



*Original Research*

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## **The Relationship between Sport Specialization and Mental Toughness in College Athletes**

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### ABSTRACT

*International Journal of Exercise Science 10(1): 44-52, 2017.* The pros and cons of early sport specialization compared to diversification have been examined in many research studies. The purpose of this study was to determine (a) the relationship between mental toughness and age of specialization in sport, and (b) differences in mental toughness based on early specialization of sport and gender. College athletes (N = 102) completed surveys about specialization and mental toughness, including MeBTough. The mean age of specialization was 13.45 ( $\pm$  4.47). Results showed no significant difference in mental toughness of those who specialized early and those who did not. There was no significant difference in mental toughness scores based on gender. It is possible that there were no differences in mental toughness based on early specialization because most of the athletes played multiple sports in high school and did not actually specialize until their later years of high school. Because the athletes in the study had similar sporting experience, it is possible that both men and women developed similar levels of mental toughness. Mental toughness develops over the years by maximizing athletes' opportunities and competition experiences, and athletes can develop their mental toughness by choosing to specialize or diversify in sports. More research needs to be done pertaining to sports like gymnastics and figure skating where early specialization may be critical to success.

**KEY WORDS:** College athletes, resiliency, diversification

### INTRODUCTION

An emerging role in athletic success is mental toughness and how it is developed in athletes. The research has defined mental toughness in many different ways. According to Jones et al., mental toughness is the ability to cope with both the stressors of sport and also allows one to perform with consistency and control, especially during pressure situations (14). In addition, mental toughness includes the psychological skills of believing in oneself, staying focused on achieving set goals, being able to control the environment, handling pressure while still

performing well, and handling both failures and success. A study conducted by Eklund et al. analyzed the coping strategies of twenty members of the United States 1988 Olympic Wrestling team (6). The study compared Olympic wrestlers who were awarded medals to those who were non-medalists and found that the coping strategies used by medalists were more internalized and automatized than non-medalists (6). When athletes compete at such a high level of competition, physical ability for the sport is typically equal between the competitors. However, athletes who attain higher psychological skills have the ability to set themselves apart from other athletes (6). Jones et al. stated that “virtually any desirable positive psychological characteristic associated with sporting success has been labelled as mental toughness” (p. 206) (14). Mental toughness is a key element for athletes to rise above their competitors.

Mack and Ragan expanded the definition of mental toughness and considered it to have three major components: mental, emotional, and physical resiliency. The mental component of mental toughness includes priming the mind to its optimal state, obtaining appropriate emotions, and being able to cope with discomfort and problems. The second component of mental toughness, emotions, is comprised of four key components: flexibility, responsiveness, strength, and resiliency. Lastly, the physical component involves being prepared physically and persevering through pain and discomfort (16).

With the increasing importance of mental toughness, researchers have examined its influence in a variety of settings. One study done by Gao et al. examined whether mental toughness differed based on both gender and athlete status. The scores revealed significant differences between males and females, as well as athletes and non-athletes, but no interaction between gender and athlete membership. Compared to females and non-athletes, male athletes possessed higher levels of mental toughness (10).

Drees and Mack performed a study with high school wrestlers to examine mental toughness over a competitive season (5). No significant differences were found in mental toughness from beginning to end of the season. Wrestlers who were older reported mental toughness scores that were higher than younger wrestlers and wrestlers with winning seasons had higher scores than wrestlers with losing seasons. This study indicated that a competitive, high school wrestling season was not long enough to increase mental toughness; however, it is likely that mental toughness is developed over time through athlete’s experiences and opportunities in sport. Supporting this fact, Thelwell et al. states that athletes start developing mental toughness through different experiences and environmental influences that they encounter during years of competition (21). When youth sport experiences are limited to only one sport it can affect their ability to develop mental toughness. (5).

Indeed, specialization in youth sport continues to be a debated issue. Hill describes sport specialization as training and competing year round in a single sport. (13). According to the criteria given by Baker et al., in the early specialization pathway are those who enter a primary sport at a young age and spend hours deliberately practicing that sport, and less time

participating in other sports. Athletes who choose to specialize start the investment years when they are approximately eight years old (1, 2). Diversification, on the other hand, is participation in practicing, training, or playing in a variety of sports (13). The Development Model of Sport Participation created by Ford et al. elaborates on the different stages of diversification. Athletes that chose early diversification go through three stages of development. The sampling years, which is the first stage, occurs from ages six to twelve years old. The second stage is the specializing years that occur from ages thirteen to fifteen years old. The last stage is the investment years and it starts when the athlete turns sixteen years old (9). Increasingly, coaches, parents, and children believe that to be superior athletes, children need to specialize at an early age in one sport (4, 13).

One of the main arguments supporting specialization is acquisition and development of motor skills in a given sport. Athletes can become more proficient at skills when they increase the frequency and duration of practice compared to athletes who only practice occasionally. Most adults believe that a child will be behind in their skill development if they are not involved in organized sports by the age of seven (22). Evidence is equivocal. For example, a group of Olympic level rhythmic gymnasts started sport-specific training earlier and acquired a higher amount of hours of deliberate practice than the comparison group of International level athletes, who did not attain Olympic level status (15). Yet, another study found no performance advantages in Russian swimmers who specialized at an earlier age; moreover, the swimmers who specialized at a later age actually advanced at a greater rate than those who specialized earlier (3).

Others have discussed potential social and psychological consequences of specialization. As athletes increase involvement in one sport, there are less opportunities outside of the sport for social interaction with others (12). Gould and colleagues also found that athletes who specialize can lose their abilities to deal with the stress of the sport and they may lose enjoyment in the sport (12). Additionally, athletes who specialize may experience burnout where sport, an enjoyable activity, becomes a cause of stress (20). Gould adds that although burnout can be caused by a wide variety of things, it is most commonly caused by high levels of training and the expectation of successful performance (11). When an athlete experiences burnout they lose the ability to cope with the stresses of their sport.

Mental toughness is important to sport performance and it is unknown whether early specialization in sport influences mental toughness. It is possible that the experience of performing one sport may not provide sufficient influences to develop mental toughness (21). Therefore, the purpose of this study was to examine mental toughness and early specialization. The purpose of this study was to determine (a) differences in mental toughness based on early specialization of sport and gender, and (b) the relationship between mental toughness and age of specialization in sport. It was hypothesized that (a) athletes who did not experience early specialization would have higher mental toughness scores than those who did experience early specialization, (b) men would have higher mental toughness scores than

women, and (c) a positive relationship would exist between mental toughness and age of specialization.

## **METHODS**

### *Participants*

The participants for this study were 102 college students (57% female) age 18-23 ( $M_{\text{age}} = 20.12$ ). Nearly 94% of the participants were White while the other 6% of the participants were African American, Asian, or multi-racial. The athletes who participated in this study were involved in the sports of swimming/diving, golf, basketball, track & field/cross country, softball, tennis, football, wrestling, and soccer. Most of the participants were freshmen (42%), followed by juniors (24%), seniors (18%), and sophomores (16%). More than half of the participants were starters (63%) and 93% of them were on full or partial scholarship. Less than half of them (34%) were ever redshirted. A total of 82% of the participants self-reported that they specialized in one sport, but most did not specialize until their college years (18 or older). The mean age for engaging in year-round training in one regulated, competitive sport at the elimination of all other sports was 13.45 ( $\pm 4.47$ ), with a range of 5-19 years.

Convenience sampling was used to recruit participants. To be included in the study, participants had to be a collegiate athlete at a Division 1 institution and at least 18 years of age.

### *Protocol*

Early specialization/diversification was defined a priori; we had intended to follow the definition based on the Development Model with early specialization happening prior to the age of 12 (9). However, because we had a low number of participants who specialized in sport prior to the age of 12, we decided to use a median split for determining the two groups. This resulted in the specialization group before the age of 14 and the diversification group as athletes who specialized after the age of 14.

Prior to starting this study, the researchers obtained IRB approval. Team coaches were emailed about the study. Researchers went before a practice to administer the surveys to the athletes as a group. After signing the informed consent, participants completed the survey and were free to leave. Athletes completed a demographic questionnaire as well as the Mental, Emotional, and Bodily Toughness Inventory (MeBTough). The demographic questionnaire examined the sport experience of the athletes, including collegiate sport, age, year in school, and at what age they experience year-round training of one sport.

The MeBTough assessed 3 components of mental toughness: mental, emotional, and physical resiliency (16). The mental dimension involves being able to create optimal performance and cope as well as, access proper emotions. An example question is "I have the ability to cope with crisis and adversity." The emotional dimension consists of flexibility, responsiveness, strength, and resiliency. An example question is "I can sustain a powerful fighting spirit against almost impossible odds." The physical dimension involves being physically prepared

and being tough. An example question is “During stressful times, I have the ability to act tough.” The MeBTough includes 43 items with responses on a Likert Scale from 1 (*almost never*) to 4 (*almost always*). The MeBTough includes 9 physical items, 15 mental items, and 19 emotional items. All 43 items were totaled for MeBT total score. Scores ranged from 43 to 172. The higher the score indicates higher levels of mental toughness. Mack and Ragan (16) reported Rasch calibration results demonstrating sufficient psychometric properties of the MeBTough. The authors showed validity evidence by showing variations MeBTough scores between athletes and nonathletes. Moreover, they found a positive correlation ( $r=.60$ ) between participants’ MeBTough scores and individual self-assessment of their mental toughness (16).

*Statistical Analysis*

To answer the primary research questions, an independent t-test as well as a correlation were conducted. First, six t-tests were conducted to determine if mental toughness differed based on the independent variables of early specialization and gender (see Table 1 and 2). Because only 18% of the sample specialized in 1 sport prior to college, we were unable to use our a priori definition of specialization. Therefore, specialization was determined by a median split to create equal groups. The median age was 14, and athletes who specialized in one sport before the age of 14 were considered to have experienced early specialization. The dependent variables were physical toughness, emotional toughness, and mental toughness. In order to determine the relationship between mental toughness and age of specialization, a correlation was conducted. SPSS Statistics 22 was used for all analyses. The alpha level was set at .05 for the correlations. Because of multiple T-Tests, a Bonferroni adjustment was used so that the alpha level was set at 0.008.

**RESULTS**

In regards to the first research question, no significant differences were found based on early specialization;  $t_{physical}(97) = -0.44, p = 0.659$ ;  $t_{emotional}(92) = -0.26, p = 0.79$ ; and  $t_{mental}(97) = -1.09, p = 0.28$ . No significant differences were found based on gender;  $t_{physical}(100) = -0.12, p = 0.90$ ;  $t_{emotional}(95) = -0.15, p = 0.88$ ; and  $t_{mental}(100) = -0.01, p = 0.99$ . Additionally, no significant relationship was found between age of specialization and mental toughness;  $r_{physical} = 0.03, p = 0.74$ ;  $r_{emotional} = 0.13, p = 0.22$ ; and  $r_{mental} = 0.14, p = 0.18$ .

**Table 1.** Means and standard deviations of the mental toughness subscales.

	Specialization <sup>a</sup>	No Specialization
Physical Subscale M(SD) <sup>b</sup>	28.74 (3.41)	29.12 (4.13)
Mental Subscale M(SD) <sup>b</sup>	46.11 (6.87)	47.76 (7.01)
Emotional Subscale M(SD) <sup>c</sup>	58.81 (7.52)	59.34 (9.71)
Total MeBT M(SD) <sup>c</sup>	133.48 (16.31)	135.78 (19.56)

<sup>a</sup> Athletes who specialized prior to age of 14

<sup>b</sup>  $n_{specialization} = 50, n_{no\ specialization} = 49$

<sup>c</sup>  $n_{specialization} = 47, n_{no\ specialization} = 47$



**Table 2.** Means and standard deviations of the mental toughness subscales for men and women.

	Men	Women
Physical Subscale M(SD) <sup>a</sup>	28.88 (4.22)	28.98 (3.73)
Mental Subscale M(SD) <sup>a</sup>	47.29 (7.08)	47.31 (6.80)
Emotional Subscale M(SD) <sup>b</sup>	59.21 (9.60)	59.49 (8.67)
Total MeBT M(SD) <sup>b</sup>	134.51 (19.53)	135.82 (17.77)

<sup>a</sup>  $n_{men} = 44$ ,  $n_{women} = 58$

<sup>b</sup>  $n_{men} = 40$ ,  $n_{women} = 57$

## DISCUSSION

The purpose of this study was to determine (a) differences in mental toughness based on early specialization of sport and gender, and (b) the relationship between mental toughness and age of specialization in sport. Counter to the hypotheses, there was no difference in scores based on early specialization or gender and there was no relationship between mental toughness and age of specialization.

Because of past research (11, 18, 19), it was hypothesized that men would have higher mental toughness than women. Unlike previous research, we found no gender difference in mental toughness scores. Because the athletes in the study had similar sporting experience, it is possible that both men and women developed similar levels of mental toughness. All athletes, male and female, had relatively high levels of mental toughness. Future research should examine other possible factors such as starting status, which may have more influence on mental toughness rather than gender.

There was no significant difference in mental toughness of those who specialized and those who did not. One potential reason for this finding is the lack of early specialization in our sample where few athletes specialized in one sport prior to late high school. A total of 82% of the athletes reported to have not specialized in one sport until they reached high school. Similarly, a previous study done by Malina, examined Division 1 female collegiate athletes and found that only 17% specialized in their college sport, the others participated in multiple sports (17). Malina also found that the average age of specialization was 13 years, which parallels the findings in the current study. As stated above, the DMSP terms the ages of 13-15 as the specializing years in the diversification pathway and that most athletes who experience early specialization do so at age eight (9). Therefore, because athletes in the current study were primarily in the diversification pathway, it would explain why there were no differences found in mental toughness scores.

In order to be classified as an expert performer, Ericsson et al. suggested that athletes need to practice more than 10,000 hours over a ten-year period (7). Because of this, it is the beliefs of many parents and coaches that it is a mistake not to specialize and that children will be behind in skill execution if they are not involved in organized sport before the age of seven (22). Although this study did not specifically examine skill proficiency, the sample consisted of

elite, collegiate athletes who have demonstrated their expertise with many of them experiencing diversification and not early specialization. It is possible, then, for athletes who diversify and involve themselves in a variety of sports to gain the number of hours required to reach elite status and also develop their skill level.

In the current study, the participants had relatively high scores of mental toughness. This is to be expected, given the athletes were participating at the collegiate level. For example, Drees and Mack found that high school senior wrestlers had significantly higher levels of mental toughness compared to high school freshmen wrestlers; and from pre to post season there was no difference in mental toughness (5). The studies suggest that maturity and more competing will help increase mental toughness scores.

No significant relationship was found between mental toughness and age of specialization in the current study. These findings suggest that sport participation in general, not just sport-specific participation may develop mental toughness over time. Given the potential consequences of early specialization (e.g., burnout, negative social development 17, 22), this study provides more evidence that diversification may be as beneficial to developing mental toughness.

Given our sample size, the lack of athletes experiencing specialization prior to high school, and the inclusion of only collegiate athletes, there is a need for continued research to examine sport specialization and mental toughness. Future research should examine these relationships in sports where early specialization is likely (e.g., gymnastics or figure skating) as well as looking at individual versus team sports as it may provide a better understanding of its relationship to mental toughness. As identified by Drees and Mack, mental toughness takes time to develop, therefore researchers should conduct longitudinal research to consider how mental toughness develops and potentially changes over time. Finally, since the current study found no differences in mental toughness based on gender, counter to other research (11, 18, 19), there should be continued investigation to gender differences. With this knowledge, coaches and practitioners can implement techniques to foster mental toughness in all athletes.

In conclusion, this study examined sport specialization and mental toughness in collegiate athletes. Mental toughness is a popular topic within sport and often identified as critical to sport success. The debate of early specialization versus diversification of sport participation continues among scholars, coaches, and parents. The findings of the current study suggest that high levels of mental toughness are developed in college athletes, but we still don't know whether early specialization or diversification enhances or inhibits mental toughness. However, because of the other consequences of early specialization (e.g., burnout, negative social development 17, 22), results of this study would suggest that promoting youth sport diversification will not be a detriment to the development of mental toughness.

## REFERENCES

1. Baker J, Côté J, Abernethy B. Sport specific training, deliberate practice and the development of expertise in team ball sports. *J Appl Sport Psychol* 15:12-25, 2003a.
2. Baker J, Côté J, Abernethy B. Learning from the experts: Practice activities of expert decision makers in sport. *Res Q Exerc Sport* 74:342-347, 2003b.
3. Barynina II, SM Vaitsekhovskii. The aftermath of early sports specialization for highly qualified swimmers. *Fitness Sports Rev Int* 132-133, 1992.
4. Coakley J. Social dimensions of intensive training and participation in youth sports. In: *Human Kinetics. Intensive Participation in Children's Sports*. Cahill and Pearl, Champaign, 1993.
5. Drees MJ, Mack MG. An examination of mental toughness over the course of a competitive season. *J Sport Behav* 35(4):377, 2012.
6. Eklund Robert C, Daniel Gould, Susan A Jackson. "Coping strategies used by U.S. Olympic wrestlers." *Res Q Exerc Sport* 64(1): 83-93, 1993.
7. Ericsson KA, Krampe RT, Tesch-Römer C. The role of deliberate practice in the acquisition of expert performance. *Psychol Rev* 100:363-406, 1993.
8. European Federation of Sports Psychology. Position statement of the European Federation of Sports Psychology: Children in Sport. *Sport Psychol* 10:224-226, 1996.
9. Ford PR, Ward P, Hodges NJ, Williams AM. The role of deliberate practice in career progression in sport: The early engagement hypothesis. *High Ability Studies* 20(1):65-75, 2009.
10. Gao Y, Mack M, Ragan M, Ragan B. Differential item functioning analysis of the mental, emotional, and bodily toughness inventory. *Measurement in Physical Education and Exercise Science* 16:203-218, 2012.
11. Gould, D. Intensive sport participation and the prepubescent athlete: competitive stress and burnout. In: *Human Kinetics. Intensive Participation in Children's Sports*. Cahill and Pearl, Champaign, 1993.
12. Gould D, S Tuffey, E Udry, J Loehr. Burnout in competitive junior tennis players: II. Qualitative analysis. *Sport Psychol* 10:341-366, 1996.
13. Hill GH. A study of sport specialization in Midwest High School Athletes. Unpublished doctoral dissertation 1997.
14. Jones G, Hanton S, Connaughton D. A framework of mental toughness in the world's best performers. *Sport Psychol* 21(2):243-264, 2007.
15. Law M, Côté J, Ericsson KA. Characteristics of expert development in rhythmic gymnastics: A retrospective study. *Int J Sport Exerc* 5(1):82-103, 2007.
16. Mack M G, Ragan BG. Development of the Mental, Emotional, and Bodily Toughness Inventory in collegiate athletes and nonathletes. *J Athl Train* 43:125-132, 2008.
17. Malina RM. Early sport specialization: roots, effectiveness, risks. *Curr Sports Med Rep* 9(6):364-371, 2010.



18. Newland A, Newton M, Finch L, Harbke RC, Podlog L. Moderating variables in the relationship between mental toughness and performance in basketball. *J Sport Health Sci* 2:184-192, 2013.
19. Nicholls AR, Polman CJ Remco, Levy AR, Backhouse SH. Mental toughness in sport: Achievement level, gender, age, experience, and sport type differences. *Personality and Individual Differences* 47:73-75, 2009.
20. Smith RE. Toward a cognitive-affective model of athletic burnout. *J Sport Psychol* 8:36-50, 1986.
21. Thelwell R, Weston N, Greenless I. Defining and understanding mental toughness within soccer. *J Appl Sports Psychol* 17:326-332, 2005.
22. Wiersma LD. Risks and benefits of youth sport specialization: perspectives and recommendations. *Pediatric Exerc Sci* 12(1):13-22, 2000.