Making it in the “Bigs”
How Mental Toughness Differentiates NCAA Division I and Professional Athletes
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“Mental toughness is many things and rather difficult to explain” – Vince Lombardi

For those with the physical talent, the allure of playing at the highest level of one’s sport can be intoxicating. It is also very unlikely to happen. A high school ice hockey player has a 4.8% chance of going on to play in the NCAA D1, and from that elite group of athletes, the NHL then drafts only about 6.4%. While these low percentages may be discouraging to all but the most elite high school hockey players, the truth is that these actually represent just about the best chance across all of the major sports.

As we see in Table 1, a high school football player’s chances of playing D1 rest at 2.7%; men’s soccer at 1.3%; baseball at 2.1%; and similarly 1.0% for basketball. With the exception of baseball (which sits at 9.5%), the probability of being drafted by a professional team from the NCAA dips even lower: 1.2% for the NBA, 1.6% for the NFL, and 1.4% for MLS (NCAA, 2018).

Table 1: Probability of Competing in NCAA D1 and Professional Sports

<table>
<thead>
<tr>
<th>Sport</th>
<th>% from HS to NCAA D1</th>
<th>% From NCAA D1 to Pros</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td>2.1%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Football</td>
<td>2.7%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Basketball</td>
<td>1.0%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Hockey</td>
<td>4.8%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Soccer</td>
<td>1.3%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Source: NCAA (2018)

What is different about the 60 athletes drafted by the NBA every year from the thousands who will fall just short? Historically, scouts have analyzed prospects’ athletic potential in such physical areas as ‘explosiveness’ (vertical jump, lateral quickness, dribbling speed), shooting, blocking shots, and court versatility. While well-above average physical prowess in one’s sport is necessary for success at the highest levels, it is not the only factor impacting success. To be sure, attempts are made to provide assessment of potential by also addressing non-physical aspects of a player’s game. Scouts refer to these as ‘intangibles’ or ‘character,’ and attempt to discern such tendencies as ‘instincts,’ ‘court awareness,’ work ethic, coachability, leadership, and other psychological factors believed to contribute to success (O’Brien, 2012). Of course, it is not just scouts that engage in this loose application of psychological principles. Coaches, commentators, and fans apply similar approaches in trying to explain performance. Contemplating how the ‘intangibles’ are causally related to on-the-field performance is its own pastime and woven into the culture of sports at the highest level.
This topic has received attention from the scientific community in recent years. A growing body of research examines the relationship between sports performance and personality traits, such as the big-five, risk-proclivity, self-efficacy, and coping styles (e.g., Gilson, Chow, & Feltz, 2012; McSherry, 2012; Piedmont, Hill, & Blanco, 1999; Schnell, Mayer, Diehl, Zipfel, & Theil, 2014; van Mierlo & Van Hooft, 2012). However, one of the most discussed and perhaps least clearly defined terms when considering the relationship between personal characteristics and sports performance is mental toughness. While mental toughness has been a very popular and valued label in sports, as an academic construct it has struggled with conceptual clarity (Harmison, 2011).

A useful starting point in better defining this construct may be athletes' behavioral patterns as they navigate the unique stressors inherent in competing at high levels. Kaiseler, Polman, and Nicholls (2012) found that athletes higher in neuroticism reacted more intensely to on-the-field stressors, while exhibiting lower perceived control over those stressors. These researchers also found that higher neuroticism was associated with a greater avoidance coping strategies, rather than problem-focused coping. Similarly, Yeatts and Lochbaum (2013) found that temperament predicts preferred coping strategy (problem-focused versus avoidant).

James Loehr (1995), who has written extensively on ‘toughness training for sport’ focused on mental and emotional, in addition to physical, conditioning as critical for success. This author defines mental toughness as the ‘ability to consistently perform toward the upper range of your talent and skills regardless of competitive circumstances.’ In addition, he offers a model of seven skills required to be mentally tough (e.g., self-confidence, negative energy control, motivation). It is from this model that the Psychological Performance Inventory (PPI) was developed. While the PPI has had some utility when working with athletes, and Loehr’s conceptualization of mental toughness has intuitive appeal, this model and assessment has received criticism for lacking underlying research and a theoretical foundation.

Clough, Earle, and Sewell (2002), borrowing from health psychology, examined the relationship between hardiness and mental toughness. According to these authors, mentally tough athletes manifest four interrelated attitudes during stressful situations. Based on this model, the authors developed the Mental Toughness 48 (MT48) instrument. Unfortunately, this assessment has also received criticism, as there is little theory offered to justify transferring the hardiness construct to sport-specific settings.

In a detailed attempt to theoretically defining the construct, Jones, Hanton, and Connnaughton (2002) employed a rigorous qualitative method by bringing together 10 world class athletes in a series of focus groups and interviews to define the nature of mental toughness. This resulted in the following overall definition:

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

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

In addition to this definition, the authors offer 12 attributes that elite athletes agreed are hallmarks of the mentally tough performer. The theme of this definition and associated attributes point to remaining at a higher level than competitors in discipline, self-confidence, focus, resilience, and control in the face of the pressure and demands (competition, lifestyle, etc.) inherent in competing at high levels. This work also defines mental toughness as a psychological advantage over opponents, suggesting it can be either innate or developed over years of experience. While this work is often cited as influential in defining mental toughness, it has been criticized for its relatively small sample size of athletes in the focus groups. Additionally, this work has done a much better job of describing what mental toughness allows athletes to do (e.g., remain focused, determined, confident) rather than what the construct actually is (i.e., emotional control, resiliency, self-discipline).
In addition to the shortcomings in theory and research mentioned above, another challenge results from the debate of whether it is an innate characteristic or something that can be developed over time. Harmison's (2011) alternative allows for the influence of both genetics and environment by defining the construct through the theoretical lens of social-cognition. This researcher examined how athletes make sense of the world and how that influences one's anticipation and predictions, which then impacts mental toughness. Using this social-cognition framework as a jumping off point, other researchers such as Coulter, Mallet, and Gucciardi (2010); and Gucciardi, Gordon, and Dimmock (2008) define the construct as being: 1.) multidimensional (i.e., the construct is defined and influenced by multiple traits); 2.) influenced by both genetics and the environment; and 3.) to some degree, learnable.

If mental toughness is a measurable construct that relates to athletic success, we would expect to observe it in athletes who reach the highest levels. In the present study we look to contribute to the research by providing strong operational definitions for the theorized components of the construct. Consistent with the findings of Coulter, Mallet, and Gucciardi (2010); and Harmison (2013) we would expect that the construct would be multidimensional (more than a single trait). Also, in line with the findings of Jones, Hanton, and Connaughton (2002), we would expect that those traits reflect an athlete's tendency to remain disciplined, self-confident, focused, resilient, and in control under the stressful conditions caused by the competition, training, and lifestyle demands that athletes face at the highest levels (Harmison, 2011). Therefore, we look to test the theory that mental toughness is not a single trait, but rather it is a multidimensional construct that reflects a combination of the following personality traits:

- **Level-Headedness** – A measure of emotional expressivity, this trait relates to the tendency to effectively manage the expression of one's emotions. Individuals who manifest higher levels tend to remain composed in a variety of stress-inducing situations. Those who score lower tend to react more emotionally.

- **Stress Tolerance** – A measure of the capacity to remain unworried about possible negative consequences, those showing high scores may remain unconcerned when faced with events beyond their control. People displaying low scores tend to focus on what might go wrong or potential negative consequences before moving to action.

- **Resiliency/Ego-Strength** – A measure of one's capacity to handle setbacks, criticism, and rejection. High scores indicate that one is less negatively impacted by failure and setbacks. Those who score low tend to internalize failure, criticism, and rejection, and often have trouble bouncing back and re-establishing self-confidence.

- **Energy/Persistence** – A measure of one's potential to sustain a high level of activity over extended periods. High scores relate to being active and persistent in overcoming obstacles. Those with lower scores tend to be less energetic with respect to tasks and may not always persist when necessary to achieve a goal.

- **Self-Structure** – A measure of one's preference for independently determining work methods. A high score indicates the motivation to work independently. A low score indicates one is unlikely to define one's own work habits and methods.

- **Thoroughness** – A measure of one's tendency to be concerned with details and to take full ownership of tasks, jobs, and roles. Those that score high tend to take responsibility and can, at times, be perfectionistic. Those who score low tend to be a bit less conscientious and may not always attend to the details required to continue to develop skill sets.

These personality traits have been used extensively in assessing individuals' potential for success across a wide range of professional, academic, and athletic contexts (Caliper, 2018; Prewett, Tett, & Christiansen, 2013). Notably, these traits have been found to be strongly related to sports outcomes such as on-base plus slugging (OPS), plate discipline, and wins above replacement (WAR) in Major League Baseball (Schoenfelder, 2015); as well as performance measures such as true shooting percentage, rebounds, turnovers, 3-point percentage, and win shares in the National Basketball League (Schoenfelder, Baytalskaya, & Butera, 2017).
**Hypothesis:** Athletes with at least one year of professional experience will score higher than NCAA Division 1 athletes in mental toughness, as measured by a combination of level-headedness, stress-tolerance, resiliency/ego-strength, self-structure, and energy/persistence.

**METHOD**

**Sample**

**NCAA Division 1 Athletes:** Between the years 2008 and 2018, personality data were collected for a total of 329 male student-athletes participating across 5 D1 sports for 10 different universities. These data were collected as part of development programs in which personality assessment was used to assess sport-specific as well as academic and professional-related strengths and development opportunities.

**Professional Athletes:** Between the years 2002 and 2018, personality data were collected for approximately 3,500 athletes at the request of professional sports franchises in either Major League Baseball (MLB), the National Basketball Association (NBA), or the National Hockey League. These data were collected as part of the amateur draft selection process. Of the athletes tested, a total of 559 had at least one year of professional experience at the time of this analysis. It is this group of 559 that served as the final professional athlete sample.

**Instrument**

Personality was assessed via the Caliper Profile, which is a robust self-report assessment that measures 22 personality traits, motivational factors, and 1 measure of cognitive ability. This well-researched personality assessment contains 3 different item formats: 4 traits are measured via Likert-type items ("strongly disagree" to "strongly agree" on a seven-point scale); 18 traits are measured via forced-choice format; the single cognitive ability is measured via multiple choice items. The raw scores calculated for each trait are converted to percentile scores based on a large representative U.S. norm sample, resulting in scores on a 1-99 scale. A large number of studies provide evidence that this assessment has strong internal consistency, temporal stability, as well as criterion-related and construct validity (Caliper, 2018; Prewett, Tett, & Christiansen, 2013).

The six traits from this assessment used as the variables of interest are all assessed via the forced-choice format and strongly related to other measures of similar constructs (note: indicators of significant relationship at * = p<.05, ** = p<.01, *** = p<.001) (Caliper, 2018):

- **Level-Headedness** is positively related to Emotional Stability (r = .33*, r = .63***), as measured by the 16PF and the G-PPI, respectively; it is negatively related to Neuroticism (r = -.39***), Anxiety (r = -.34***), Depression (r = -.35***), Hostility (r = -.26**), Impulsiveness (r = -.25**), and Vulnerability (r = -.32***); as measured by the NEO PI-R; as well as to Global Anxiety (r = -.28*), Liveliness (r = -.30*), and Apprehension (r = -.34*), as measured by the 16PF.

- **Ego-Strength** is positively related to Emotional Stability (r = .52**), and Social Boldness (r = .34*) as measured by the 16PF; Ascendancy (r = .35***), as measured by the G-PPI; negatively related to Neuroticism (r = -.29**), Anxiety (r = -.31***), Depression (r = -.28**), Self-Consciousness (r = -.34***), and Modesty (r = -.30**) as measured by the NEO PI-R; as well as with Global Anxiety (r = -.53**), and Apprehension (r = -.53**) on the 16PF.
• **Stress Tolerance** is positively related to Emotional Stability ($r = .21$, $r = .24^{***}$) on the 16PF and G-PPI, respectively; negatively related to Global Anxiety ($r = -.31^{*}$) and Apprehension ($r = -.53^{**}$) as measured on the 16PF.

• **Thoroughness** is positively related to Conscientiousness ($r = .36^{***}$), Order ($r = .31^{**}$), Dutifulness ($r = .25^{**}$), Deliberation ($r = .22^{*}$), and Self-Discipline ($r = .36^{***}$) as measured by the NEO PI-R; Rule-Consciousness ($r = .31^{*}$) and Perfectionism ($r = .44^{**}$) as measured by the 16PF; Responsibility ($r = .53^{***}$) and Cautiousness ($r = .49^{***}$) as measured by the G-PPI; negatively related to Openness to Change ($r = -.47^{**}$) on the 16PF; and Impulsiveness ($r = -.27^{**}$) on the NEO PI-R.

• **Self-Structure** is positively related to Conscientiousness ($r = .23^{*}$), Competence ($r = .30^{**}$), Order ($r = .26^{**}$), and Self-Discipline ($r = .37^{***}$) as measured by the NEO PI-R.

• **Energy/Persistence** is positively related to Conscientiousness ($r = .42^{***}$), Assertiveness ($r = .44^{**}$), Activity ($r = .40^{**}$), Achievement ($r = .31^{**}$), and Self-Discipline ($r = .40^{***}$) as measured by the NEO PI-R; Tension ($r = .25$) as measured by the 16PF; and Vigor ($r = .51^{**}$) and Ascendancy ($r = .38^{***}$) as measured by the G-PPI; negatively related to Depression ($r = -.25^{**}$) as measured by the NEO PI-R.

Additionally, 5 of these 6 traits (not including self-structure) load on a single factor that is conceptually similar to the neuroticism factor of the “Big-5.”

### Results

Table 2 summarizes the means and SDs, as well as the magnitude of the difference (Cohen’s $d$) for the Professional and NCAA D1 athletes in this study. We observe significant differences ($p < .001$) in all 6 mental toughness-related traits, with the greatest magnitude of difference between groups found in thoroughness ($d = .87$), level-headedness ($d = .79$), and ego-strength ($d = .73$).

**Table 2: Mean Differences Between Professional and NCAA D1 Athletes on Mental Toughness-Related Traits**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Professional Athletes (n=559)</th>
<th>NCAA D1 Athletes (n=329)</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Level-Headedness</td>
<td>62.9</td>
<td>27.9</td>
<td>39.8</td>
</tr>
<tr>
<td>Stress Tolerance</td>
<td>51.5</td>
<td>29.7</td>
<td>32.8</td>
</tr>
<tr>
<td>Ego-Strength /Resilience</td>
<td>67.3</td>
<td>28.1</td>
<td>45.5</td>
</tr>
<tr>
<td>Self-Structure</td>
<td>51.2</td>
<td>28.7</td>
<td>38.8</td>
</tr>
<tr>
<td>Thoroughness</td>
<td>60.3</td>
<td>26.8</td>
<td>36.2</td>
</tr>
<tr>
<td>Energy/Persistence</td>
<td>41.9</td>
<td>28.9</td>
<td>34.5</td>
</tr>
</tbody>
</table>
Table 3 summarizes the results of logistic regression analysis to test the efficacy of the mental toughness model with 6 component trait predictors. These results suggest that this mental toughness model is a strong indicator of an athlete’s likelihood for professional success (i.e., at least one year of experience): Nagelkerke $R^2 = 0.33$, $\chi^2(6) = 242.78$, $p < .001$. We further observe that 5 of the 6 component traits are individually significant with respect to predicting professional success. Self-Structure is the single trait in which a significant Z value was not reached.

Table 3: Results of Logistic Regression

<table>
<thead>
<tr>
<th>Predictor</th>
<th>$\beta$</th>
<th>S.E.($\beta$)</th>
<th>Z</th>
<th>$e^\beta$</th>
<th>95% C.I. ($e^\beta$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-2.4928</td>
<td>0.2497</td>
<td>-9.98***</td>
<td>0.0827</td>
<td>0.0501 to 0.1334</td>
</tr>
<tr>
<td>Level-Headedness</td>
<td>0.0094</td>
<td>0.0030</td>
<td>3.16**</td>
<td>1.0094</td>
<td>1.0036 to 1.0154</td>
</tr>
<tr>
<td>Stress Tolerance</td>
<td>0.0119</td>
<td>0.0030</td>
<td>3.97***</td>
<td>1.0120</td>
<td>1.0061 to 1.0180</td>
</tr>
<tr>
<td>Ego-Strength /Resilience</td>
<td>0.0135</td>
<td>0.0029</td>
<td>4.67***</td>
<td>1.0135</td>
<td>1.0079 to 1.0194</td>
</tr>
<tr>
<td>Thoroughness</td>
<td>0.0230</td>
<td>0.0031</td>
<td>7.46***</td>
<td>1.0234</td>
<td>1.0172 to 1.0297</td>
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<tr>
<td>Energy/Persistence</td>
<td>0.0062</td>
<td>0.0028</td>
<td>2.19*</td>
<td>1.0063</td>
<td>1.0007 to 1.0119</td>
</tr>
<tr>
<td>Self-Structure</td>
<td>-0.0023</td>
<td>0.0030</td>
<td>-0.75</td>
<td>0.9977</td>
<td>0.9916 to 1.0037</td>
</tr>
</tbody>
</table>

Discussion

The results of this study strongly support a model of mental toughness that incorporates 5 related personality traits predictive of success in professional sports. We found that athletes who reach the highest levels may indeed have a psychological edge that allows them to deal effectively with the pressure and demands (competition, lifestyle, etc.) inherent in competing at the highest levels. The personality dynamics exhibited by successful professional athletes suggest they are more likely to constructively manage their emotionality; tolerate stress more effectively; bounce back more quickly from setbacks, failures, and rejection; take ownership and tend to the many details and tasks that are critical in maintaining the long-term training and development regimens; and maintain high levels of energy and persistence in the face of obstacles. Somewhat surprisingly, however, the competitive benefit of developing independent practice and training methods (Self-Structure) was not supported by the data.

These results contribute to the growing body of research in a number of ways. The data obtained from the large sample of professional athletes provides robust empirical evidence that certain personality patterns are predictive of athletic success at the highest levels. The results of this study serve to provide some additional clarity and show how mental toughness can be operationalized to provide stronger predictive power. Consistent with the conceptual definition of mental toughness proposed by Jones, Hanton, and Connaughton (2002), these findings suggest that athletes at the highest levels are likely to maintain a competitive edge when maintaining discipline, self-confidence, focus, resilience, and control in the face of the stress that is uniquely present when competing at this level. Furthermore, these findings provide evidence that mental toughness is a multidimensional construct (Coulter, Mallet, & Gucciardi, 2010; Harmison, 2013), and that it is best conceptualized as a composite of personality traits that drive mentally tough behavior. Understanding these dynamics of mental toughness can serve as an extremely powerful decision tool for professional sports teams in the high-stakes game of creating draft strategy.
A shortcoming of the present study is that we cannot make a causal inference about whether these traits actually drive athletic success. It could certainly be that those with the greatest amount of physical talent engage in lifestyles early on in life, and that this type of lifestyle shapes behavioral tendencies that align with these traits. Future research should explore if and how these traits can be developed/learned effectively enough to impact an athlete’s likelihood of succeeding at these levels. That is: can we develop behavioral patterns in D1 athletes (or even earlier), that lead to emerging mental toughness? Additionally, future research should explore potential differences in the mental toughness-success relationship across different sports (e.g., individual v. team), as well as potential differences across genders.

References


