling the way I'm feeling.

_____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

_____ 12. It's hard for me to find the words to describe what I'm thinking.

_____ 13. I am easily distracted.

_____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

_____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.

_____ 16. I have trouble thinking of the right words to express how I feel about things

_____ 17. I make judgments about whether my thoughts are good or bad.

_____ 18. I find it difficult to stay focused on what's happening in the present.

_____ 19. When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.

_____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

_____ 21. In difficult situations, I can pause without immediately reacting.

_____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

_____ 23. It seems I am “running on automatic” without much awareness of what I'm doing.

_____ 24. When I have distressing thoughts or images, I feel calm soon after.

_____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.

_____ 26. I notice the smells and aromas of things.

_____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 28. I rush through activities without being really attentive to them.

_____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.

_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

_____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

_____ 32. My natural tendency is to put my experiences into words.

_____ 33. When I have distressing thoughts or images, I just notice them and let them go.

_____ 34. I do jobs or tasks automatically without being aware of what I'm doing.

_____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

_____ 36. I pay attention to how my emotions affect my thoughts and behavior.

_____ 37. I can usually describe how I feel at the moment in considerable detail.

_____ 38. I find myself doing things without paying attention.

_____ 39. I disapprove of myself when I have irrational ideas.

Appendix C: P-P and Scatter Plots

