

**DEVELOPMENT AND VALIDATION OF  
MENTAL TOUGHNESS QUESTIONNAIRE  
AMONG VOLLEYBALL PLAYERS IN  
MALAYSIA**

**LIEW GUO CHEN**

**UNIVERSITI SAINS MALAYSIA**

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MENTAL TOUGHNESS QUESTIONNAIRE  
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MALAYSIA**

by

**LIEW GUO CHEN**

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## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENT</b> .....	<b>ii</b>
<b>TABLE OF CONTENTS</b> .....	<b>iv</b>
<b>LIST OF TABLES</b> .....	<b>ix</b>
<b>LIST OF FIGURES</b> .....	<b>xi</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>xii</b>
<b>ABSTRAK</b> .....	<b>xiii</b>
<b>ABSTRACT</b> .....	<b>xvi</b>
<b>CHAPTER 1 INTRODUCTION</b> .....	<b>1</b>
1.1 Background .....	1
1.2 Problem Statement .....	3
1.3 Rationale of the Study .....	4
1.4 Significance of the Study .....	5
1.5 Operational Definition .....	5
1.6 Research Objectives .....	7
1.7 Research Questions .....	7
1.8 Research Hypothesis .....	8
1.9 Proposed Factors of Mental Toughness .....	8
1.9.1 Definition of the Factors .....	9
<b>CHAPTER 2 LITERATURE REVIEW</b> .....	<b>10</b>
2.1 Introduction .....	10
2.2 Background .....	10
2.3 Definition and Attributes of Mental Toughness .....	13
2.4 Previous Measurement of Mental Toughness .....	21
2.4.1 Psychological Performance Inventory (PPI) .....	22
2.4.2 Mental Toughness Questionnaire 48 (MTQ-48) .....	23
2.4.3 Psychological Performance Inventory-Alternative (PPI-A) .....	24
2.4.4 Mental Toughness Inventory (MTI) .....	25

2.4.5	Sport Mental Toughness Questionnaire (SMTQ) .....	25
2.4.6	Australian Football Mental Toughness Inventory (AfMTI) .....	26
2.4.7	Cricket Mental Toughness Inventory (CMTI) .....	27
2.5	Relationship between Mental Toughness and Other Variables .....	28
2.5.1	Anxiety .....	28
	2.5.1(a) Revised Competitive State Anxiety Inventory-2 (CSAI-2R) .....	30
2.5.2	Motivation .....	31
	2.5.2(a) Sport Motivation Scale-II (SMS-II) .....	34
2.5.3	Sustained Attention .....	35
	2.5.3(a) Digit Vigilance Test (DVT) .....	36
2.6	Final Framework of Mental Toughness .....	38
<b>CHAPTER 3 METHOD</b> .....		<b>39</b>
3.1	Introduction .....	39
3.2	Study Design .....	39
3.3	Study Duration .....	39
3.4	Study Location .....	39
3.5	Sampling Method .....	40
3.6	Sample Size Calculation .....	40
3.7	Participants .....	41
	3.7.1 Phase 1 .....	41
	3.7.2 Phase 2 .....	42
3.8	Measures .....	42
	3.8.1 Mental Toughness Questionnaire-48 (MTQ-48) .....	43
	3.8.2 Revised Competitive Sport Anxiety Inventory-2 (CSAI-2R) .....	44
	3.8.3 Sport Motivation Scale-II (SMS-II) .....	45
	3.8.4 Digit Vigilance Test (DVT) .....	46
3.9	Study Procedures .....	47
	3.9.1 Item Construction Procedure .....	47

3.9.2	Questionnaire Validation Procedure .....	48
3.10	Statistical Analyses .....	50
3.11	Study Flow Chart .....	52
<b>CHAPTER 4</b>	<b>RESULTS .....</b>	<b>53</b>
4.1	Introduction .....	53
4.2	Sample Description .....	53
4.2.1	Phase 1 .....	53
4.2.2	Phase 2 .....	54
4.3	Preliminary Data Analysis .....	55
4.3.1	Phase 1 .....	55
4.3.2	Phase 2 .....	57
4.4	Primary Results of Phase 1 .....	58
4.4.1	Confirmatory Factor Analysis .....	58
4.4.2	Internal Consistency .....	62
4.4.3	Test-Retest Reliability .....	62
4.4.4	Correlation between Subscales of the Newly Developed Questionnaire with MTQ-48, CSAI-2R, SMS-II and DVT .....	66
4.5	Primary Results of Phase 2 .....	67
4.5.1	Confirmatory Factor Analysis .....	67
4.5.2	Internal Consistency .....	68
4.5.3	Correlation between Subscales of the Newly Developed Questionnaire with MTQ-48, CSAI-2R, SMS-II and DVT .....	71
4.5.4	Mental Toughness Level of Volleyball Players .....	72
<b>CHAPTER 5</b>	<b>DISCUSSION .....</b>	<b>75</b>
5.1	Introduction .....	75
5.2	Data Collection and Data Management .....	75
5.3	Sample Size .....	76
5.4	Participant's Demographic and Characteristics .....	77
5.4.1	Phase 1 .....	77
5.4.2	Phase 2 .....	78

5.5	Primary Finding of Phase 1 .....	78
5.5.1	Confirmatory Factor Analysis .....	78
5.5.2	Internal Consistency .....	80
5.5.3	Test-Retest Reliability .....	80
5.5.4	Correlation between Subscales of the Newly Developed Questionnaire with MTQ-48, CSAI-2R, SMS-II and DVT .....	81
5.6	Primary Finding of Phase 2 .....	82
5.6.1	Confirmatory Factor Analysis .....	82
5.6.2	Internal Consistency .....	83
5.6.3	Correlation between Subscales of the Newly Developed Questionnaire with MTQ-48, CSAI-2R, SMS-II and DVT .....	84
5.6.4	Mental Toughness Level of Volleyball Players .....	86
5.7	Conclusion .....	86
<b>CHAPTER 6 SUMMARY AND CONCLUSION .....</b>		<b>88</b>
6.1	Introduction .....	88
6.2	Summary of The Research and Key Findings .....	88
6.3	Strengths and Limitation of the Study .....	90
6.4	Implication of the Research .....	92
6.5	Future Research Direction .....	93
<b>REFERENCES .....</b>		<b>95</b>
<b>APPENDICES</b>		
APPENDIX A: HUMAN ETHICAL APPROVAL LETTER		
APPENDIX B: ETHICS COMMITTEE		
APPENDIX C: KEMENTERIAN PENDIDIKAN MALAYSIA (APPROVAL LETTER)		
APPENDIX D: JABATAN PENDIDIKAN NEGERI SARAWAK (APPROVAL LETTER)		
APPENDIX E: RESEARCH INFORMATION (PARENTAL INFORMATION AND CONSENT)		
APPENDIX F: PARENTS/GUARDIAN INFORMATION AND CONSENT FORM (UNDER 15 YEARS OLD)		



APPENDIX G: PARENTS/GUARDIAN MATERIAL'S PUBLICATION CONSENT FORM (UNDER 15 YEARS OLD)

APPENDIX H: RESEARCH INFORMATION

APPENDIX I: PARTICIPANT'S INFORMATION AND CONSENT FORM

APPENDIX J: PARTICIPANT'S MATERIAL PUBLICATION CONSENT FORM

APPENDIX K: QUESTIONNAIRES AMONG STATE TEAM ATHLETES AND VOLLEYBALL PLAYERS FROM SCHOOL, UNIVERSITY, DISTRICT, STATE AND NATIONAL TEAM

Section A: Socio-Demographic Data

Section B: CSAI-2R

Section C: SMS-II

Section D: MTQ-48

Section E: DVT

Section F: MMTQ – V

APPENDIX L: RESEARCH POSTER

APPENDIX M: PHOTOS

**LIST OF PUBLICATIONS**

## LIST OF TABLES

	<b>Page</b>
Table 3.1	No. of items for each of the MTQ-48 subscales ..... 44
Table 3.2	No. of items for each of the CSAI-2R subscales ..... 45
Table 3.3	No. of items for each of the SMS-II subscales ..... 46
Table 4.1	Summary of response rate – Phase 1 ..... 54
Table 4.2	Summary of response rate – Phase 2 ..... 54
Table 4.3	Demographic characteristics of the athletes who represented any state team in Malaysia ..... 56
Table 4.4	Demographic characteristics of the volleyball players who represented school, university, district, state and national teams in Malaysia ..... 58
Table 4.5	Model Fit Indices for 6 models of measurement model ..... 59
Table 4.6	Standardised Item Loading for five models of measurement model ..... 60
Table 4.7	Standardised Item Loading and reliability for model-6 ..... 63
Table 4.8	Correlation between subscales of the newly developed questionnaire with MTQ-48, CSAI-2R, SMS-II, and DVT – Phase 1 ..... 66
Table 4.9	Model Fit Indices for the measurement model ..... 67
Table 4.10	Standardised Item Loading and reliability for the measurement model ..... 68
Table 4.11	Correlation between subscales of the newly developed questionnaire with MTQ-48, CSAI-2R, SMS-II, and DVT – Phase 2 ..... 71

Table 4.12	One-Way ANOVA results for mental toughness level of volleyball players .....	72
Table 4.13	Post-Hoc LSD for self-confidence level of volleyball players .....	74
Table 4.14	Post-Hoc LSD for sustained attention level of volleyball players ...	74

## LIST OF FIGURES

	<b>Page</b>
Figure 1.1 Proposed components of mental toughness .....	9
Figure 2.1 Final framework of mental toughness .....	38
Figure 3.1 Study Flow Chart .....	52
Figure 4.1 Path diagram for the latent and observed variables in the CFA – Phase 1 .....	65
Figure 4.2 Path diagram for the latent and observed variables in the CFA – Phase 2 .....	70

## LIST OF ABBREVIATIONS

AfMTI	Australian Football Mental Toughness Inventory
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMTI	Cricket Mental Toughness Inventory
CSAI-2R	Revised Competitive State Anxiety Inventory-2
DVT	Digit Vigilance Test
ESEM	Exploratory Structural Equation Modeling
ICC	Intraclass Correlation Coefficient
MTI	Mental Toughness Inventory
MTQ-48	Mental Toughness Questionnaire 48
PPI	Psychological Performance Inventory
PPI-A	Psychological Performance Inventory-Alternative
RMSEA	Root Mean Square Error of Approximation
SEA	Southeast Asian Games
SMS-II	Sport Motivation Scale-II
SMTQ	Sport Mental Toughness Questionnaire
SRMR	Standardised Root Mean Square Residual
TLI	Tucker Lewis Index
MMTQ-V	Malaysia Mental Toughness Questionnaire – Volleyball
USM	Universiti Sains Malaysia

**PEMBANGUNAN DAN VALIDASI SOAL SELIDIK KETAHANAN MENTAL  
DALAM KALANGAN PEMAIN BOLA TAMPAR DI MALAYSIA**

**ABSTRAK**

Prestasi atlet sering dipengaruhi oleh pelbagai faktor psikologi dan ia harus diberi perhatian yang serius bagi memastikan tahapnya yang maksimum semasa pertandingan. Ketahanan mental merupakan salah satu faktor psikologi yang mempengaruhi prestasi atlet dan biasa dibincang dalam kalangan ahli psikologi sukan. Pembangunan dan pemupukan faktor ketahanan mental ini telah menunjukkan bahawa ia boleh membantu atlet untuk mengawal pemikiran, kata-kata, tindakan, dan emosi mereka yang seterusnya membawa kepada pencapaian sukan yang optimum. Sejak kebelakangan ini, dalam pengetahuan kami, tiada kajian yang telah dijalankan untuk mengkaji ketahanan mental dalam kalangan pemain bola tampar di Malaysia. Oleh itu, bagi memahami konsep abstrak seperti ketahanan mental, instrumen pengukuran amat diperlukan. Selain itu, memandangkan tiada instrumen pengukuran khusus bagi atlet bola tampar, adalah sangat penting untuk menghasilkan soal selidik yang sesuai untuk menilai ketahanan mental mereka. Dalam kajian ini, penyelidik memberi tumpuan kepada ketahanan mental yang terdapat dalam kepustakaan untuk mencari faktor-faktor ketahanan mental yang paling konsisten. Berdasarkan faktor-faktor ini, satu instrumen pengukuran dihasilkan dan disahkan. Kajian ini berhasrat untuk mengenal pasti ciri-ciri ketahanan mental khusus bagi pemain bola tampar di Malaysia. Kajian ini bermula dengan proses pembinaan soalan yang melibatkan lima orang pakar bagi menilai kesesuaian soalan yang ada kaitan dengan faktor-faktor yang dicadangkan. Pakar-pakar juga telah diminta untuk memilih 10 soalan yang paling sesuai dan relevan bagi setiap

faktor yang dicadangkan. Seterusnya, berdasarkan 40 soalan yang terpilih ini, lima orang lagi pakar psikologi sukan, jurulatih dan pemain bola tampar elit negara yang mempunyai pengalaman lebih kurang lima belas tahun telah dikenalpasti untuk membuat penilaian terhadap kandungan soalan yang dipilih. Kajian ini menggunakan reka bentuk kajian rentas untuk mengesahkan soal selidik yang dihasilkan bagi mengukur faktor-faktor yang berkaitan dengan ketahanan mental. Kajian ini terbahagi kepada dua fasa. Fasa 1 dijalankan dalam kalangan atlet berdaya saing yang mewakili pasukan negeri di Malaysia. Seterusnya, kajian Fasa 2 dijalankan dalam kalangan pemain bola tampar yang pernah mewakili sekolah, universiti, daerah, negeri dan kebangsaan. Dengan menggunakan persampelan secara “purposive”, peserta dimaklumkan bahawa penyertaan mereka adalah secara sukarela. Mereka yang berminat telah melengkapkan soal selidik yang disediakan. Data statistik deskriptif telah dianalisis dengan menggunakan SPSS 25, dan Mplus versi-8 telah digunakan untuk “Confirmatory Factor Analysis” (CFA). Perbezaan purata kesan faktor ketahanan mental terhadap tahap penglibatan pemain bola tampar telah dianalisis dengan menggunakan satu hala ANOVA. Hasil analisis mendapati empat faktor yang paling konsisten melalui proses penumpuan iaitu kawalan perhatian, kepercayaan sendiri, komitmen dan keinginan untuk berjaya. Dalam Fasa 1, seramai 404 atlet peringkat negeri telah mengambil bahagian (lelaki 66.1%, wanita 33.9%) dengan usia purata 16.44 (SD = 2.57). Dalam cubaan menguji ukuran model soal selidik yang baru dihasilkan, model akhir mengandungi 35 soalan yang mempunyai keputusan data yang baik [CFI = .897, TLI = .891, SRMR = .052, RMSEA (90% CI) = .042 (.038, .046)]. Koefisien konsistensi dalaman yang diukur oleh “Cronbach’s alpha” ialah .849 bagi kawalan perhatian, .837 bagi kepercayaan diri, .867 bagi komitmen dan .849 bagi keinginan untuk berjaya. Nilai “Intraclass Correlation Coefficient” (ICC) untuk kebolehppercayaan

ujian-ujian semula faktor-faktor soal selidik yang baru dihasilkan berada dalam julat antara .620 hingga .727. Dalam Fasa 2, seramai 272 pemain bola tampar dari peringkat sekolah, universiti, daerah, negeri dan kebangsaan telah mengambil bahagian (lelaki 56.6%, perempuan 43.4%) dengan usia purata 17.33 (SD = 3.96). Dalam cubaan menguji ukuran model soal selidik yang baru dihasilkan, model akhir mengandungi 35 soalan yang mempunyai keputusan data yang baik [CFI = .903, TLI = .901, SRMR = .055, RMSEA (90%CI) = .046 (.041, .052)]. Koefisien konsistensi dalaman yang diukur oleh “Cronbach’s alpha” ialah .845 bagi kawalan perhatian, .850 bagi kepercayaan diri, .870 bagi komitmen dan .849 bagi keinginan untuk berjaya. Terdapat perbezaan min yang signifikan antara tahap ketahanan mental pemain bola tampar sekolah, universiti, daerah, negeri dan kebangsaan dari segi keyakinan diri dan kawalan perhatian. Dapatan ini menunjukkan bahawa soal selidik yang baru dihasilkan dapat digunakan untuk menilai tahap ketahanan mental pemain bola tampar di Malaysia. Maklumat yang baru ini adalah penting kepada ahli psikologi sukan dan jurulatih negara kita supaya mereka boleh menerapkan ketahanan mental dalam kalangan atlet negara kita bagi meningkatkan prestasi sukan mereka.



**DEVELOPMENT AND VALIDATION OF MENTAL TOUGHNESS  
QUESTIONNAIRE AMONG VOLLEYBALL PLAYERS IN MALAYSIA**

**ABSTRACT**

Athletes' performance is often affected by various psychological factors, which should be taken seriously to ensure peak performance during competitions. Mental toughness is one of the psychological attributes commonly discussed by sport psychologists to influence athletic performance. Developing and nurturing these attributes can help athletes to control their thoughts, words, actions, and emotions, which will ultimately lead to optimal athletic achievement. Currently, to the best of our knowledge, no studies have been conducted to examine mental toughness among volleyball players in Malaysia. Understanding an abstract concept, such as mental toughness, requires a sound measurement instrument. Moreover, given the lack of specific measurement instruments in volleyball, it is crucial to develop an appropriate questionnaire to assess mental toughness for this sport. In this study, the present researcher is attempting to converge the available literature in the research of mental toughness to find the most consistent predictors of mental toughness. Based on these predictors, a measurement instrument has been developed and validated. This study hopes to identify the attributes of mental toughness, specifically for the Malaysian volleyball players. The study began with the item construction procedure, which involved five experts in assessing the relevance of the initial items to the proposed subscales. The experts were asked to select 10 most appropriate and relevant questions for each factor. Next, based on these 40 selected items, another five experts in the field of sport psychology, coaching, and elite volleyball national players with approximately

fifteen years' experience were identified to provide expert assessment regarding the content of the initially selected items. The present study employed a cross-sectional study design, validating the developed questionnaire to measure pertinent factors related to mental toughness. It was divided into two phases. Phase 1 was conducted among competitive athletes who represented the state team in Malaysia. This is followed by Phase 2, which was conducted among volleyball players who represented teams from school, university, district, state, and national levels. Using purposive sampling, the participants were informed that their participation was entirely voluntary; those who were interested completed the self-administered questionnaires. The data were analysed using SPSS 25 for descriptive statistics, and Mplus version-8 was used for the confirmatory factor analysis. The mean differences of the mental toughness subscales among the volleyball players' levels of involvement were analysed using one-way ANOVA. The results found four most consistent factors through the converging process, namely attention control, self-belief, commitment, and desire for success. For Phase 1, a total of 404 state-level athletes participated in the study (males 66.1%, females 33.9%), with a mean age of 16.44 (SD=2.57). In the testing measurement model of the newly developed questionnaire, the final model consisted of 35 items, which resulted in a good fit to the data [CFI = .897, TLI = .891, SRMR = .052, RMSEA (90%CI) = .042 (.038, .046)]. The internal consistency coefficients measured using Cronbach's alpha were .849 for attention control, .837 for self-belief, .867 for commitment and .849 for the desire to succeed. The ICC value for the test-retest reliability ranged from .620 to .727 among the newly developed questionnaire subscales. For Phase 2, a total of 272 volleyball players from school, university, district, state, and national levels participated in the study (males 56.6%, females 43.4%), with a mean age of 17.33 (SD=3.96). In the testing measurement model of the newly developed questionnaire, the final model

consisted of 35 items that resulted in a good fit to the data [CFI = .903, TLI = .901, SRMR = .055, RMSEA (90%CI) = .046 (.041, .052)]. Internal consistency coefficients measured by Cronbach's alpha were .845 for attention control, .850 for self-belief, .870 for commitment and .849 for the desire to succeed. There was a significant mean difference between the mental toughness levels of volleyball players from school, university, district, state, and national levels in self-confidence and sustained attention. The findings indicated that the newly developed questionnaire could be used to assess the mental toughness levels of volleyball players. This newly developed information is important for the sport psychologists and coaches of our nation so that they could apply it to our national athletes to improve their sporting performance.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Sport is form of physical activity that requires an extent of physical exertion to obtain its optimal form. The development of sport related skills has often focus on its physical and technical components and ignoring the role internal or psychological factors, which is also an important influence on mastery of sport. An athlete's success or failure is dependent on the combination of physical and psychological abilities.

Psychological factors had been accepted all over the world as one of the influential factors in sport (Brewer, 2009). It was also supported by Ragab (2015) stated that “it is widely accepted that sports performance is also influenced in great measure by psychological factors” (pp. 431-435). In addition, the importance of psychological factor to sport performance is evidence from the growing number of sports psychologists and mental trainers around the world. Furthermore, this provide another major milestone in the development of the sport.

Sport psychologists attempt to understand the psychological attributes of elite athletes in many ways. According to Gould, Hodge, Peterson, and Petlichkoff (1987), in sports such as wrestling, psychological attributes such as mental toughness accounted for 82% in terms of the importance of success. This notion is supported by Gould, Dieffenbach, and Moffett (2002) in a study on ten Olympians’ which showed that mental toughness as one of the highest ranked psychological attributes which needed to be mastered for athletes to attain peak performances.

Mental toughness, as described by Olympic champions and various elite athletes throughout sport psychology literature, generally refers to the ability of an athlete to cope effectively with training and competition demands in an effort to remain resilient (Bull, Albinson, & Shambrook, 1996; Connaughton, Wadey, Hanton, & Jones, 2008; Fourie & Potgieter, 2001; Gould et al., 2002; Jones, Hanton, & Connaughton, 2007; Thelwell, Weston, & Greenless, 2005). It is one of the major attributes in sport psychology which is often associated with outstanding athletic performances (Creasy, 2005; Golby & Sheard, 2004; Jones, Hanton, & Connaughton, 2002; 2007).

Jones et al. (2002) conceptualise mental toughness in a more comprehensive perspective by defining it as “the psychological edge that enables one to cope with competition, training and lifestyle demands; and be more consistent and better than the opponents’ coping mechanisms. It helps the athlete to remain determined, focused, confident, and in control under pressure” (p. 209). In competitive sports, to maintain the competitiveness, mental toughness is an important factor and requirement for each athlete (Kuan & Roy, 2007). This might be due to a person or athlete with robust mental toughness is more ambitious in competition and keep struggle regardless of any situation that can bring beneficial impact to the teams or organisations (Perry, Clough, Crust, Earle, & Nicholls, 2013).

Understanding of abstract concept such as mental toughness require a sound measurement instrument. Indeed, this has led to the development of a number of questionnaires in the attempt to quantify and measure mental toughness. These include the 42-item Psychological Performance Inventory (PPI; Loehr, 1986), the 48-item Mental Toughness Questionnaire-48 (MTQ-48; Clough, Earle, & Sewell, 2002), the

14-item Psychological Performance Inventory-A (PPI-A; Golby, Sheard, & Van Wersch, 2007), the 36-item Mental Toughness Inventory (MTI; Middleton, Marsh, Martin, Richards, & Perry, 2004), the 14-item Sport Mental Toughness Questionnaire (SMTQ; Sheard, Golby, & Wersch, 2009), the 24-item Australian Football Mental Toughness Inventory (AFMTI; Gucciardi, Gordon, & Dimmock, 2009b), and the 15-item Cricket Mental Toughness Inventory (CMTI; Gucciardi & Gordon, 2009). However, these questionnaires measure general conceptualisation of mental toughness. In order for us to understand the need for specific group, such as volleyball, a specific instrument may be needed.

Therefore, further research need to be undertaken to identify the importance of mental toughness specifically for volleyball players as it is one major sport in the world. Thus, the aim of the research is to develop a mental toughness questionnaire specifically for Malaysian volleyball players. Such a questionnaire would benefits future research and application with various groups of volleyball players, helping sport psychologists and coaches establish a better understanding of how to improve their players' sporting performance and to achieve their goals.

## **1.2 Problem Statement**

A growing number of empirical evidence support the notion that mental toughness is essential to consistent success in sport (Blakesless & Goff, 2007; Mamassis & Doganis, 2004; Patrick & Hrycaiko, 1998; Thelwell, Such, Weston, Such, & Greenlees, 2010; Turner & Barker, 2013). Developing and nurturing this attributes has shown to help athletes to control their thoughts, words, actions, and emotions, which will ultimately lead to optimal athletic achievement (Loehr, 1994). Currently, in the best of our knowledge, we found no study have been conducted to examine

mental toughness among volleyball players in Malaysia. Besides, emergence the news of Malaysia volleyball team in Southeast Asian Games (SEA) 2017 whereby the headcoach said the players look suspects under pressure during the pre-SEA Games competition and still need to improve on their mental toughness. Then, the researcher was thinking to come out with an instrument to measure the mental toughness among the volleyball players which could help the coaches to establish a better understanding and improve their players sporting performance. As previously stated, understanding of this attribute require a sound measurement instrument. Moreover, given a lack in volleyball specific measurement instrument, it is crucial to develop an appropriate questionnaire in assessing the mental toughness for this sport. The potential knowledge that may be generated from this research may help sport psychologists and volleyball coaches of our nation to improve our national sports performance, specifically for volleyball.

### **1.3 Rationale of the Study**

As a growing sport discipline in Malaysia, sport psychology researchers and practitioners ought to focus on a number of crucial psychology attributes such as mental toughness. Nurturing this attributes may provide athletes with strong mental readiness to gain a winning edge over their opponents. Therefore, examining the impact of mental toughness in sports performance among the volleyball players need to be given attention. In this study, the present researcher is attempting to converge the literature available in mental toughness in order to find the most consistent predictors of mental toughness. Then, based on these predictors, a measurement instrument has been be developed and validated, this study hopes to identify the attributes of mental toughness specifically for the Malaysian volleyball players.

#### **1.4 Significance of the Study**

A well-developed questionnaire in assessing the levels of mental toughness in enhancing the athletes' performance is crucial; this research will give insight to the sport psychology, sport ministry, sports association and coaches in improving the sport performance in our country especially for volleyball. As volleyball is one of the sports where children and teenagers tend to get involved with, it is possible to create a next iconic sportsman from the Malaysian volleyball players, who will be able to compete at the international level.

#### **1.5 Operational Definition**

Mental toughness:

- Is one of the important psychological factors, which have the ability to give a positive impact on athletes' performance.
- In this research study, mental toughness was measured by self-administered questionnaire consists of four consistent factors derived from the literature review which are attention control, self-belief, commitment and desire to success. In addition, mental toughness also used to examine the relationship between other mental toughness scale (Mental Toughness Questionnaire-48; MTQ-48), anxiety (Revised Competitive State Anxiety Inventory-2; CSAI-2R), motivation (Sport Motivation Scale-II; SMS-II) and sustained attention (Digit Vigilance Test; DVT).
- The MTQ-48 developed to operationalise Clough et al.'s (2002) 4Cs' conceptualisation of mental toughness. This questionnaire has been widely used in research (e.g., Crust, 2009; Crust & Azadi, 2009; 2010; Crust & Clough, 2005; Horsburgh, Schermer, Veselka, & Vernon, 2009; Nicholls,



Polman, Levy & Backhouse, 2008; 2009). The MTQ-48 assesses total mental toughness and six subcomponents: challenge, commitment, interpersonal confidence, confidence in own abilities, emotional control, and life control.

- Anxiety can be defined as a feeling of tension and fear that an individual experiences in response to perceived threats (Martens, Vealey, & Burton, 1990). The CSAI-2R; Cox, Martens, & Russell, 2003) has been the measure of choice of competition anxiety in most studies (Bagherpour & Hashim, 2018; Hajji & Elloumi, 2017; Hashim & Baghepour, 2016; Hashim & Zulkifli, 2010; Liew, Hashim, Chin, Kueh & Kuan, 2019; Martinent, Ferrand, Guillet & Gauthier, 2010; Raudsepp & Kais, 2008). The CSAI-2R, was to use to measures cognitive and somatic anxiety and self-confidence has been considered a reliable inventory.
- Self-determination theory (SDT) has been widely used for studying athlete motivation (Mayorga-Vega & Viciano, 2014; Mesquita, Farias, & Hastie, 2012; Navas, Soriano, & Holgado, 2012). The SMS-II, based on the SDT multidimensional scale, was developed to assess athlete motivation. The SMS-II composed of six factors: intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external motivation, and amotivation.
- Attention is primarily described as the selection of relevant stimuli and the selective structuring of the field of perception (e.g., Knudsen, 2007; Smith & Kosslyn, 2007). Emerging here is a classification of four different attentional sub-processes, which include attentional orientation, selective attention, divided attention, and sustained attention (Memmert, 2009). In sport settings, sustained attention play an important role because athlete involves focusing

mental effort on relevant environmental cues, and maintaining that attention. Sustained attention is the ability to maintain attention that allows direct and focus cognitive activity on specific stimuli over extended periods of time. The DVT is a common task that has been used to examine the ability to sustain focused attention.

## **1.6 Research Objectives**

### **General Objective**

To develop and validate a measure of mental toughness among the Malaysian volleyball players.

### **Specific Objectives**

1. To develop a mental toughness questionnaire specifically for the Malaysian volleyball players.
2. To examine the validity and reliability of the newly developed mental toughness questionnaire on other validated related mental toughness subscales.
3. To examine the mean differences between the mental toughness levels of volleyball players from school, university, district, state and national team.

## **1.7 Research Questions**

1. What are the consistent factors associated with mental toughness?
2. How valid and reliable of the developed questionnaire to measure the factors associated with mental toughness among the Malaysian volleyball players?

3. Is there any differences between the mental toughness levels of volleyball players from school, university, district, state and national team?

### **1.8 Research Hypothesis**

1. The most consistent factors associated with mental toughness from the literature were attention control, self-belief, commitment and desire to success.
2. The developed mental toughness questionnaires are valid and reliable to measure the mental toughness among the Malaysian volleyball players.
3. There are no differences between the mental toughness levels of volleyball players from school, university, district, state and national team?

### **1.9 Proposed Factors of Mental Toughness**

The researcher begun the study by focusing on the comprehensive review of mental toughness literature. From these comprehensive review, seven measures of mental toughness which are Psychological Performance Inventory (PPI; Loehr, 1986), Mental Toughness Questionnaire-48 (MTQ-48; Clough, Earle, & Sewell, 2002), Psychological Performance Inventory-A (PPI-A; Golby, Sheard, & Van Wersch, 2007), Mental Toughness Inventory (MTI; Middleton, Marsh, Martin, Richards, & Perry, 2004), Sport Mental Toughness Questionnaire (SMTQ; Sheard, Golby, & Wersch, 2009), Australian Football Mental Toughness Inventory (AFMTI; Gucciardi, Gordon, & Dimmock, 2009b) and Cricket Mental Toughness Inventory (CMTI; Gucciardi & Gordon, 2009) were indentified. Then, based on these measures, the researcher identify the four most consistent factors used in the mental toughness framework.

### 1.9.1 Definition of the Factors

In this thesis, the definition of the mental toughness factors relate to; (1) Attention control, which describes the ability of the athletes' to sustain attention and concentrate on a task despite facing distractions; (2) Self-belief, which reflects the athletes' belief and confidence in their own abilities to perform in any circumstance; (3) Commitment, which describes the ability to persist to a purpose despite obstacles or difficulties; (4) Desire to success, which reflects the athletes' insatiable desire and determination to pursue personal best performance and achieve success.

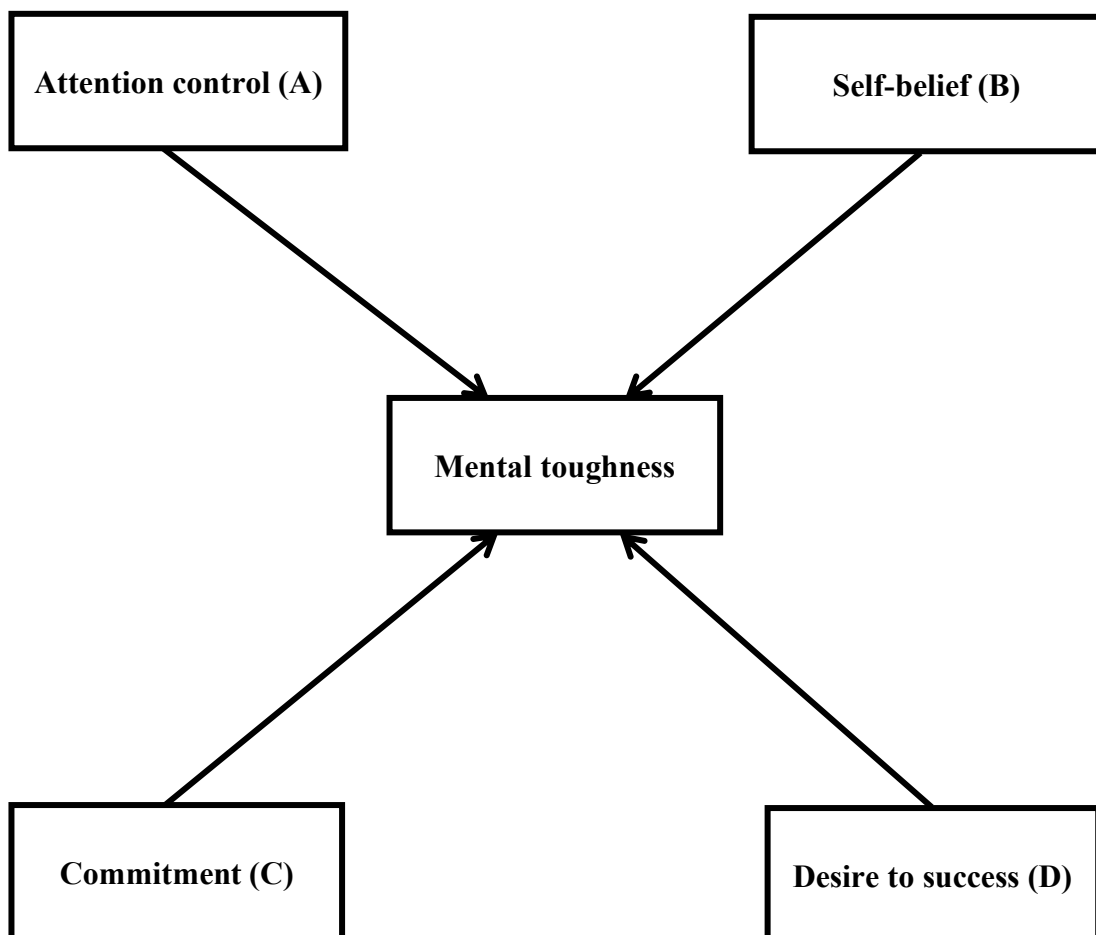


Figure 1.1 Proposed factors of mental toughness

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents a review of the literature to develop a comprehensive picture of what is presently known about the topic under investigation. The literature review is a summary and critical analysis of research and non-research literature, which are relevant to the subject being studied. It also recognised gaps or inconsistency between existing knowledge, thus helping to inspire research ideas (Cronin, Ryan & Coughlan, 2008). The review was organised into five sections covering topics supporting or disagreeing with the study's hypotheses (see previous chapter section 1.8). The first section focuses on the background's early conceptualisation of mental toughness, the second section focuses on the definition and attributes of mental toughness, and third, on previous measurement of mental toughness. The fourth section focuses on the relationship between mental toughness and other variables (anxiety, motivation and sustained attention) and the final section focuses on the details of the study's conceptual framework on mental toughness.

#### **2.2 Background**

Athletes' performance is often being affected by various psychological factors, which should be taken seriously as one of the ways to ensure that they can perform to their peak performance (Kuan, Morris, Kueh & Terry, 2018). Mental toughness is the psychological attribute that is commonly discussed among sport psychologists, especially in the area of the significant influence on athletic performance (Weinberg, Freysinger, Mellano & Brookhouse, 2016). An athlete who has a high level of mental

toughness is expected to show better performance compared to the ones with a low level of psychological attributes (Liew, Kuan, Chin & Hashim, 2019). It was found that there are various studies which linked mental toughness to the specific discipline of sport, such as rugby (Golby & Sheard, 2004), soccer (Thelwell et al., 2005), and cricket (Bull, Shambrook, James & Brooks, 2005). Most of these studies were conducted specifically to the sport and only confined to the sport concerning the definition, opinions, effects and relations of mental toughness in the sports, which were done at different levels of athletes with the coaches and sport psychologists. Consequently, their definition is different and could not correlate to other sports and levels of the mental toughness. Therefore, a collective mental toughness, which applies to other sports should be created.

The first academic reference to the concept of mental toughness was created by Cattell, Blewett and Beloff (1955) who suggested “tough-mindedness” was a culturally or environmentally determined personality trait seen as the fundamental to success. It was purported to being one of sixteen primary source traits that described personality, Cattell (1957) viewed tough-minded individuals as self-reliant, realistic and responsible, and contrasted this with emotional sensitivity. This view was supported by suggestions that “the athlete who are mentally tough are somewhat insensitive to the feelings and problems of others” (Tutko & Richards, 1971, p.46), and that “being able to handle pressure off the field can help you be mentally tough on it” (Tapp, 1991, p.45). Whilst others supported the notion that mental toughness was a personality trait (Kroll, 1967, Werner & Gottheil, 1966), others have challenged this (Dennis 1978), with some purporting that the construct is simply a state of mind (Gibson, 1998) or even just a set of psychological attributes (Bull et al., 1996).

Most elite athletes testified that at least 50% of their superior athletic performance was the result of mental or psychological factors that reflect the phenomenon of mental toughness (Loehr, 1982; 1986), whereas 82% of wrestling coaches rated mental toughness as the most important psychological attributes for determining competitive success (Gould et al., 1987). The extensive work of Loehr (1982; 1986; 1995) advocated that mental toughness is important for those athletes who achieved ultimate success, and illustrated that mentally tough athletes are usually consistently respond to problems, pressure, making mistakes and competition with the right attitude. According to Loehr (1986), mentally tough performers are disciplined thinkers who respond to pressure in ways which enables them to remain feeling relaxed, calm and energised simply because of the ability to sustain positive energy flow despite adversity. However, Loehr (1995) pointed out that mental toughness can be developed and acquired, and not just innate genetic traits (Gucciardi, Gordon, & Dimmock, 2009a).

One of the key advances toward a greater understanding of mental toughness appears to be the development of the valid and reliable measurement instruments. Although self-report measures of mental toughness are currently available, there are still concerns regarding the validity and reliability of the existing measures. It is apparent that no specifically instrument is available to assess the mental toughness among the volleyball players. Therefore, the purpose of this study was to develop and validate a mental toughness questionnaire specifically to measure mental toughness among the Malaysian volleyball players.

### **2.3 Definition and Attributes of Mental Toughness**

Mental toughness is the term whereby its definition has yet to reach a consensus among sport psychologists and researchers. Started from the 1980's, there were less than five definitions of mental toughness yielded by plenty of researchers and sport psychologists (Jones et al., 2002). Loehr (1982) defined mental toughness as, “mentally tough athletes respond in varying ways which enable them to remain feeling relaxed, calm, and energised because they have learned to develop two skills: first, the ability to increase their flow of positive energy (i.e., using energy positively) in crisis and adversity, and, second, to think in specific ways so that they have the right attitudes regarding problems, pressure, mistakes, and competition”. Then, Loehr (1986) published a model of mental toughness that included seven attributes: self-confidence, negative energy, attention control, visual and imagery control, motivation, positive energy, and attitude control. Although this model is conceptually appealing, Loehr offered very little rationale for the selection of the seven mental toughness factors.

Since then, Goldberg (1998) has redefined mental toughness as “the ability to stand tall in the face of adversity and being able to rebound from repeated setbacks and failures”. Interestingly, Fourie and Potgieter (2001) were believed to be the first to identify the psychological attributes that individuals considered to be associated with mental toughness in sport using a qualitative approach. In their study, written responses from 131 expert coaches and 160 elite athletes were collected. They responded to a series of open-ended questions requiring them to provide their best definitions and descriptions of mental toughness. Fourie and Potgieter's analyses of these written responses identified twelve components of mental toughness, including



motivation level, coping skills, confidence maintenance, cognitive skills, discipline and goal-directedness, competitiveness, possession of prerequisite physical and mental requirements, team unity, preparation skills, psychological hardiness, and ethics. Drawing from these results and Loehr's earlier work, what emerges is a multidimensional model of mental toughness, whereby a range of important skills or capacities relate to the construct of mental toughness. Fourie and Potgieter (2001) recognised that there were a wide variation in the way the coaches and athletes described attributes of mental toughness. For this reason, the researchers concluded by suggesting that further work was needed to finalise a working definition and to generate an ideal model of mental toughness.

In another qualitative study, Jones et al. (2002) came out with a trigger question, "what is this thing called mental toughness?" to initiate his study on definition and concept of mental toughness. Jones et al. (2002) employed Kelly's (1955) personal construct theory to understand how mental toughness is construed. In brief, this theory focuses on both the uniqueness of the individual and the processes common to all people. Furthermore, personal construct theory proposes that individuals strive to understand, interpret, anticipate, and control the world of experience in order to deal effectively with it (Kelly, 1955). In Jones et al. (2002) 's study, ten international performers did three stages of study procedures (Stage 1: focus group; Stage 2: individual interviews; and Stage 3: individual rating of definition). Then, Jones and colleagues (2002) ranked them according to the mental toughness attributes, just after they were explained in detail about the purpose of the study. As a result, Jones et al. (2002) create a mental toughness definition as:

Mental toughness is having the natural or developed psychological edge that enables athletes to:

1. Generally, cope better than the opponents with the many demands (competition, training, lifestyle) that sport places on a performer; and
2. Specifically, be more consistent and better than the opponents in remaining determined, focused, confident, and in control under pressure.

As a result of inductive thematic content analysis, twelve key attributes of mental toughness were also identified and ranked in order of its relevance:

1. Having an unshakable self-belief in the ability to achieve the competition goals.
2. Bouncing back from performance setbacks as a result of increased determination to succeed.
3. Having an unshakable self-belief that can possess unique qualities and abilities.
4. Having an insatiable desire and internalised motives to succeed.
5. Remaining fully-focused on the task at hand in the face of competition specific distractions.
6. Regaining psychological control following unexpected, uncontrollable events (competition-specific).
7. Pushing back the boundaries of physical and emotional pain, while still maintaining technique and effort under distress (in training and competition).
8. Accepting that competition anxiety is inevitable and knowing that can cope with it.

9. Thriving on the pressure of competition.
10. Not being adversely affected by others' good and bad performances.
11. Remaining fully-focused in the face of personal life distractions.
12. Switching a sport focus on and off as required.

The attributes above were related to the performance and lifestyle-related focus, self-belief, desire and motivation, and how a mentally tough performer deals with the pressure (external), anxiety (internal) and the hardship associated with top-level performance (i.e., physical and emotional pain). Subsequently, participants were asked to rank these in order of importance.

Differ from Jones et al. (2002), by adding the confidence element into the hardiness construct (i.e., commitment, control, challenge), Clough et al. (2002) come up with the 4Cs' conception of mental toughness. According to Clough et al. (2002), "Mentally tough individuals tend to be sociable and outgoing; as they are able to remain calm and relaxed, they are competitive in many situations and have lower anxiety levels than others. With a high sense of self-belief and an unshakeable faith that they can control their own destiny, these individuals can remain relatively unaffected by competition or adversity". There have been numerous reviews (Crust, 2009; Crust & Azadi, 2009; 2010; Crust & Keegan, 2010; Kaiseler, Polman & Nicholls, 2009; Levy, Polman, Clough, Marchant & Earle, 2006; Nicholls, et al., 2008; 2009) that support Clough et al.'s (2002) conceptualisation of mental toughness. This is probably due to the availability of a measuring tool developed to measure the four key components outlined in their model. However, there has also been a criticism of Clough et al.'s (2002) work. Specifically, their concepts of mental toughness are criticised as being founded on a theoretical framework of a hypothesised-related construct (with no in-depth rationale for drawing on hardiness theory) and use of a

sample that is not sport-based. This gives rise to doubt about the applicability of their model in sport (Gucciardi et al., 2009a).

Middleton et al. (2004; 2005) generated the components with the conceptualisation and definition of mental toughness from the perspectives and experiences of the 33 elite athletes and coaches from diverse sporting backgrounds. They defined mental toughness as “an unshakeable perseverance and conviction toward a common goal despite pressure or adversity” (Middleton et al., 2004). Middleton et al. (2004) affirmed that the concept of mental toughness as being multidimensional. They considered an athlete as being mentally tough when he/she possesses at least some of the 12 attributes of mental toughness outlined in their study. These include: self-efficacy, potential, mental self-concept, task familiarity, value, personal best, goal commitment, perseverance, task focus, positivity, stress minimisation, and positive comparisons. Their view of mental toughness defines the concept rather than describe what a mentally tough performer can do. Additionally, Middleton et al. (2005) contended that their model of mental toughness transcends beyond the application within sports settings.

A further attempt to investigate the definition and attributes of mental toughness was conducted by Bull et al. (2005). Bull et al. (2005) focused specifically on mental toughness in cricket players. They addressed two main objectives in their study which are to obtain a better understanding of what mental toughness is within cricketers and to identify how existing mentally tough English cricketers developed their mental toughness. They used qualitative procedures to interview 12 mentally tough cricketers. The participants were drawn from a total of 101 English cricketers who have been identified by coaches as having the most mentally tough cricketers of

the previous 20 years in English cricket. From their results, they presented a complex model of mental toughness that included four structural categories, each containing a number of themes related to overall mental toughness. These include environmental influence: parents, childhood, the need to earn success, opportunities to survive early setbacks, exposure to foreign cricket; tough character: resilient confidence, independence, self-reflection, competitiveness with self as well as others; tough attitudes: never-say-die mindset, go-the-extra-mile mindset, thrive on competition, belief in making a difference, exploit learning opportunities, willing to take risks, belief in quality preparation, determination to make the most of ability, self-set challenging targets; and tough thinking: thinking clearly-making good decisions, keeping perspective, honest self-appraisal and robust self-confidence-overcoming self-doubts, feeding off physical conditioning and maintaining self-focus.

In addition to previous definitions of mental toughness, Thelwell et al.'s (2005) research on mental toughness was geared towards examining the definition and attributes of mental toughness specifically within a soccer context. These researchers believed that exploring the concept of mental toughness within soccer might lead to different outcomes. They employed the same sampling procedure as Jones et al. (2002) by enlisting athletes who competed at the international level. Their findings affirmed the validity of the definition and attributes of mental toughness proposed by Jones et al. (2002). The soccer sample viewed mental toughness as enabling players to "always" cope better than their opponents rather than "generally" cope better, likewise they identified only ten attributes as opposed to Jones et al.'s (2002) twelve attributes. The following attributes emanated from this study and are presented in order of importance:

1. Having total self-belief at all times that one will achieve success.
2. Wanting the ball at all times (when playing well and not so well).
3. Having the ability to react to situations positively.
4. Having the ability to hang on and be calm under pressure.
5. Knowing what it takes to grind oneself out of trouble.
6. Having the ability to ignore distractions and remain focused.
7. Controlling emotions throughout the performance.
8. Having a presence that affects opponents.
9. Having everything outside of the game under control.
10. Enjoying the pressure associated with performance.

Another advancement of knowledge about mental toughness is the work of Jones et al. (2007), which extends beyond self-belief as the core of known attributes of mental toughness, Jones et al. (2007) conducted a follow-up study using a sample of super-elite sports performers (i.e., Olympic/World Champions) to expand the mental toughness knowledge base, and broadened the scope by including the perceptions of coaches and sport psychologists who had coached and consulted at that level. Results verified their earlier definition of mental toughness, and in doing so, also extended the list of attributes considered essential to the make-up of mental toughness to 30. These were subsequently categorised into 13 sub-components (e.g., belief, focus, using long-term goals as the source of motivation, controlling the training environment, and pushing oneself to the limit, handling pressure, regulating performance, staying focused, awareness and control of thoughts and feelings, controlling the environment, handling failure, handling success) of mental toughness, which were organised into a framework of mental toughness comprising four

dimensions; a general Attitude/mindset dimension, and three time-specific dimensions of training, competition, and post-competition.

In assessing the knowledge base of mental toughness, Gucciardi et al. (2009a) employed Personal Construct Psychology (PCP; Kelly, 1955) as a theoretical framework to construct the following definition;

“Mental toughness is a collection of experientially developed and inherent sport-specific and sport-general values, attitudes, behaviours, and emotions that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressures, challenges and adversities to consistently achieve his or her goals” (p. 278).

Gucciardi et al. (2009a) then developed a grounded theory of mental toughness that entails the interaction of three components deemed critical in the mental toughness in Australian football: characteristics, situations and behaviours. These components encompass 11 bipolar constructs of which seven were consistent with attributes forwarded by Jones et al. (2002): self-belief vs. self-doubt; self-motivated vs. extrinsically or unmotivated; tough attitude vs. weak attitude; concentration/focus vs. distractible/unfocused; resilience vs. fragile mindset; handling pressure vs. anxious and panicky; work ethic vs. lazy. Four other attributes were unique to this sample: personal values vs. poor integrity and philosophy; emotional intelligence vs. emotionally immaturity; sport intelligence vs. lack of sport knowledge; physical toughness vs. weak sense of toughness. According to Gucciardi et al. (2009a), the situational dimension captured in this research alludes to those events, both internal and external causing varying degrees of mental toughness (e.g., injury, fatigue). The

behaviours include overt actions of mentally tough footballers in situations demanding mental toughness (such as consistent performances, and superior decision making).

Gucciardi et al.'s (2009a) research differ from previous research by going beyond the definition and attributes of mental toughness and draws attention to the negative attributes perceived as mental weakness and highlighting situations influencing such behaviour. The authors concluded that mental toughness is a multidimensional construct with sport-specific dimensions. They suggested that knowledge about mental toughness will be gained from further studies with athletes from different sport codes.

#### **2.4 Previous Measurement of Mental Toughness**

In the domain of sport, the recognition and nurturing of mentally tough athletes have become a prime focus for many teams. Consequently, a need arises for psychometrically-sound instruments to assess mental toughness. Some researchers have focused on developing questionnaires to measure mental toughness for specific sport codes (e.g., Gucciardi et al., 2009b; Gucciardi & Gordon, 2009) and for sport in general (e.g., Clough et al., 2002; Golby et al., 2007). An obvious downside to the sport-specific approach is its limited usefulness (e.g., the Australian Football Mental Toughness Inventory and the Cricket Mental Toughness Inventory). It is important to note that no volleyball specifically measures of mental toughness has been developed. Therefore, the following discussion will focus mainly on general measurement of mental toughness.



### **2.4.1 Psychological Performance Inventory (PPI)**

Loehr (1986) constructed the initial mental toughness measurement tool, the Psychological Performance Inventory (PPI). This questionnaire was developed to operationalise Loehr's (1982) definition of mental toughness, which suggested that mentally tough athletes had learned or developed two important skills: first, the ability to increase their flow of positive energy when faced with adversity or a crisis; and second, to think in ways that promote the right attitudes to solve problems, or to deal with pressure, mistakes, or competition. The PPI contains 42 items and measures mental toughness via the seven subscales of self-confidence, negative energy, attention control, visualisation and imagery control, motivation, positive energy, and attitude control. Each subscale contains six items, each scored on a 5-point Likert scale, with scores for each subscale ranging from 6 to 30, and for total mental toughness ranging from 42 to 210. A number of studies (e.g., Golby, Sheard, & Lavalley, 2003; Golby & Sheard, 2004; Kuan & Roy, 2007; Lee, Shin, Han, & Lee; 1994) have employed the PPI as a measure of mental toughness on athletes.

From the initial work by Loehr (1986), more evidence (Golby et al., 2007; Middleton et al., 2004) have emerged in assessing the construct validity of the PPI. Middleton et al. (2004) study on 263 student-athletes reported inadequate psychometric properties for the PPI. Middleton et al. (2004) suggested that the PPI was not a psychometrically sound measure of mental toughness. Some criticism has been levelled at Middleton et al. (2004) for using a small sample size ( $N = 263$ ) for testing construct validity and the limited age range of the sample (12 – 17 years old). Golby et al. (2007) used a larger sample ( $N = 408$ ) with a wider age range (12 – 63 years old) to evaluate the psychometric properties of the PPI, and they reported a

similar lack of support as Middleton et al. (2004) for the factorial structure of the PPI. Besides, Gucciardi and Gordon (2011) also concluded that the psychometric evidence for the hypothesised measurement model of the PPI is not encouraging for its future use.

#### **2.4.2 Mental Toughness Questionnaire 48 (MTQ-48)**

Clough et al. (2002) developed the Mental Toughness Questionnaire-48 (MTQ-48) to work their own 4Cs model of mental toughness. They adopted the hardiness theory with its tenets (i.e., commitment, control and challenge) to conceptualise mental toughness. Emanating from their qualitative interviews, the authors redefined their conceptualisation of mental toughness from hardiness by adding the fourth component of “confidence” to propose a 4Cs model. These components include, challenge (the extent to which an individual interprets problems as opportunities for self-development); commitment (strong involvement in what one is doing); emotional control (keeping anxiety in check); life control (feeling and acting as if one is influential); confidence in abilities (a strong sense of self-belief and less dependency on external validation); and interpersonal confidence (being assertive when interacting with others).

The MTQ-48 contains 48 items that are scored on a 5-point Likert scale ranging from (1) strongly agree to (5) strongly disagree, with an average completion time between 10 and 15 minutes (Crust & Clough, 2005). The MTQ-48 has an overall test-retest coefficient of .90, with the internal consistency of the subscales (Control, Commitment, Challenge and Confidence) found to be .73, .71, .71, and .80 respectively (Clough, et al., 2002). The factor structure identified in their research is in line with key attributes prominent in the literature on mental toughness (Gucciardi,

Hanton & Mallett, 2012). Connaughton, Hanton, Jones, and Wadey (2008) suggested that Clough et al. (2002) MTQ-48 findings should be interpreted with caution because the rationale for the conceptualisation of mental toughness is essentially based on hardiness and confidence constructs and there was no demonstration of validity even if a sound conceptualisation was apparent.

### **2.4.3 Psychological Performance Inventory-Alternative (PPI-A)**

With the analyses revealing a lack of support for the hypothesised factor structure of the original PPI (Loehr, 1986), Golby et al. (2007) subsequently developed the Psychological Performance Inventory-Alternative (PPI-A), which represents four factors of mental toughness, namely determination, self-belief, positive cognition, and visualisation. Golby et al. (2007) used the responses (N = 408) from the original PPI study to generate the PPI-A. After using principal component analysis to find structure in their data, they used confirmatory factor analysis to assess the psychometric structure of the model. Collectively satisfying absolute and incremental fit index benchmarks, the inventory possesses satisfactory psychometric properties, with adequate reliability and convergent and discriminant validity. The results lend preliminary support to the factorial validity and reliability of the model. Sheard (2009) used the PPI-A to investigate national differences in mental toughness between rugby league players in the United Kingdom and Australia. The results from this study indicated that significant differences in mental toughness were apparent between national teams. Although these findings are based on small sample size, Sheard (2009) concluded that these findings provided evidence for the divergent (or discriminant) validity (i.e., does not correlate too much with similar but distinct constructs) of the PPI-A.