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## **Programa de entrenamiento psicológico y desarrollo de la fortaleza mental: una revisión integradora de la literatura**

### **Psychologic training program and mental toughness development: an integrative revision of literature**

### **Programa de treinamento psicológico e desenvolvimento da robustez mental: uma revisão integrativa da literatura**

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#### **RESUMEN**

El constructo Mental Toughness (MT) se considera un componente esencial del rendimiento deportivo, por lo tanto, es importante examinar cómo se ofrecen y aplican a los atletas los programas para desarrollar MT. En este sentido, el objetivo de este estudio fue revisar la literatura en relación a los programas de entrenamiento psicológico (PST) aplicados para el desarrollo de la Robustez Mental en el contexto deportivo. Se utilizaron las bases de datos Scielo, PubMed, SportDiscus, BVS, Embase y Psynet, considerando los idiomas portugués, inglés y español. Se utilizó el programa EndNote® para almacenar y organizar el material. Los criterios de inclusión fueron artículos completos, con atletas, que investigaran el entrenamiento psicológico para el desarrollo de MT; los criterios de exclusión fueron: estudios de revisión, estudios de áreas distintas al deporte y entrenamiento psicológico realizado con atletas lesionados. Los resultados muestran 1.858 estudios y, de ese total, se incluyeron diez estudios para síntesis y análisis cualitativo. Los hallazgos muestran que cuatro estudios utilizaron modalidades colectivas y siete utilizaron modalidades individuales, siendo cuatro estudios con atletas adultos y seis con atletas adolescentes. En cuanto a la estructura de los programas, seis estudios utilizaron actividades tradicionales de PST, mientras que dos trabajaron con actividades específicas para desarrollar MT. Para la evaluación previa y posterior, los diez estudios utilizaron herramientas que miden MT. De los estudios analizados, nueve muestran un aumento en las puntuaciones de MT después de las intervenciones. En conclusión, los programas de entrenamiento psicológico orientados al desarrollo de la MT no se diferencian de los programas tradicionales de PST, tanto en las habilidades psicológicas trabajadas, las actividades realizadas y el número de sesiones.

**Palabras clave:** deportes, deportistas, fortaleza mental.

#### **ABSTRACT**

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## Psychologic training program and mental toughness development

The Mental Toughness (MT) construct is considered an essential component of sports performance, therefore, it is important to examine how programs to develop MT are being offered and applied to athletes. In this sense, the objective of this study was to review the literature in relation to psychological training programs (PST) applied for the development of Mental Toughness in the sport context. The Scielo, PubMed, SportDiscus, BVS, Embase, and Psynet databases were used, considering the Portuguese, English and Spanish languages. The program EndNote® was used to store and organize the material. The inclusion criteria were full papers, with athletes, investigating the psychological training for MT development; the exclusion criteria were: review studies, studies of areas other than sports, and psychological training carried out with injured athletes. The results show 1.858 studies and, from this total, ten studies were included for synthesis and qualitative analysis. The findings show four studies used collective modalities, and seven used individual modalities, being four studies with adult athletes and six with teenager athletes. Concerning the structure of the programs, six studies used traditional PST activities, while two worked with specific activities to develop MT. For the pre- and post-evaluation, all the ten studies used tools that measure MT. From the analysed studies, nine show an increase in MT scores after the interventions. In conclusion, the psychological training programs geared to developing the MT are not different from traditional PST programs, both in terms of the psychological skills worked on, the activities performed and the number of sessions.

**Keywords:** sports, athletes, mental toughness

### RESUMO

O construto Robustez Mental (RM) é considerado um componente essencial do desempenho esportivo, portanto, é importante analisar como os programas para desenvolver a RM estão sendo oferecidos e aplicados aos atletas. Nesse sentido, o objetivo deste estudo foi revisar a literatura em relação aos programas de treinamento psicológico (PST) aplicados para o desenvolvimento da Robustez Mental no contexto esportivo. Foram utilizadas as bases de dados Scielo, PubMed, SportDiscus, BVS, Embase e Psynet, considerando os idiomas português, inglês e espanhol. O programa EndNote® foi utilizado para armazenar e organizar o material. Os critérios de inclusão foram artigos completos, com atletas, investigando o treinamento psicológico para o desenvolvimento da RM; os critérios de exclusão foram: estudos de revisão, estudos de outras áreas que não o esporte e treinamento psicológico realizado com atletas lesionados. Os resultados mostram 1.858 estudos e, desse total, dez estudos foram incluídos para síntese e análise qualitativa. Os achados mostram que quatro estudos utilizaram modalidades coletivas e sete utilizaram modalidades individuais, sendo quatro estudos com atletas adultos e seis com atletas adolescentes. Quanto à estrutura dos programas, seis estudos utilizaram atividades tradicionais do PST, enquanto dois trabalharam com atividades específicas para desenvolver a RM. Para a pré e pós-avaliação, todos os dez estudos utilizaram instrumentos que medem a RM. Dos estudos analisados, nove mostram um aumento nos escores da RM após as intervenções. Em conclusão, os programas de treinamento psicológico voltados ao desenvolvimento da RM não diferem dos programas tradicionais de PST, tanto em termos de habilidades psicológicas trabalhadas, quanto nas atividades realizadas e no número de sessões.

**Palavras chave:** esportes, atletas, robustez mental.

### INTRODUCCIÓN

The relationship between some psychological factors and sports performance has been recognized for many years. The evidence confirming this relationship comes from various studies about anxiety (Weinberg & Gould, 2018; Palazollo, 2019), emotional intelligence (Kopp & Jekauc, 2018), concentration (Nideffer, 2021), emotional regulation (Roy & Suwarganda, 2015), perfectionism (Waleriańczyk & Stolarski, 2021; Rosado et al., 2013), motivation (Deci

& Ryan, 2000; Duda, 2005, (Álvarez et al., 2018), self-confidence (Brace et al., 2020), stress management (Brandão et al., 2021), others, which unanimously concluded that these factors are substantial and positively associated with participation and success in sports.

However, in the last 20 years, studies conducted by Bull, et al. (2005); Golby, et al. (2007); Gucciardi and Jones, 2012; Clough and Strycharczyk (2012); Gucciardi and Gordon (2013); Cowden, et al. (2016);

Rintaugu et al. (2022) showed athletes with high sport results (Olympic/world champions) presented a set of psychological factors, behaviours, and attitudes that, together, had a significant impact over sport performance.

This set was named Mental Toughness (MT), which allows athletes to better deal with their competitors, have positive and consistent performances regardless of situational factors, be more determined, focused, and confident, to resist and overcome obstacles and challenges of a day-to-day sports career (Loehr, 1982; Sheard & Golby, 2006; Clough & Strycharczyk, 2012; Gucciardi & Gordon, 2013; Cowden et al. 2016, Gucciardi, 2020; Benítez-Sillero et al., 2021).

Historically, however, MT researchers, despite considering it a multidimensional construct, disagree as to the number of attributes of this set of psychological, behavioral, and attitudinal factors. Loehr (1982), one of the pioneers in the study of MT, remarks that seven attributes constitute it (self-confidence, attention control, negative energy, motivation, attitude control, positive energy, and visual and image control).

Clough, et al. (2002) consider four attributes (control, commitment, confidence, and challenge), Middleton et al. (2004), point out twelve (self-efficacy, self-concept, potential, focus on the task, perseverance, familiarity with the task, personal words, value of the task, commitment, positive thoughts, and stress minimization); Gucciardi and Gordon (2008) talk about five (emotional intelligence, attention control, resilience, self-confidence, and desire to win). Sheard et al. (2009) consider three attributes (control, commitment, and confidence), while Gucciardi, et al. (2008) mention four (dealing with challenges, knowledge of the sport, assertive attitude, and desire for success).

The lack of consensus as to the number of attributes probably led to an expressive number of tools developed to measure MT and identify the athletes that are more/less mentally tough, and its impact on their performance. The literature shows some tools: 1) Psychological Performance Inventory (PPI), proposed by Loehr (1986) and the reviewed version named Alternative Psychological Performance Inventory (PPI-A) (Golby et al., 2007); 2) Mental Toughness Questionnaire 48 (MTQ48) by Clough, et al. (2002)

and its reduced version, the MT18; 3) Mental Toughness Inventory (MTI) by Middleton et al. (2005); 4) Mental Toughness Scale (MTS) from Madrigal, et al. (2013); 5) Mental, Emotional, and Bodily Toughness Inventory (MeBTough) developed by Mark and Ragan (2008); 6) Sport Mental Toughness Questionnaire (SMTQ) proposed by Sheard, et al. (2009); 7) Australian Football Mental Toughness Inventory (AFMTI), developed by Gucciardi, et al. (2009), 8) The Cricket Mental Toughness Inventory (CMTI), developed by Gucciardi and Gordon (2009), and 9) Mental Toughness Scale in sports for adult Brazilian athletes (Escala de Robustez Mental no esporte para atletas brasileiros adultos) (RME-A) and young (RME-J) by Corrêa (2019) and Sermarini (2019), respectively.

However, despite the importance of the MT for sport, another aspect that deserves attention refers to programs for the acquisition and development of MT in athletes. There is a significant discussion if MT is an innate dimension of the personality or can be developed depending on contextual-situational factors (Crust, 2007; Stamatis, et al., 2021). This discussion has led to search and understand how these programs are being offered, if as traditional mental training programs known as PST, or if through MT formal training programs based on the development of the different attributes assigned to the construct.

Sports psychology literature is rich in studies about psychological training programs in general, known as

Psychological Systematic Training – PST). A PST consists in the learning and practice of systematic psychological skills like self-confidence, concentration, stress management, anxiety control, motivation, resilience, communication, group cohesion, coping strategies through self-regulation techniques, concentration exercises, goal setting, routine setting, strategies to deal with adversities, etc., which can help athletes reach better sport performance (Weinberg & Gould, 2018).

PST programs in different sports modalities were carried out to help athletes develop mental skills to improve their performance (Weinberg & Gould, 2018; Kim, et al., 2021). The combined use of psychological techniques efficiently improved performance (Daw & Burton, 1994; Olmedilla et al. 2010; Meggs & Chen, 2019). However, these programs differ as to the

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proposed methodology, duration of the interventions held, duration of the programs, but not as to the mental skills trained, considered a consensus among researchers. Connaughton and Hanton (2009) stated that the MT development involves more than the athlete's exposure to challenging situations. Corroborating with the authors, Caruzzo et al., (2021), highlight the importance of the influence of coaches, team colleagues, and parents; that is, the influence of the environment on the learning process and the biopsychosocial development of the athlete must also be considered.

In 2016, Anthony, Gucciardi, and Gordon conducted a comprehensive systematic review with three main objectives: to review the literature on MT's main factors, to understand the process of its development, and to produce knowledge for further research related to MT development. However, the authors themselves confirm the need to investigate the various aspects of the development process.

Thus, the main objective of this study was to perform an integrative review of the literature to understand how psychological training programs are applied for the development of MT in the sports context.

### MATERIAL Y MÉTODOS

The integrative review is structured in six stages: identification of the theme and selection of the research's question, definition of the inclusion and exclusion criteria, identification of pre-selected and selected studies, and presentation and synthesis of the knowledge (Botelho et al., 2011), as presented below.

In this study, the research of the literature was conducted in the databases: Portal BVS - as it makes up the bases (Lilacs and Medline, Ibecs, Cumed, and others.) - PubMed/Medline for being a base associated with the biomedical and health sciences area, Scielo for being the largest Brazilian journal database, SportDiscus (EBSCO) for having a large scope of studies in the sports science area, Embase, the largest publisher of medical literature in the world, and Psynet for having a wide range of studies in the field of psychology.

To recover the documents according to the terms used, Brandau, et al. (2005) suggest selecting the words to facilitate the organization of the information found.

English, Spanish, and Portuguese languages were selected using the terms of each database, according to the PICO strategy. English and Spanish languages were chosen because they are commonly used in scientific publications (Packer et al., 2007), and Portuguese which is the native language of the authors.

To choose English terms for the PubMed/Medline, Scielo and Portal BVS databases we used the Mesh (Medical Subject Headings), which are terminologies used for index and catalog information in these databases (Boland et al., 2017). For searches in English at Embase, Psycnet, and SPORTDiscus, we used Emtree and Thesaurus. For searches performed in Spanish and Portuguese on BVS portal and Scielo we used the descriptors in Ciências da Saúde (Health Sciences, DeCS), a structured, trilingual vocabulary created by BIREME and developed from MeSH to allow the use of a common terminology for search in three languages (Petticrew & Roberts, 2006). The PICO strategy helped to build specific terms for the search as it represents a population, intervention, and context (Cherry & Dickson, 2017); the advanced search, with Boolean operators "AND" and "OR" was used. The search terms are in the following table.

Table 1.  
*PICO Strategy*

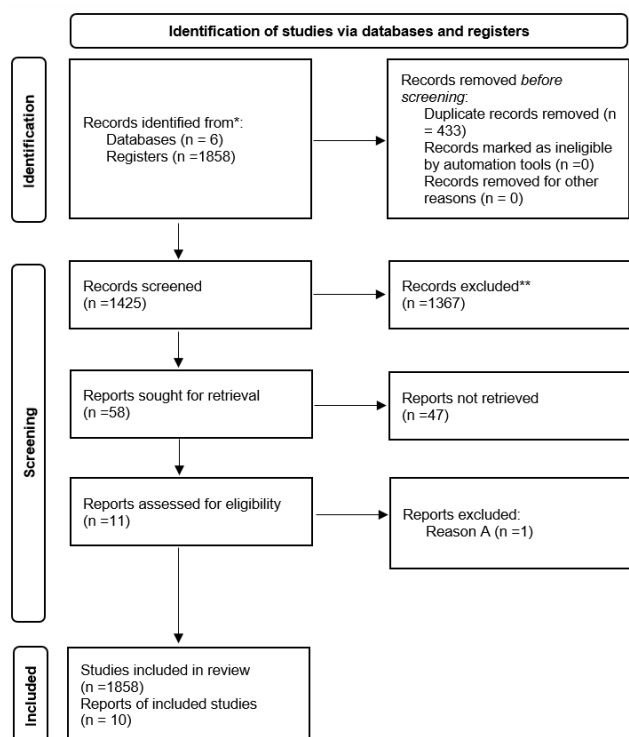
PICO	DESCRIPTION
POPULATION	Athletes
INTERVENTION	Psychological training; Psychological skills training, Mental training
CONTEXT	SPORT

The software EndNote X9® was used to store and organize information collected on databases, as according to Yamakawa et al., (2014), this software has most resources and convenience, as it detects duplicated references, performs internal bibliographical data searches, and manages bibliographical data.

The inclusion criteria adopted were full articles (introduction, methodology, and results), with athletes, coaches, or referees, investigating psychological training as a resource for MT development. The exclusion criteria were review studies, studies on fields other than sports, e.g.,

military, and psychological training with injured athletes.

In the period between 02/03/2021 and 03/04/2021, the search found 1,858 pieces of evidence that two independent reviewers screened following the previously defined eligibility criteria. The screening was performed in two phases, as proposed by Dunder and Fleeman (2017). The first phase was the analysis of titles and summaries of the studies on the theme and in compliance with the inclusion criteria defined previously. In the second phase, all the studies included in the first phase were read and the exclusion criteria were applied. See Figure 1 for the flowchart of the phases.



Notice: Exclusion criteria: A) Review study

\*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

\*\*If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

The data extracted from the selected studies were pre-defined, and they were as follows: authors, year of publishing, journal, title, sample, age, sports modality, objective and type of study, duration of the program, time of each training session, variables worked, assessment done, and results (tables 3, and 4).

In Table 2, the following data are presented with the evaluation of some methodological criteria considered fundamental to analyze the quality of the selected articles (Franquelo, Hernández-Mendo, Capafons, 2022), such as: (a) specifying the sample: do the selected studies specify the sample, sex and age and its eligibility? b) distribution of the sample: the groups were randomly divided and allocation of the subjects was made to blind? c) the studies used programs related to the subject investigated, TM? d) the studies present statistical results, has been made inter-group comparison? e) the studies present a measure of accuracy or a measure of the size of the treatment effect. The effect of treatment can be described as a difference in group outcomes, or as the result in all (or each) groups. Measurements of variability include standard deviations (DP's), standard errors (EP's), confidence intervals, interquartis amplitudes (or other amplitudes of quantis), and amplitudes of variation (Cohen, 1988). The studies were evaluated according to Yes or No and, the items were chosen because they were in accordance with the objectives of this review.

According to the data it can be observed that only the study of Mostafa (2015) has no methodological quality, however, it has been chosen to maintain it because it is a study that covers the topic of MT. The other selected studies present more than 70% of the items selected to evaluate the methodological quality of the studies.

## RESULTADOS Y DISCUSIÓN

After searching in the databases and completing the screening process of all the studies, ten studies were selected according to the criteria defined and were part of the analysis. Table 3 lists the studies included, comprised of the descriptive data and presented as follows: authors and year of publishing, journal, title of the study, participants (athletes, coaches, and referees), age bracket (years) and sports modality. The analytical results are described in table 4, and they include: the objectives of the study, type of methodology, duration of the program, duration of the intervention sessions, variables worked on during the sessions, assessment done pre- and post- interventions, and results obtained.

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According to the descriptive analysis, five of the ten papers were published in influential journals in the field of sports psychology. One appeared in an Asian publication, another in an Indian publication, another in a broad-spectrum educational publication, and two in Romanian publications. The first studies involving psychological training programs aimed at the development of MT began in 2005 with Bhambri et al. (2005) and Sheard and Golby (2006), then there was a three year interval until the publishing of another study (Gucciardi et al., 2009), and after another three year interval, from 2012 on, 7 studies were published: Abdelbaky (2012); Bell, et al. (2013); Mostafa (2015); Rasti, et al. (2015); Golby and Wood (2016); Mahoney, et al. (2016); Miçoogullari and Ekmekçi (2017).

Regarding the sports modalities investigated, there were 11 different modalities, three studies for soccer (the most studied), followed by rowing, table tennis (two studies each). One study developed an MT program for seven different modalities, and aside from the ones mentioned above, it included karate, taekwondo, five-a-side soccer, volleyball and basketball athletes. It is important to say that the soccer modality has been frequent in PST programs in general, maybe because it is the most practiced sport in the world, in different countries, making it easier to find clubs and athletes (Olmedilla et al., 2010; Godfrey & Winter, 2017; Navarrón et al., 2017).

As for the genre of the participants, four studies used mixed samples (men and women), three only had male athletes, and three did not inform the participants' genre. From the ten studies analysed, four were conducted with samples of adult athletes (studies number 4, 6, 8, and 10), and six studies were with teenagers' athletes (studies number 1, 2, 3, 5, 7, and 9). These data seem to be following the development of PST traditional programs, especially for young athletes (Foster et al., 2016), since according to Hrycaiko, et al. (2004) the cognitive skills training has demonstrated being beneficial in helping young people be more psychologically conscious. Corroborating with the authors, Sheard and Golby (2006), Ramolale, et al. (2021), stress that well elaborated PST programs are an opportunity to positively nourish the personal development of young athletes in competitive sports, and to facilitate their

growth in other areas of life, transferring the mental skills learned to their day-to-day lives.

Regarding the methodology used, all ten studies presented a quasi-experimental/quantitative methodological design, with a control group and intervention group. Only study #9 used mixed methods (qualitative and quantitative), also with a control group and intervention group. However, the authors used semi-structured interviews as one of the methods to evaluate post-intervention.

Concerning the interventions' duration, there is no consensus among the studies: two of them (studies #4 and #9) lasted for 8 weeks. The shorter program lasted 46 days (study #5) and the largest, 16 weeks (study #10) and the rest varied between 2 to 12 weeks, corroborating with the traditional PSTs' duration (Navarrón et al., 2017; Meggs & Chen 2019; Hut et al., 2021).

Also, regarding the duration of the programs, one should consider the number of dimensions that were worked on, e.g., studies numbers 1, 2, 4, 6, and 8 used PPI as a tool for pre- and post-assessment across 7 dimensions of MT. However, it is interesting to notice that study number 1 lasted 2 weeks, study number 8 lasted 4 weeks, and the rest lasted more than 7 weeks for the development of the same dimensions

Study number 5 (Bell, Hardy & Beattie, 2013) shows that the authors conducted a 46 days intervention program to develop MT's 12 attributes, while the authors of studies numbers 3, 7, 9, and 10 prepared programs over six weeks long to develop fewer dimensions: Gucciardi et al. (2009), proposed a six-week program to work on four dimensions, and Miçoogullari and Ekmekçi (2017), used 16 weeks to develop three dimensions (control, commitment, and confidence). These data show no consensus towards the number of sessions even when they work with an equal number of dimensions.

About the variables worked on through the interventions, nine studies used the psychological skills from traditional PSTs: confidence, concentration, set goals, and self-regulation. To develop these skills, they used various strategies: self-talk, visualization, relaxing, thought control, and elaboration of routines.

Two studies (#3 and #9) used an intervention program that was different from the others. Study number 3 divided its sample into three groups: PST Group, MT Group, and Control Group. PST Group received conventional PST interventions, and the MT Group received interventions based on the dimensions considered by the author as MT attributes: work ethics, mental attitude, motivation, self-confidence, concentration, resilience, emotional intelligence, and sport intelligence. As study number 9 was conducted among coaches aiming to verify if the interventions would raise the MT scores of their athletes, the activities were based on: basic psychological needs, autonomy, skills, and good relationships.

Here, it is worthy to notice that, although the objective of this study is to analyse intervention programs conducted with athletes, study number 9 was included for two reasons: 1) to understand how the program was conducted; 2) the authors are reference researchers in the study of MT.

Thus, answering to the main objective of this study on how psychological training programs geared towards the development of MT are built, it is possible to state that nine of them were based on traditional PST, meaning they are not based on the MT dimensions, regardless of how many dimensions the author believes the construct encompasses.

In this context, it calls the attention that there are few studies of MT's intervention in the literature. However, MT is a construct that arouses researchers' interest due to the relevant impact on athletes' performance. Gucciardi et al., 2009, points out that one of the reasons for the lack of experimental studies is the difficulty to distinguish between an MT intervention from a standard PST package, due to the similarity among program components, such as self-regulation, mental essay, thought control, etc.

Also, regarding the interventions, it is worth mentioning that studies numbers 1, 2, 3, 5, 8, 9 and 10 reported the variables used in the programs without detailing the procedures, raising doubts about the replication of these studies to test their applicability.

In terms of the evaluations, the participants in all studies were assessed pre- and post-intervention. The tools used were Psychological Performance Inventory – PPI (5 studies), MTI (2 studies), AFMTI (1 study),

SMTQ (3 studies). The authors also used some psychological construct tools related to MT, as shown in the studies by Hodge, et al. (2009); Rosado et al. (2013); Corrêa (2019); Sermarini (2019), among them: self-esteem scale, self-efficacy scale, positive affection scale, resilience scale, dispositional flow scale, psychological well-being scale, and life orientation test (LOT).

The results found after the interventions showed significant improvement, both in MT and in the other variables evaluated in the 10 studies reviewed in this project, however, study 6 does not mention statistical analyses and intergroup comparisons. Study number 9 (Mahoney et al., 2016), did not show a significant rise in the athletes' MT results, meaning that the program was not able to change the coaches' behaviors, and consequently raise the athletes' MT. Coaches participating in the study reported being able to discuss the practice with other coaches and promote self-reflection as benefits of the program. However, they also said that over time they returned to the old practice. This data is relevant because, like Smith, Qusted, Appleton and Duda (2016) remark, the motivational atmosphere created by the coach, measured through the way they relate and behave with their athletes is an important predictor of the athletes' well-being and involvement with the sport practice.

## CONCLUSIONES

This integrative review sought to investigate how psychological training programs for the development of Mental Toughness are being applied to athletes. It was observed that there was an increase in studies from 2012 to 2017, however, after 2017, no other studies were found regarding specific psychological training programs for MT. Based on the studies evaluated, it is noted that psychological training programs aimed at specifically developing the MT construct do not differ from traditional PST's programs both in terms of psychological skills worked and in terms of activities, performed and the number of sessions. As for the assessment instruments used both pre- and post-intervention, it was also observed that there is no consensus regarding the scales used.

## APLICACIONES PRÁCTICAS

It is important to highlight that despite the difference, in terms of how the programs for the development of

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MT are offered, knowing them has important practical implications in the preparation of athletes to help them increase the level of psychological skills that have a direct relationship with sports performance, since their effectiveness is proven even when using conventional psychological programs based on PSTs with different numbers of sessions. This finding can provide important information for the innate versus acquired "war"; the parameters of the MT can be developed through psychological preparation programs.

Although a positive effect has been observed for increasing levels of Mental Toughness in all evaluated programs and, 70% of studies have shown methodological quality it should be taken into account that studies differ in the procedures adopted so, it is not possible to affirm a precise MT development protocol based on the studies carried out so far, thus requiring further research to ensure its applicability in different populations.

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Table 2.

*Methodological evaluation of the studies included for analysis*

Studies	Specifying the sample	Allocation of subjects	MT Programmes	Statistical results	Measurement of effect size
Bhambri, Dhillon e Sahni (2005)	N	N	Y	Y	Y
Sheard e Golby (2006)	Y	Y	Y	Y	N
Gucciardi, Gordon e Dimmock (2009)	Y	Y	Y	Y	Y
Abdelbaky (2012)	N	N	Y	Y	N
Bell, Hardy e Beattie (2013)	Y	N	Y	Y	Y
Mostafa (2015)	N	N	Y	N	N
Rasti, Abubakar, Abidin e Valiollah (2015)	N	N	Y	Y	Y
Golby e Wood (2016)	Y	N	Y	Y	Y
Mahoney et al., (2016)	Y	N	N	Y	Y
Miçoogullari e Ekmekçi (2017)	N	N	Y	Y	Y

Table 3.

*Descriptive Results of the Participants of the Study*

Authors	Journal	Title	Participants (athletes)	Age (years)	Modality
1 Bhambri, Dhillon and Sahni (2005)	Journal of the Indian Academy of Applied Psychology	Effect of Psychological Interventions in Enhancing Mental Toughness Dimensions of Sports Persons	32 athletes (12 female and 20 male)	12 - 17 y.o.	Table tennis
2 Sheard and Golby (2006)	International Journal of Sport and Exercise Psychology	Effect of a psychological skills training program on swimming performance and positive psychological development	36 athletes (23 female) (13 male)	10 - 18 y.o.	Swimming
3 Gucciardi et al. (2009)	Journal of Applied Sport Psychology	Evaluation of a mental toughness training program for youth-aged Australian Footballers: A quantitative analysis	75 athletes (75 male)	15 y.o.	Football
4 Abdelbaky (2012)	Science, Movement and Health	Impacts of Mental Toughness Program on 20 km Race Walking	20 athletes	18 - 20 y.o.	Athletism

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	<b>Authors</b>	<b>Journal</b>	<b>Title</b>	<b>Participants (athletes)</b>	<b>Age (years)</b>	<b>Modality</b>
5	Bell, Hardy and Beattie (2013)	Sport, Exercise, and Performance Psychology	Enhancing Mental Toughness and Performance Under Pressure in Elite Young Cricketers: A 2-Year Longitudinal Intervention	41 athletes (male)	16 - 18 y.o.	Cricket
6	Mostafa (2015)	Science, Movement and Health	The effect of mental toughness training on elite athlete self-concept and record level of 50m crawl swimming for swimmers	50 athletes	23 y.o.	Swimming
7	Rasti, Abubakar, Abidin and Valiollah (2015)	Asian Social Science	The Effect of Mental Training Program on Improving Mental Toughness among Tehran High School Student Athletes	160 athletes (80 female and 80 male)	15 - 18 y.o.	Futsal, volleyball, basketball, football, table tennis, Karate, taekwondo, and swimming
8	Golby and Wood (2016)	Psychology	The Effects of Psychological Skills Training on Mental Toughness and Psychological Well-Being of Student-Athletes	16 athletes	18 - 31 y.o.	Rowing
9	Mahoney et al., (2016)	Journal of Applied Sport Psychology	Implementing an autonomy-supportive intervention to develop mental toughness in adolescent rowers	113 athletes (78 female) (35 male) 18 coaches (1 female) (17 male)	Athletes 12 - 16 y.o. Coaches 54 y.o.	Rowing
10	Miçoogullari and Ekmekçi (2017)	Universal Journal of Educational Research	Evaluation of a Psychological Skill Training Program on Mental Toughness and Psychological Wellbeing for Professional Soccer Players	26 athletes (male)	18 - 33 y.o.	Soccer

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Table 4. *List of methodological data and results of the studies found in this review*

Objective	Type of study	Duration of program	Duration of sessions	Variables worked upon	Evaluations	Results
1 To examine the effect of psychological interventions like relaxation, imagination, and combination of both in the mental toughness scores of table tennis players.	Quasi-experimental Quantitative	2 weeks	30 minutes 1x per day	- Relaxation -Imagination techniques	- Psychological Development de Inventory (PPI)	Results indicate that all three interventions raised the athletes' RT scores. However, the combined intervention -relaxation therapies and mental images - showed a more significant effect on the athletes' RT.
2 To evaluate the effects of a psychological training program in competitive swimming performance	Quasi-experimental Quantitative	7 weeks Individual Program One meeting with everybody	45mins Once in a week	To establish targets, visualization, relaxing, concentration and thought interruption.	-Psychological Performance Inventory (PPI) -self-esteem, self-efficacy, optimism, positive affectivity	Significative improvement in the psychological profile and in the athletes' race times
3 To evaluate changes in MT, resilience, and flow among three groups (PST, MT, and control) after the interventions	Quasi- experimental Quantitative	PST group (6 weeks)  RT group (6 weeks)  Control group without intervention	2 hours, once in a week	PST group (self-regulation, excitement control, mental essay, attention control, ideal performance status MT Group (work ethics, mental attitude, motivation, self-confidence, concentration, emotional intelligence, sport intelligence)	-- MT test in soccer (AFMTI) - resilience scale - dispositional flow scale - Consultant efficacy scale - Social validation scale	Improvement in all variables evaluated in PST and MT groups. The control group has not changed. Positive results for efficacy and social validation of the consultant
4 To determine the effect of an MT program in a 20 km athletic walk	Quasi- experimental Quantitative	8 weeks	3x per week		-Psychological Performance Inventory (PPI)	Positive effects of the program: improvement in all variables
5 To assess the efficacy of a MT intervention applied to a young group of elite cricket players.	Quasi- experimental Quantitative	46 days (29 days, group divided into 4 training fields, and 17 days everybody together on tour)	3 workshops with athletes. Daily consultancy for coaches	- Definition of goals -Imagination techniques - Internal conversation - Reorientation strategies - Excitement control - Cognitive restructuring	- Mental Toughness Inventory (MTI) -Performance's statistics (running and batting)	Significative improvements in the intervention group, both for MT and for sport performance
6 To point out the efficiency of mental resistance training in the elite athlete's self-concept and the time in the 50m swimming competition.	Quasi- experimental Quantitative	3 months	3x per week	Confidence Negative energy control Attention control Visualization Motivation Positive energy control Attitude	- Self-description questionnaire for the elite athlete (EASDQ) (skills, body, aerobic and anaerobic physiological) - Mental competence - General performance Psychological - Performance Inventory (PPI)	Significant improvement in factors of the EASDQ test after the intervention, except for body skills and aerobic system. No improvement in time in the 50m competition. Significative differences between pre- and post-test PPI except for the variable's attention and attitude

	Objective	Type of study	Duration of program	Duration of sessions	Variables worked upon	Evaluations	Results
7	To assess a training program's effect on the MT in high school student-athletes in Tehran.	Quasi- experimental		Once in a week		- Sport Mental Toughness Questionnaire (SMTQ)	The mental training program was efficient in changing the MT of Tehran high school students' involved in different sports. However, there was no difference in MT by genre.
8	To examine the PST effects in MT and psychological well-being in a sample of rowing students during the competitive season. To study the relationship between MT and psychological well-being.	Quasi- experimental Quantitative	4 weeks, 3-month interval between sessions and individual follow-up via e-mail	1:30 h duration	- MT and psychological well-being conceptualization. Confidence -Control over negative thoughts	- Psychological Performance Inventory (PPI) - Sport Mental Toughness Questionnaire (SMTQ) - Rosenberg's Self-esteem scale (RSES) - Generalized Self-efficacy scale (GSES) - Life orientation test (LOT) - Positive and Negative Affection Scale (PANAS)	Perceptible improvement in MT, self-efficacy, positive affection, self-esteem, and optimism. Significative raise in psychological well-being. Positive correlations between MT and well-being and the constructs of self-efficacy, self-esteem, positive affection, and optimism.
9	To evaluate the efficacy of an intervention, among coaches, to support autonomy. To verify if the training environment promotes the MT through basic psychological needs	Quasi- experimental Qualitative/quantitative	8 weeks	2 hours, once in a week	Basic psychological needs (autonomy, skill, relationship)	- Sport climate scale – SCQ - SF (perceived autonomy) - Coach control behaviour scale - Basic needs scale - Psychological needs hindrance scale - MT index - Observation scale used with coaches - Semi-structured interviews with coaches	There were no significant effects overtime on the study variables, except for unmet psychological needs. Coaches identified benefits (to discuss the practice with other coaches (self-reflection) and barriers related to the interventions (over time, return to the previous practice, limited resources).
10	The objective of this study was to evaluate the efficacy of psychologic skills training (PST) in the improvement of MT among professional Turkish soccer teams	Quasi- experimental Quantitative	16 weeks	45 mins Once in a week	Establishment of goals Images Self-speech Self-regulation	- Sport Mental Toughness Questionnaire (SMTQ) - Psychological well-being scales (SPW)	Levels of MT and life satisfaction increased significantly, also self-acceptance, autonomy, and positive relationship with others. Beyond that, there were positive relationships found between the components of PWB and MT.