

MID05301

Making the Leap from Good to Great: Comparisons between Sub-Elite and Elite Athletes on Mental Toughness

Simon C. Middleton, Herb W. Marsh, Andrew J. Martin, Garry E. Richards, and Clark Perry SELF Research Centre, University of Western Sydney, Australia

The purpose of this study is to utilise the newly developed and validated instrument - the Mental Toughness Inventory (MTI) - in order to determine how patterns of mental toughness vary across ages, gender, and between elite and sub-elite athletes. The MTI was administered to 438 aspiring elite athletes (aged 12 to 18 years) based at an elite sports high school along with 292 elite athletes (aged 11 to 38 years) from various institutes of sport around Australia (including the Australian, NSW and WA Institute of Sports, Australian Rugby Union Wallabies, and Australian Cricket). A number of significant differences in mental toughness levels across age (favouring older athletes), gender (favouring males), and between elite athletes (favouring sub-elite athletes) are observed. There is also a significant age x group interaction such that sub-elite athletes' mental toughness decrease with age whilst elite athletes decrease through 15-16 years of age before significantly increasing. The study highlights differences in patterns of mental toughness that may contribute to athletes making the leap from sub-elite to elite performance.

The rise of a champion athlete is a fascinating and complex process. This process is often marked by significant and defining moments or turning points – moments that provide new wisdom and provoke change, growth and learning. Yet, initially these moments are unappreciated, recognised only in hindsight, possibly because they often arrive in the company of adversity. In fact, it is not unreasonable to suggest that once overcome, adversity in many cases provides the significant turning points in the sporting careers of elite athletes. If, therefore, we accept that adversity is an unavoidable factor in sporting achievement, and that ultimately, success requires adversity as much as it requires triumph over adversity, then it is the varying capacity to endure that separates the champion athletes from the rest. In the research to follow, the capacity to endure and triumph over adversity – mental toughness – is explored across a variety of groups of athletes (such as sub-elite and elite athletes, males and females).

The past few years have seen the sporting media become increasingly preoccupied with mental toughness. The expression is used frequently in interviews, newspaper reports and during match commentaries. Despite growing interest, large-scale empirical studies on the make-up of mental toughness are rare and the studies that have been conducted lack rigorous scientific evaluation. Loehr (1986), in his classic book on mental toughness training for sports, presented the Psychological Performance Inventory as a test of mental toughness. Unfortunately, he presented no psychometric data to support its use, nor any theoretical offerings in relation to the development of the concept. Jones, Hanton and Connaughton (2002) completed a qualitative study of elite athletes identifying multiple facets of mental toughness. The study had a number of significant limitations including a small sample size and limited data analysis in relation to established sporting concepts.

Middleton et al. (2004a) completed a series of in-depth qualitative interviews, drawing on the experience of elite athletes and coaches to unearth a conceptualisation and definition of mental toughness. The interviews of 33 elite athletes and coaches (including 25 current or former elite athletes, of whom 15 had achieved an Olympic Gold Medal or World Champion status) were transcribed verbatim and analysed qualitatively to reveal underpinning components of mental toughness. Components of mental toughness were allowed to emerge from the interview data, whilst the interpretation of these components was guided by relevant theory. The strength of this approach to data analysis is that it allows the researcher to benefit from both qualitative experience and established sources of theory. The results indicated that mental toughness is multi-dimensional and consists of twelve components, including: self-efficacy, potential, mental self-concept, task familiarity, value, personal bests, goal commitment, perseverance, task focus, positivity, stress minimisation, and positive comparisons. Mental toughness was defined as *an unshakeable perseverance and conviction towards some goal despite pressure or adversity*. The researchers foreshadowed the development of the Mental Toughness Inventory (MTI) based on their conceptualisation of mental toughness.

The Mental Toughness Inventory was developed following sound psychometric principles to measure 12 components of mental toughness (as identified by Middleton et al., 2004a). Middleton et al. (2004b; 2005) evaluated psychometric properties of the MTI with a large representative sample of athletes to refine, and test the instrument (i.e., reliabilities, confirm factor structure). Results were good, yielding reliabilities for each of the factors ranging from .82 to .94 and acceptable goodness of fit with confirmatory factor analysis. Furthermore, tests of invariance indicate that the structure underpinning the MTI is equivalent across a range of groups (such as sub-elite and elite athletes).



The recent development and validation of a test of mental toughness – the Mental Toughness Inventory (Middleton et al., 2005) – presents a range of possibilities to study mental toughness in athletes. The current study uses the MTI to examine differences in mental toughness between sub-elite and elite athletes, males and females, and younger and older athletes. This research answers such questions as: How do elite and sub-elite athletes differ on characteristics of mental toughness? Does mental toughness vary according to age? In what way does mental toughness differ between males and females? Taken together, the answers to these questions and more will provide timely information of great use to athletes and coaches.

Effects of Age, Gender and Level of Competition

Theoretical Perspectives

Age, gender and level of competition effects on mental toughness have theoretical, practical, and methodological implications. Unfortunately there is a complete dearth of research that examines the effect of these variables on mental toughness. Therefore, predictions about the effect of age, gender and level of competition are proposed guided by the extensively researched construct physical self-concept. Shavelson, Hubner, and Stanton (1976) hypothesised that self-concept becomes more differentiated with age. Marsh (1990; Marsh, Barnes, Cairns, & Tidman 1984) expanding the Shavelson et al. hypothesis, proposed that self-concepts of very young children are consistently high but that with increasing life experience children learn their relative strengths and weaknesses so that mean levels of self-concept decline, individual self-concept becomes more differentiated, and self-concept becomes more highly correlated with external indicators of competence (e.g., skills and accomplishments). Markus and Wurf (1987) noted that the structure of self depends on both the information available to an individual and the cognitive ability to process this information.

Age and Gender Effects

How does mental toughness vary with age? In a review of age effects on self-concept, Marsh (1989; Marsh & Craven, 1997) found systematic increases in self-concept during late adolescent and early adult years based on responses to global self-esteem scales in large, nationally representative samples. For mental toughness, systematic increases are also expected for the 12 characteristics of mental toughness. Factors that particularly rely on experience are proposed to be most significantly affected by age (i.e., task familiarity, self-efficacy, stress minimisation, mental self-concept).

It has been shown that psychological aspects of gender, such as gender roles, influence the ways women and men cope with stress (e.g., Gianakos, 2000; 2002). In a study on gender effects on coping strategies in late adolescents, Kimberly and Renk (2003) found that females used emotion-focussed coping strategies more than males. Other research shows that females tend to use behavioural coping (e.g., taking direct and positive actions to deal with problems) more actively than males (Fielden & Davidson, 2001). Similarly, Gianakos (2000, 2002) found that women were more likely than men to use direct action coping to deal with stress by working longer and harder. Alternatively, self-concept research reports large between-group gender effects on physical self concept (Marsh, 1998), such that males rated themselves higher on physical self-concept than females. Examining gender-based variations in mental toughness, therefore, may offer important insights for developing programs that address the needs of male and female athletes.

The Present Investigation

This research aimed to examine differences in mental toughness between sub-elite and elite athletes, males and females, and younger and older athletes. Previous research has identified a 12 factor model of mental toughness (Self-Efficacy, Future Potential, Mental Self-Concept, Task Familiarity, Value, Personal Best Motivation, Goal Commitment, Task Specific Attention, Perseverance, Positivity, Positive Comparisons, Stress Minimisation). Subsequently, the Mental Toughness Inventory was developed and validated (MTI; Middleton, Marsh, Martin, Richards & Perry, 2005; 2004) to measure these 12 mental toughness characteristics. The current study uses the MTI to investigate differences in mental toughness between sub-elite and elite athletes, males and females, and younger and older athletes.

Method

Participants

This study utilised two participant samples, a sub-elite athlete sample and an elite athlete sample. The first sample consisted of 438 aspiring elite athletes who attend a specialised sports high school in Sydney, Australia. The school is one of the most prestigious sports high schools in Australia. Each year, student athletes from across the state compete for enrolment in major sports, including basketball, softball, rugby league, soccer, baseball, swimming, track and fields, dance aerobics, cricket and netball. The sample included 274 males (62.6%) and 164 females (37.4%). The participants ranged in age from 12 to 18 years of age (mean= 14.34 years, SD=1.50 years). The second sample was 392 elite athletes from various institutes of sport around Australia (including the Australian Institute of Sport, New South Wales Institute of Sport, Western Australia Institute of Sport, ACT Academy of Sport, Australian Rugby Union Wallabies, and Australian Cricket). The elite athlete sample consisted of 202 males (51.5%) and 190 females (48.5%). The elite athlete participants ranged in age from 11 to 38 years of age (mean= 18.55, SD= 4.48 years).



Measures

The MTI is a 36-item self-report instrument designed by Middleton et al. (2005; 2004b) to measure twelve components of mental toughness are measured by three items each, one of which is presented with each scale:

Self-Efficacy. "No matter what the pressure, I still believe in myself."
Task Value. "This activity is one of the most valuable parts of my life."
Self Belief about Potential. "I feel my future in this area will be good."
Task Familiarity. "My experience makes me stronger when performing."
Personal Bests. "To have done my best is the most important thing to me."
Stress Minimisation. "I am good at minimizing the effects of stress."
Mental Self-Concept. "I excel because of my mental strength."
Positivity. "When things are bad I try to turn it around into something positive."
Perseverance. "I keep working at things until I overcome them."
Positive Comparison. "Seeing the opposition feeling the pressure builds my confidence."
Task Specific Attention. "I get absolutely focused on the task, nothing distracts me."

Goal Commitment. "No matter what, I remain committed to my goals."

Participants respond to the items using an 8-point true-false response scale. Research (Middleton et al., 2005; 2004b) demonstrates that the MTI responses are reliable and have a well-defined factor structure as shown by confirmatory factor analysis. Tests of invariance show that the MTI factor structure is stable across groups (such as sub-elite and elite athletes).

Procedures

All participants were informed that the researchers were interested in how they engage in their sport with the view to assisting coaches in promoting mental toughness. Anonymity was guaranteed and participants were assured that the data would be used for research purposes only and not for athlete selection purposes. Each testing session began with a brief set of instructions. The researchers worked through the background/demographic questions on an accompanying instrument with each group. Following this, the rating scale was explained, and participants then completed a few related example items. All participants were encouraged to seek assistance from a member of the research group if they were experiencing any difficulties in responding to an item. Participants were then asked to work through the questionnaire and submit the completed form to the researcher when they had finished.

Statistical Analyses

Multiple-Indicator-Multiple-Cause (MIMIC) Models

Kaplan (2000; see also Grayson, Mackinnon, Jorm, Creasey & Broe, 2000) suggested the MIMIC approach, which is similar to a regression model in which latent variables (e.g., multiple dimensions of athlete mental toughness) are 'caused' by discrete grouping variables (e.g., gender, competition level, gender x competition level) that are represented by a single indicator. One advantage of the MIMIC approach over the standard approach is that it can handle cases in which sample size in a given group may be too small to ensure stable estimates of variances and covariances. Moreover, by representing group membership in appropriate ways, the MIMIC approach allows the researcher to consider more familiar models of main effects and interactions. This type of model also has the important advantage that the dependent variables are latent variables based on multiple indicators.

The present MIMIC model included the effects of gender, level of competition, age (treated as a continuous variable), gender x age interaction, gender x level of competition interaction, age x level of competition interaction, and gender x age x level of competition interaction. Consistent with recommendations by Aiken and West (1991), age was zero-centred (put in deviation score form so that the mean is zero) so as to reduce the multicollinearity between age and the corresponding interaction term. Very high levels of multicollinearity can introduce technical problems in estimating regression coefficients and centering variables often minimises these potential problems. The interaction term was calculated by multiplying gender and the zero-centered age variable. To further reduce collinearity between the interaction term and its composite main effects, a series of preliminary linear regressions where main effects predicted the interaction term and residuals saved thereby developing a 'pure' interaction term with the collinearity of main effects removed.

Results and Discussion

MIMIC Modelling: Level of Competition, Gender and Age Effects

It was of interest to explore the possible role of gender, level of competition and age on the mental toughness constructs. Multiple-indicator multiple-cause (MIMIC) modelling was the analytical method to examine this issue. This involved a structural equation model in which gender, level of competition, age and their interaction were used as predictors of the twelve latent first order factors of the Mental Toughness Inventory. This model yielded an excellent fit to the data ($\chi^2 = 1603.57$, df = 696, CFI = .99, NNFI = .99, RMSEA = .040). Derived beta coefficients are presented in Table 1 and



MIMIC Analysis: Beta Coefficients and Effects for Gender, Level of Competition (group), Age and all Interactions

	Gender (β)	Age (β)	Group (β)	Gend x Age (β)	Gend x Grp (β)	Age x Grp (β)	Gend x Age x Grp (B)
MTI Factors							
Self-efficacy	25***	.13*	.23***	05	.02	18*	12
Positive Comparisons	20***	10	07	- 06	.05	05	.06
Value	08*	11*	10	07	10	21**	.13
Potential	19***	.04	.04	-09	- 00	28***	.14
Task Familiarity	17***	.17***	.33	01	.04	12	02
Personal Bests	.07*	.06	01	04	05	19***	.02
Stress Minimisation	18***	.18**	.23***	17	10	06	17*
Mental Self-Concept	28***	.25***	.35***	. 03	01	15*	08
Positivity	08	.20***	.24***	13	09	22***	17*
Perseverance	10 **	.06	.03	02	05	22***	.04
Task Specific Attention	13***	.14**	.19***	.01	05	09	60.
Commitment	.06	00.	05	. 05	- 06	32***	.12

* p < 0.05 ** p < 0.01 *** p < 0.001





significant main effects for gender, level of competition and age as well as the significant interaction effects are discussed. A conservative Bonferroni correction was used to minimise the risk of Type I error by dividing the p-value of 0.05 by the number of outcome variables (12) to yield a revised significance criterion level of .005 (rounded). Therefore, this paper focuses on results significant at the .001 level.

There are large between group effects of gender (favouring males), group (favouring sub-elite athletes), age (favouring older athletes) and age x group interaction such that group differences (i.e., elite verses sub-elite) are larger for older athletes than for younger athletes. There are also small gender x age x group effects (however, non significant at the .001 level of significance). None of the other interaction effects are statistically significant.

Effects of Gender and Age on Mental Toughness

Table 1 shows a number of significant main effects for gender and age on mental toughness characteristics. Specifically, several negative beta coefficients show that females consistently report themselves lower than males on characteristics of mental toughness. Age also positively effects mental toughness characteristics self-efficacy, task familiarity, stress minimisation, mental self-concept, positivity and task focus. Between-group differences due to gender and age are largely consistent with predictions based on previous research.

Effects of Level of Athlete on Mental Toughness

Level of athlete/competition (i.e., elite verses sub-elite) proved to have 6 significant main effects on characteristics of mental toughness (See Table 1). Elite athletes self-report mental toughness characteristics self-efficacy, task familiarity, stress minimisation, mental self-concept, positivity, and task focus lower than do sub-elite athletes.

Social comparison theory suggests that other individuals in one's context provide one important frame of reference. In an application of this theoretical approach, Marsh (1991, 1993) reviewed a growing body of research showing that academically elite students tend to experience a decline in academic self-concept when they attend academically selective schools compared to equally able students who attend nonselective schools. This follows in that a very bright student may be "average" in comparison to other students in an academically selective school, whereas the same student would be well above average in a nonselective school. This frame of reference effect has also been demonstrated with athletes in selective sporting programs. Marsh, Perry, Horsely, and Roche (1995) showed how the physical self-concepts of elite athletes were significantly attenuated due to elite athletes using other elite athletes to evaluate their physical self-concepts (i.e., other elite athletes create a frame of reference). A similar phenomenon may affect athletes' views about their mental toughness when participating in selective sports programs like the Australian Institute of Sport. Tests of this suggestion and an evaluation of implications if support is found are clearly beyond the scope of the present investigation, but provide an important area for further research.

Markus and Wurf (1987) identify that views formed about the self depend on the information available and the cognitive ability to process that information. Elite athletes have significantly more experience and information available to them from which to form perhaps a more accurate view of their mental toughness as compared to sub-elite and less experienced athletes. As athletes increase in age and become more experienced with elite sports competition and training, it follows that they also become more aware of their relative strengths and weaknesses. Therefore, it should be expected that elite athletes are perhaps more aware of their relative strengths and weaknesses in terms of mental toughness. The current results certainly provide support to this notion. Furthermore, improved awareness of relative mental toughness strengths and weaknesses tied with frame of references effects (i.e., self identification compared to sub-elite athletes) also lead one to expect elite athletes to report themselves lower on mental toughness as compared to sub-elite athletes. These effects are indeed supported by the current results. An interesting question to be resolved in future research then, is the question of whether self-reported MTI responses assess *perceived* or *actual* levels of mental toughness. This line of research is beyond the scope of the present investigation.

It is also interesting to speculate why elite athletes may report lower scores on mental toughness than do sub-elite athletes. Elite athletes' dedication and commitment towards achieving athletic excellence in many ways represents perfectionist type tendencies. Perfectionist athletes are people who crave excellence, always striving for better, perhaps never being entirely satisfied with current achievements or performances (Botterill, 2005; Horsley, 1995). The same may be expected when elite athletes come to rate their mental toughness. These perfectionist tendencies perhaps lead to "harsher" evaluations on mental toughness compared to their sub-elite counterparts. The suggestion that perfectionist type tendencies affect elite athletes' self-ratings of mental toughness is an important question to be explored through future research.

It is also important to recognise here that mental toughness is not the same thing as success. Mental toughness does play a significant role in *achieving* success, but it is not the only predictor of success. For example, as discussed above, perfectionism may also be a predictor of success, along with physical talent, skill, and opportunity. So when comparing elite verses sub-elite (i.e., more successful and relatively less successful) one should not assume that with success comes equally higher levels of mental toughness. Indeed it is well documented that many elite athletes struggle many of the same battles as do sub-elite athletes (such as depression, form slumps, choking). Coaches and athletes should always aim to enhance mental toughness at all levels of competition.



Age x Group (elite verses sub-elite) Interaction Effect

There are significant age x group (elite verses sub-elite) interaction effects on the mental toughness characteristics potential, personal bests, positivity, perseverance and commitment. In all cases, these mental toughness characteristics consistently decrease with age for sub-elite athletes. This pattern of decreasing mental toughness is almost identical for elite and sub-elite athletes from the age of 12 through to 14 years of age. The difference between the two groups becomes apparent from the age of 15 years. It is at this time where mental toughness continues to decrease for sub-elite athletes but increases for elite athletes (See Figure 1).

There are a number of explanations that can help to explain this pattern of interaction effects. Firstly, junior athletes (11 to 14 years of age) may over-report their mental toughness due to a lack of experience that would otherwise allow them to more accurately predict their strengths and weaknesses in mental toughness. Indeed this explanation would explain why for all athletes (elite and sub-elite) mental toughness is consistently rated higher at 12-14 years old than for any other age group. The pattern follows that all athletes start with high self-ratings, they then "wise-up" during the middle years (15-16) becoming more aware of their strengths and weaknesses, before elite athletes make significant increases in mental toughness during their senior years (17 years and above).

A second explanation for this pattern of age x group interaction effects on mental toughness has to do with how athletes of different ages rate their mental toughness. The frame of reference effect (where athletes rate their mental toughness relative to their immediate social comparison group) may play-out with mental toughness such that younger/sub-elite athletes may rate themselves higher (than older elite) in mental toughness relative to their peer group (i.e., other young/sub-elite athletes). Also, older/elite athletes may rate themselves lower (than younger sub-elite) on mental toughness relative to their peer group (i.e., other older/elite athletes). What this spells for theory, measurement and practice is that perhaps levels of mental toughness can not be compared across groups, but rather to developed norms for each group. A critical mass of research needs to be completed in order to establish appropriate age and group mental toughness norms.

A third explanation for this interaction effect comes through the identification of one limitation of this study. This limitation has to do with how athletes were assigned to elite or sub-elite groups for statistical purposes. Athletes were assigned to the sub-elite participant sample because they were drawn from a sports high school. On the other hand, athletes were assigned to the elite athlete group because they were drawn from a recognised selective sports program such as the Australian Institute of Sport. The reality is that the sports high school chosen as the sub-elite athlete sample is one of the most elite sports high schools in Australia. The school has a strong history of successful sporting performances dating back over a period of years. The "eliteness" of these athletes may not be statistically different from the elite athletes of the same age enrolled in selective sports programs such as the Australian Institute of Sport. Where levels of "eliteness" can be clearly differentiated is for athletes in the senior age groups enrolled at selective sports institutes, particularly athletes aged 20-35 who are perhaps reaching their performance peak. Remembering that the sub-elite group were students as well as athletes, the mean age for senior/sub-elite athlete group is 17.07 years (range=17 to 18 years). Alternatively, the senior/elite athlete sample has a mean age of 20.91 (range= 17-38). Senior/elite athletes increased level of "eliteness" may explain why they report higher on mental toughness characteristics. Future research would do well to more clearly define how athletes are assigned to elite athlete groupings.

In answering the main research questions posed by this research, what makes a champion is bouncing back from a decline in mental toughness. What makes a champion is being able to survive a highly competitive environment and claw back on key dimensions after initial context effects have had their negative effect. What separates elite from sub-elite is how they respond to a decline on key dimensions of mental toughness. What makes a champion is a more accurate self-perception (that is lower than sub-elites initially) that can withstand the competitive context to increase as skill and experience are gained.

Implications for Coaching and Elite Athlete Development

This study presents some important findings that have real implications for coaching and elite athlete development. Firstly, athlete development programs that aim to help athletes make "the leap from good to great" would do well to expose their athletes to a variety of elite level experiences. This exposure is likely to help sub-elite athletes become increasingly aware of their own mental toughness strengths and weaknesses, thus enabling more accurate reporting, assessment, training and subsequent development. When exposing developing athletes to elite level competition, care must be taken to ensure that these athletes are coached through the experience in a way that promotes positive outcomes for mental toughness. Secondly, these results have direct implications for measurement in suggesting the need to develop age and group appropriate normative data to which athletes can be compared. Thirdly, differences between males and females on mental toughness highlight the need to develop gender specific approaches to training mental toughness in athletes of all ages and ability.























Junior = 11-14 years Middle = 15-16 years Senior = 17+ years



Limitations and Future Directions

When interpreting these findings, it is important to recognise some limitations associated with the research and which may also provide directions for future research. The key correlates were all self-report measures and therefore, broader measures might be included in future research derived through reports by significant others (e.g., coaches), performance outcomes, and observational techniques. All the data collected were cross-sectional and so main effect evaluations are based on responses from a single point in time. Future research should also examine effects of age, gender and level of competition on mental toughness by examining related processes and outcomes over time. Level of "eliteness" was determined by group membership rather than on individual performance levels. Future research should find ways to more carefully assign athletes to sub-elite and elite groups.

Conclusion

The results of this investigation reveal a number of significant main effects of age (favouring older athletes), gender (favouring male athletes) and level of competition (favouring sub-elite athletes) on mental toughness as well as some key interactions which broadly show that elite athletes decrease in mental toughness from 12 to 16 years of age (as do sub-elite) before making significant improvements on several characteristics of mental toughness from 17 years and older (sub-elite continue to decrease in mental toughness through to adulthood). The frame of reference effect and the role of perfectionism are important areas to be researched when looking at how elite athletes self-report mental toughness. Within-person studies across time also would provide great insights into the development of mental toughness across a time. This research also provides further demonstrates the validity of the Mental Toughness Inventory as a test of mental toughness. Taken together, this research uncovers a series of group differences in mental toughness for gender, age and level of competition that hold implications for research and practice aimed at developing champion athletes who can successfully deal with challenge and adversity in their pathway to athletic success.

About the Authors

Mr Cory Middleton is a registered psychologist, with a particular interest in understanding and developing mental toughness. He is the PhD candidate working on the Mental Toughness Research Project funded through the Australian Research Council and the SELF Research Centre, University of Western Sydney.

Professor Herb W. Marsh is a professor of Educational Psychology, founding Director of the Self-concpet Enhancement and Learning Facilitation (SELF) Research Centre, and served as Dean of Graduate Research Studies (1996-2000) and Pro-Vice Chancellor of Research (1995-96) at UWS. He is the author of internationally recognised psychological tests that measure self-concept, motivation, and university students' evaluations of teaching effectiveness. He is well known in sports psychology for the development of the physical self-concept instruments for elite athletes (Elite Athlete Self Description Questionnaire) and non-elite athletes (Physical Self Description Questionnaire) and methodological contributions to the field.

Dr Andrew Martin is a Post-Doctoral Research Fellow at the SELF Research Centre, University of Western Sydney. He specialises in student motivation with an emphasis on strategies educators can use to enhance student motivation in the classroom. Dr Martin also has a keen interest in research methodology with particular strengths in survey design and structural equation modelling.

Mr Garry Richards OAM, completed undergraduate degrees at the University of Sydney and his further post graduate studies have been through the Australian National University, James Cook University and Sturt University. He was formally Executive Director of Outward Bound, National Chairman of ORCA, and Executive Director of National Outdoor Education and Leadership Services, a national consultancy and research company.

Mr Clark Perry has a long history of working in elite sport in both the US and Australia. His appointments to four Olympic Games, three Commonwealth Games and multiple world championships demonstrate the respect that he has earned in the field of sport psychology.

Contact Details Professor Herb Marsh, SELF Research Centre, University of Western Sydney, Penrith South DC, NSW 1797, AUSTRALIA. E-Mail: <u>h.marsh@uws.edu.au</u>.



References

- Botterill, C. (2005). Competitive drive: Embracing positive rivalries. In S. Murphy (Ed.), *The Sport Psych Handbook*, Champaign, IL: Human Kinetics.
- Fielden, S.L., & Davidson, M.J. (2001). Stress and the women manager. In J. Dunham (Ed.), Stress in the workplace: Past, present and future, London, England: Whurr Publishers Ltd.
- Gianakos, I. (2000). Gender roles and coping with stress. Sex Roles, 42, 211-223.
- Gianakos, I. (2002). Predicotrs of coping wit work stress: The influences of sex, gender roles, social desirability, and locus of control. Sex Roles, 46, 149-158.
- Grayson, D. A., Mackinnon, A., Jorm, A. F., Creasey, H., & Broe, G. A. (2000). Item bias in the center for epidemiologic studies depression scales: Effects of physical disorders and disability in elderly community sample. *Journal of Gerontology Series B-Psychological Sciences and Social Sciences*, 5, 273-282.
- Horsley, C. (1995). Confidence and sporting performance. In T. Morris & J. Summers, Sport Psychology: theory, applications and issues, Brisbane, Australia: John Wiley & Sons.

Kaplan, D. (2000). Structural Equation Modeling: Foundations and Extensions. Newbury Park, CA: Sage.

Kimberly, G., & Renk, C. (2003). The relationship of gender, gender identity, and coping strategies in late adolescents. *Journal of Adolescents*, 26, 159-168.

Loehr, J.E. (1982). Athletic excellence: Mental toughness training for sports. Forum Publishing Company.

- Loehr, J.E. (1986). Mental toughness training for sports: Achieving athletic excellence. Lexington, MA: Stephen Greene.
- Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. Annual Review of Psychology, 38, 299-337.
- Marsh, H.W. (1990). Age and sex effects in multiple dimensions of self-concept: Preadolescence to early-adulthood. Journal of Educational Psychology, 81, 417-430.
- Marsh, H.W. (1991). The failure of high ability high schools to deliver academic benefits: The importance of academic selfconcept and educational aspirations. *American Educational Research Journal, 28*, 445-480.
- Marsh, H.W. (1993). Academic self-concept: Theory measurement and research. In J. Suls, (Ed.), *Psychological perspectives on the self* (Vol. 4, pp. 59-98). Hillsdale, NJ: Erlbaum.
- Marsh, H.W. (1998). Age and gender effects in physical self-concepts for adolescent elite athletes and nonathletes: A multicohort-multioccasion design. *Journal of Sport and Exercise Psychology*, 20, 237-259.
- Marsh, H.W., Barnes, J., Cairns, L., & Tidman, M. (1984). The Self Description Questionnaire (SDQ): Age effects in the structure and level of self-concept for preadolescent children. *Journal of Educational Psychology*, 76, 940-956.
- Marsh, H.W., & Craven, R. (1997). Academic self-concept: Beyond the dustbowl. In G. Pye (Ed.), Handbook of classroom assessment: Learning, achievement, and adjustment (pp.131-198). Orlando, FL: Academic Press.
- Marsh, H.W., Perry, C., Horsely, C., & Roche, L. (1995). Multidimensional self-concepts of elite athletes: How do they differ from the general population? *Journal of Sport & Exercise Psychology*, 17, 70-83.
- Middleton, S.C., Marsh, H.M., Martin, A.J., Richards, G.E., Perry, C., (2004a). Discovering mental toughness: A qualitative study of mental toughness in elite athletes. *Self Research Centre Biannual Conference, Berlin.*
- Middleton, S.C., Marsh, H.W., Martin, A.J., Richards, G.E., & Perry, C. (2004b). Developing the Mental Toughness Inventory. *Self Research Centre Biannual Conference, Berlin.*
- Middleton, S.C., Marsh, H.W., Martin, A.J., Richards, G.E., & Perry, C. (2005). Developing a Test for Mental Toughness: The Mental Toughness Inventory. AARE *Conference, Sydney*.
- Shavelson, R.J., Hubner, J.J., & Stanton, G.C. (1976). Validation of construct interpretations. *Review of Educational Research*, 46, 407-441.