STUDIA UBB EDUCATIO ARTIS GYMN., LXV, 2, 2020, pp. 69 - 80
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.65(2).15

OPTIMIZING SPORTS PERFORMANCE THROUGH MENTAL TOUGHNESS: PILOT STUDY

KALININ RĂZVAN[1,*], BALAZSI ROBERT[2], HANȚIU IACOB[1]

ABSTRACT. Background. Mental toughness is one of the most important and well-known psychological constructs in sports and beyond. Researchers in the field, argue that the development of mental toughness is based on both the influences of the environment in which the person operates and the learning and training processes that it went through them. "Gold Medal - Metal Training" it's a program for developing mental toughness and it's based on the work of several psychologists and coaches from Eastern Europe and Scandinavia. **Aims.** The aim of the present study was to verify the 4 essential aspects (process, resources, management and scientific) of the intervention program. **Methods.** The sample of this study consisted of N = 16 participants (31.8% male and 68.8% female), from a diverse range of sports (Judo, Hockey, Basketball, Triathlon, Dance, Athletics). Of these, 8 are performance athletes, and 8 are amateurs. Their age ranged from 19 to 44 years with a mean of M = 25.81 (SD = 7.70). Self-reports were obtained from all athletes regarding their mental toughness (Mental toughness Inventory) and the feasibility of the intervention program through a questionnaire in accordance with the objectives of the study. **Results.** Regarding the difference between statistical test indicate significant difference for item 2, item 3 and item 9. For the difference between the level of physical activity statistical test indicate significant difference for item 2. The results obtained in the ANOVA analysis with repeated measurements F (1, 15) = 8.257 (p = 0.012, MSE = 5.181, η^2 = 0.355) the F test is statistically significant despite the small sample size because the value of Eta (η^2) far exceeds the threshold (> 0.14) in terms of a large effect. **Conclusions.** According to the results, the study is feasible with slight changes related to the implementation and organization of the process, so the coordinator must be more active in collaborating with subjects and provide them with information and suggestions more often.

***Key words**: mental toughness, mental toughness program, sport performance, pilot study, Gold medal mental workout, Mental Toughness Inventory.*

[1] *Babeș-Bolyai University, Faculty of Physical Education and Sport, Cluj-Napoca, Romania*
[2] *Babeș-Bolyai University, Faculty of Psychology and Educational Sciences, Cluj-Napoca, Romania*
[*] *Corresponding Author: kalinin.razvan@yahoo.ro*

REZUMAT. ***Optimizarea performanței sportive prin intermediul conceptului Mental Toughness: studiu pilot.*** **Introducere.** Mental toughness (MT) este unul dintre cele mai importante și bine cunoscute constructe psihologice în sport și nu numai. Cercetătorii din domeniu susțin că dezvoltarea Mental toughness se bazează atât pe influențele mediului în care acționează persoana respectivă, cât și pe procesele de învățare și formare pe care le-a parcurs. „*Medalia de aur – antrenament mental*" este un program pentru dezvoltarea Mental toughness și se bazează pe munca mai multor psihologi și antrenori din Europa de Est și Scandinavia. **Obiective.** Scopul acestei lucrări a fost de a verifica cele 4 aspecte esențiale (proces, resurse, management și științific) ale programului de intervenție. **Metode.** Eșantionul acestui studiu a fost format din N = 16 participanți (31,8% bărbați și 68,8% femei), dintr-o gamă variată de sporturi (judo, hochei, baschet, triatlon, dans, atletism). Dintre aceștia, 8 sunt sportivi de performanță, iar 8 sunt amatori. Vârsta acestora a variat între 19 și 44 de ani, cu o medie de M = 25,81 (SD = 7,70). Aceștia au completat 2 chestionare, primul cu scopul de a măsura nivelul Mental toughness (Inventarul Mental toughness), iar al doi-lea fiind un chestionar care viza fezabilitatea programului de intervenție în conformitate cu obiectivele studiului. **Rezultate.** În ceea ce privește genul subiecților testul statistic a arătat diferențe semnificative pentru itemul 2, itemul 3 și itemul 9. Pentru diferența dintre nivelul de practicare a activității fizice testul statistic indicați diferența semnificativă pentru itemul 2. Pe baza rezultatelor obținute în cadrul analizei ANOVA cu măsurători repetate F (1 , 15) = 8,257 (p = 0,012, MSE = 5,181, η^2 = 0,355) testul F este semnificativ statistic în ciuda dimensiunii reduse a eșantionului, deoarece valoarea Eta (η^2) depășește cu mult pragul (> 0,14) în ceea ce privește un efect mare. **Concluzii.** Conform rezultatelor, studiul este fezabil cu modificări ușoare legate de implementarea și organizarea procesului, astfel încât coordonatorul trebuie să fie mai activ în colaborarea cu subiecții și să le ofere informații și sugestii mai des.

Cuvinte cheie: *Mental toughness, program Mental toughness, performanță sportivă, studiu pilot, Medalia de aur – antrenament mental, Inventarul Mental toughness.*

Introduction

Mental toughness is one of the most important and well-known psychological constructs in sports and beyond. Several authors (Clough, Earle & Sewell, 2002; Crust, 2007; Jones & Moorehouse, 2007; Loehr, 1986; Cowden & Meyer-Weitz, 2016) have stated that mental toughness is a psychological construct that supports success, excellence, and performance in sports.

Therefore, performance is based on innovation, competitive advantage, success, there are few constructs that resonate as strongly with people as mental toughness. The concept of mental toughness has attracted the attention

of both researchers and coaches and practitioners through the volume of research on the construct and its conceptualization. It is not surprising that mental toughness has become one of the most widespread concepts in the broad field of psychological training (Gucciardi, 2017).

Sports psychologists (Bull, Albinson & Shambrook, 1996; Gibson, 1998; Goldberg, 1998; Loehr, 1995) state that a person's MT level can be influenced. The development of MT through the certain mental skills in programs aimed at influencing performance have been proposed by some authors (Goldberg, 1998; Loehr, 1986; Watts, 1978) as a means of developing MT. Although it has been found that a good part of MT is related to social experiences, there are also aspects of MT that can be learned (Gordon, 2005).

Researchers in the field (Connaughton, Wadey, Hanton & Jones, 2008; Gucciardi, Gordon & Dimmock, 2009; Weinberg, Butt & Culp, 2011) argue that the development of MT is based on both the influences of the environment in which the person operates and the learning and training processes that it went through them. It has not been established which of these two methods is more beneficial, but neither can it be a question of establishing a ranking, but rather of combining these two methods for a maximum yield (Crust, 2008).

Regarding the effectiveness of intervention programs, several authors (Bell, Hardy & Beattie, 2013; Bhambri, Dhillon & Sahni, 2005; Gucciardi et al., 2009) support their effectiveness in the development of MT. Although both the implementation period of the programs was different from one study to another (2 weeks (Bhambri et al., 2005) to 2 years (Bell et al., 2013), and their content were different (multidisciplinary programs, programs targeting different key attributes of MT or programs targeting different psychological abilities) these have had a positive impact on the MT level of athletes (tennis players, footballers or cricketers). According to the results of Bell et al. (2013), reported that the MT level was approximately the same at the initial measurement in the case of the MT analysis on 2 groups (control and intervention), after the intervention the MT level of the control group remained the same, and in the case of the intervention group recorded significant differences ($p = .003$). Bhambri et al. (2005), in his study conducted on 4 groups recorded differences in the level of MT. Three of the groups differed on the MT level compared to the control group. These 3 groups received different intervention programs, but even so they all recorded MT increases compared to the control group. Moreover, Gucciardi et al. (2009) argue that both intervention programs aimed at the development of MT and programs aimed at developing psychological skills have seen positive changes in the level of MT and resilience compared to the control group.

Over time, several experts in the field have proposed intervention programs in order to develop MT, the intervention program chosen for this study will be presented below.

Gold medal mental workout. It is a MT development program created by Dariusz Nowicki, who is a psychologist and coach of the Polish Judo team, with numerous international medals. Starting from the idea that any method that contributes to sports performance must be used and that most of the time when 2 opponents are of the same level in terms of physical training, the one who wins you will be the one who is stronger mentally. He states that there is a possibility that a well-trained athlete will lose to another less physically fit but with a strong mind (Dariusz Nowicki, 1997). The "Gold Medal - Metal Training" program is based on the work of several psychologists and coaches from Eastern Europe and Scandinavia and includes a user manual that offers implementation suggestions and 12 audio materials that have different themes (for example: breath control, relaxation muscle, mental relaxation, sportsmanship, recovery).

Objectives

According to Thabane et al. (2010) the objectives of a pilot study focus on 4 essential aspects: the implementation process, resources, management and scientific character. Therefore, this study aimed to verify the 4 aspects (process, resources, management and scientific) of the intervention program.

Materials and methods

Participants

The sample of this study consisted of N = 16 participants (31.8% male and 68.8% female), from a diverse range of sports (Judo, Hockey, Basketball, Triathlon, Dance, Athletics). Of these, 8 are performance athletes, and 8 are amateurs. Their age ranged from 19 to 44 years with a mean of M = 25.81 (SD = 7.70).

Instruments

Mental Toughness Inventory (Gucciardi, Hanton, Gordon, Mallett & Temby, 2015) self-reported measure was used to operationalize mental toughness. Participants were asked to indicate how true each of the statements are (e.g., "I strive for continued success" and "I am able to regulate my focus when performing tasks") as an indication of how they typically think, feel, and behave as an athlete using a 7-point response scale (ranging from 1 = false, 100% of the time, to 7 = true, 100% of the time).

Questionnaire that according to the objectives of the study investigates the 4 aspects (process, resources, management and scientific). Participants were asked to answer items on a scale of 1 to 5 (where 1 = total disagreement and 5 = total agreement). Among the items being "it was easy for me to respect the coordinator's requirements", "I think the program needs too much time" and "I need someone to remind me when I have to run the program".

Procedure

Participants were informed about the purpose and objectives of the study. After their agreement, an initial MT level measurement was performed. Later, an online group was created where they received directions and materials to listen to. These materials were sent every 3 days, and after each material the MT level was measured again. At the end of the program, the final value of MT was measured and a feasibility questionnaire was applied according to the research objectives.

Results

According to the objectives set, the results of the study are to be presented for each aspect.

Process

The progress and effective implementation of the intervention is measured by this aspect. The items representative of the process in the feasibility questionnaire being item 1- "*it was easy for me to comply with the coordinator's requirements*", item 4 "*I had difficulties in implementing and carrying out the intervention*" and item 9 "*I consider that the audio listening sessions should be more frequent*". According to the answers given, the participants did not encounter difficulties in implementing and carrying out the intervention.

The descriptive statistics of the items from the feasibility questionnaire regarding the intervention implementation process are presented in table 1.

Table 1. Descriptive statistics of the items that represent the Process

Item	Minimum	Maximum	Mean	Std. Deviation
1	4.0	5.0	4.94	.25
4	1.0	4.0	1.19	.75
9	3.0	5.0	4.19	.91

The average item 1 is 4.94, this represents the ease with which the participants managed to meet the requirements of the coordinator, the average item 4 shows us the extent to which they encountered difficulties in carrying out and implementing the intervention. According to item 9, the subjects consider this intervention to be useful and that the sessions should be more than 2 per week. The descriptive statistics by gender of the items representative of the process are presented in table 2.

Table 2. Descriptive statistics on gender

Item	Gender	N	Mean	Std. Deviation	Std. Error Mean
1	M	5	4.80	.45	.20
	F	11	5.00	.00	.00
4	M	5	1.60	1.34	.60
	F	11	1.00	.00	.00
9	M	5	5.00	.00	.00
	F	11	3.82	.87	.26

For the difference between the gender categories, item 1 registers a difference of 0.20, the girls having a higher score, but the calculated statistical test indicates a value t (14) = 1.56 (p = 0.14) indicates an insignificant difference. Item 4 registers a difference of 0.60, the boys having a higher score, the calculated statistical test indicates a value t (14) = 1.45 (p = 0.14) the difference being insignificant. Item 9 registers a difference of 1.18, the boys having a higher score, the calculated statistical test indicates a value t (14) = 2.97 (p = 0.01) the difference being significant.

Descriptive statistics of the items according to the level of practice of the sports activity are presented in table 3.

Table 3. Descriptive statistics on the level of practicing sports activities

Item	Level	N	Mean	Std. Deviation	Std. Error Mean
1	P	8	4.88	.35	.13
	H	8	5.00	.00	.00
4	P	8	1.38	1.06	.38
	H	8	1.00	.00	.00
9	P	8	4.25	1.04	.37
	H	8	4.13	.83	.30

Regarding the difference between the categories of physical activity, item 1 registers a difference of 0.12, those who practice at hobby level have a higher score, but the calculated statistical test indicates a value t (14) = 1.00 (p=0.33) indicate an insignificant difference. Item 4 registers a difference of 0.38, those who practice at the performance level with a higher score, the calculated statistical test indicates a value t (14) =1.00 (p = 0.33) the difference being insignificant, and item 9 registers a difference of 0.12, those who practice at the level of performance having a higher score, the calculated statistical test indicates a value t (14) = 0.27 (p = 0.80) the difference being insignificant.

Resources

This aspect analyzes the needs of the subjects (time, devices, knowledge) for the implementation of the intervention. The representative items of this aspect are item 2 "*I think the program needs too much time*", item 5 "*it was difficult for me to understand the program*" and item 6 "*I easily completed the program and its content*". According to the answers, the program does not need too much time to be implemented, and its content did not impose problems on the participants.

The descriptive statistics of the items from the feasibility questionnaire regarding the resources necessary for the intervention are presented in table 4.

Table 4. Descriptive statistics of the items that represent the Resources

Item	Minimum	Maximum	Mean	Std. Deviation
2	1.0	5.0	1.94	1.18
5	1.0	1.0	1.00	.00
6	4.0	5.0	4.81	.40

The average item 2 shows the extent to which participants consider that the intervention needs too much time. According to item 5, participants do not need special knowledge or skills to understand the content, and item 6 represents the ease of completing the program and their openness to such interventions.

Table 5 presents the descriptive statistics by gender of the items representative of this aspect.

Table 5. Descriptive statistics on gender

Item	Gender	N	Mean	Std. Deviation	Std. Error Mean
2	M	5	3.40	.89	.40
	F	11	1.27	.47	.14
5	M	5	1.00	.00	.00

Item	Gender	N	Mean	Std. Deviation	Std. Error Mean
6	F	11	1.00	.00	.00
	M	5	5.00	.00	.00
	F	11	4.73	.47	.14

Item 2 has a difference of 2.12, the boys with a higher score, the calculated statistical test indicates a value t (14) = 6.36 (p = 0.00) the difference being significant. Item 5 does not differ. Item 6 registers a difference of 0.27, the boys having a higher score, the calculated statistical test indicates a value t (14) = 1.48 (p = 0.22) the difference being insignificant.

Below, in table 6 are the descriptive statistics on the level of practicing the sports activity.

Table 6. Descriptive statistics on the level of physical activity

Item	Level	N	Mean	Std. Deviation	Std. Error Mean
2	P	8	2.88	.99	.35
	H	8	1.00	.00	.00
5	P	8	1.00	.00	.00
	H	8	1.00	.00	.00
6	P	8	4.63	.52	.18
	H	8	5.00	.00	.00

Regarding the differences between the level of practicing sports activities, item 2 has a difference of 1.88, those who practice at the performance level with a higher score, but the calculated statistical test indicates a value t (14) = 5.35 (p = 0.00) the difference being significant. Item 5 does not differ. Item 6 registers a difference of 0.37, those who practice at hobby level having a higher score, the calculated statistical test indicates a value t (14) = 2.05 (p = 0.06) the difference being insignificant.

Management

This aspect represents the process of organizing and implementing the intervention. The representative items of this aspect are item 3 "*I happened to forget to listen to the audio materials*", item 7 "*it is difficult to run the program if I am not at home*" and item 8 "*I need someone to remind me when I have to run the program*". Subjects did not encounter problems in managing the study. The results show that organization, location or time were not an issue to meet and implement the requirements of the intervention.

The descriptive statistics of the items from the feasibility questionnaire regarding the managerial aspects necessary for the intervention are presented in table 7.

Table 7. Descriptive statistics of the items that represent the managerial aspects

Item	Minimum	Maximum	Mean	Std. Deviation
3	1.0	4.0	2.13	1.50
7	1.0	2.0	1.13	.34
8	1.0	2.0	1.56	.51

The mean of item 3 show if participants forgot to comply with what was required of them, while item 7 shows us that it was not difficult for them to meet the requirements if they were not at home. Item 8 it shows us that they don't need someone to remind them of what they have to do.

Table 8 presents the descriptive statistics by gender of the items representative of the managerial aspect.

Tabel 8. Descriptive statistics on gender

Item	Gender	N	Mean	Std. Deviation	Std. Error Mean
3	M	5	1.00	.00	.00
	F	11	2.64	1.57	.47
7	M	5	1.00	.00	.00
	F	11	1.18	.40	.12
8	M	5	1.80	.45	.20
	F	11	1.46	.52	.16

Item 3 registers a difference of 1.64, the girls having a higher score, but the calculated statistical test indicates a value t (14) = 2.30 (p = 0.04) the difference being significant. Item 7 registers a difference of 0.18, the girls having a higher score, the calculated statistical test indicates a value t (14) = - 0.99 (p = 0.34) the difference being insignificant. Item 8 registers a difference of 0.34, the boys having a higher score, the calculated statistical test indicates a value t (14) = 1.28 (p = 0.34) the difference being insignificant.

The descriptive statistics of the items representative of the managerial aspect on the level of practicing the sports activity are presented in table 9.

Table 9. Descriptive statistics on the level of physical activity

Item	Level	N	Mean	Std. Deviation	Std. Error Mean
3	P	8	2.13	1.55	.55
	H	8	2.13	1.55	.55
7	P	8	1.00	.00	.00
	H	8	1.25	.46	.16
8	P	8	1.50	.53	.19
	H	8	1.63	.52	.18

Item 3 records no differences. Item 7 registers a difference of 0.25, those who practice at hobby level having a higher score, the calculated statistical test indicates a value t (14) = 1.53 (p = 0.15) the difference being insignificant. Item 8 registers a difference of 0.13, those who practice at hobby level with a higher score, the calculated statistical test indicates a value t (14) = - 0.48 (p = 0.64) the difference being insignificant.

Scientific

With the help of this aspect, the effect generated by the intervention is presented. The Mental Toughness Inventory proposed by Gucciardi et al. (2015) was used to measure MT. For the analysis of the results we used ANOVA with repeated measurements. Following the analysis, the results showed for the initial measurement of MT an average of M = 49.13, and in the case of the final measurement M = 51.62. Therefore, based on the results obtained in the ANOVA analysis with repeated measurements F (1,15) = 8.257 (p = 0.012, MSE = 5.181, η^2 = 0.355) the F test is statistically significant despite the small sample size because the value of Eta (η^2) far exceeds the threshold (> 0.14) in terms of a large effect.

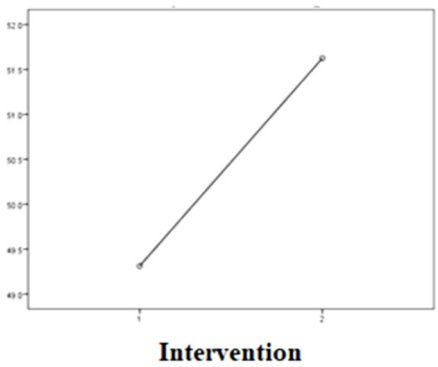

Fig. 1. Graph the effect size

The effect size is shown in Figure 1. The graph represents the differences between the 2 measurements, pretest and posttest.

Discussion and Conclusions

According to the results, in the case of the gender analysis of the feasibility questionnaire, item 2 registers a significant difference t (14) = 6.36 (boys with higher score), this item measuring the time resources of the participants to go through the materials. This may be due to the boys' higher training volume program or their busier schedule. Regarding item 3, it showed significant differences t (14) = 2.30 (girls with a higher score). Item 3 measures the management dimension of the study, more precisely, the extent to which they forgot to follow the instructions given by the coordinator, suggesting that in the study, the coordinator should be more careful and remind participants of the tasks they have to perform. Item 9 showed a significant difference t (14) = 1.28 (boys with higher score). Item 9 represents the desire of the subjects to be more frequent the sessions of implementation of the program, in the present study they being in number of 2 per week.

Regarding the analysis of the feasibility questionnaire on the levels of practicing the sport activity, item 2 showed significant differences t (14) = 5.35 (those who practice physical activities in performance regime with a higher score). The time resource may be less for performance athletes due to the training process which involves a higher volume and additional recovery time due to heavy and exhausting workouts.

According to the results, the study is feasible with slight changes related to the implementation and organization of the process, so the coordinator must be more active in collaborating with subjects and provide them with information and suggestions more often. We propose that in the main study the subjects be part of groups in which they regularly receive messages with implementation instructions and messages that remind them of the tasks required by the program. From a scientific point of view, the effect of the intervention proved to be great, which supports the process of implementing the intervention.

REFERENCES

Bell, J. J., Hardy, L., & Beattie, S. (2013). Enhancing mental toughness and performance under pressure in elite young cricketers: A 2-year longitudinal intervention. *Sport, Exercise, and Performance Psychology* Vol. 2, No. 4, 281–297.

Bhambri, E., Dhillon, P.K. & Sahni, S.P. (2005). Effect of Psychological Interventions in Enhancing

Mental Toughness Dimensions of Sports Persons. *Journal of the Indian Academy of Applied Psychology No.1-2, 65-70.*

Bull, S. J., Albinson, J. G., and Shambrook, C. J. (1996) *The Mental Game Plan: Getting Psyched for Sport,* Eastbourne: Sports Dynamics.

Clough, P., Earle, K., & Sewell, D. (2002). Mental toughness: The concept and its measurement. In I. Cockerill (Ed.) *Solutions in sport psychology* (pp. 32-45). London: Thomson.

Connaughton, D., Wadey, R., Hanton, S., & Jones, G. (2008*).* The development and maintenance of mental toughness: Perceptions of elite performers. *Journal of Sport Sciences, 26*, 83–95. DOI: 10.1080/02640410701310958

Crust L. (2007). Mental toughness in sport: A review. *International Journal of Sport and Exercise Psychology, 5*:3, 270-290. doi.org/10.1080/1612197X.2007.967183.

Crust, L. (2008). A review and conceptual re-examination of mental toughness: Implications for future researchers. Personality and Individual Differences, 45, 576-583. doi.org/10.1016/j.paid.2008.07.005.

Gibson, A. (1998). *Mental toughness*. New York: Vantage Press.

Goldberg, A. S. (1998). *Sports Slump Busting: 10 Steps to Mental Toughness and Peak Performance*. Champaign, IL: Human kinetics.

Gordon, S. (2005). *Identification and development of mental toughness*. Psychology promoting health & performance for life: Proceedings of the ISSP 11th World Congress of Sport [CDROM] Sydney: International Society of Sport Psychology (ISSP).

Gucciardi, D.F. (2017). Mental toughness: progress and prospects. *Current Opinion in Psychology, 16*:17–23, http://dx.doi.org/10.1016/j.copsyc.2017.03.010.

Gucciardi, D.F., Gordon, S., & Dimmock, J.A. (2009). Advancing mental toughness research and theory using personal construct psychology. *International Review of Sport and Exercise Psychology, 2:1*, 54-72, DOI: 10.1080/17509840802705938.

Gucciardi, D.F., Gordon, S., & Dimmock, J.A. (2009) Evaluation of a Mental Toughness Training Program for Youth-Aged Australian Footballers: I. A Quantitative Analysis, *Journal of Applied Sport Psychology*, 21:3, 307-323, DOI: 10.1080/10413200903026066.

Gucciardi, D.F., Hanton, S., Gordon, S., Mallett, C.J., Temby, P. (2015). The concept of mental toughness: tests of dimensionality, nomological network, and traitness. *Journal of Personality. 83*:26-44. DOI: 10.1111/jopy.12079.

Jones, G., and Moorehouse, A. (2007). *Developing Mental Toughness: Gold Medal Strategies for Transforming your Business Performance.* Oxford: Spring Hill.

Loehr, J. E. (1986). *Mental Toughness Training for Sports: Achieving Athletic Excellence*, Lexington, MA: Stephen Greene Press.

Loehr, J. E. (1995). *The new mental toughness training for sports*. New York: Plume.

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., Reid, R., Thabane, M., Giangregorio, L., Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. BMC *Medical Research Methodology, 10(1).* doi:10.1186/1471-2288-10-1.

Watts, G. (1978*). Mental toughness for disadvantaged track teams*. Scholastic Coach, 47, 100-102.

Weinberg, R., Butt, J., and Culp, B. (2011). Coaches' views of mental toughness and how it is built. *International Journal of Sport and Exercise Psychology.* doi.org/10.1080/1612197X.2011.567106.