APPLICATION OF SPORT PSYCHOLOGY TO MIXED MARTIAL ARTS: A SYSTEMATIC REVIEW

Alexandro Andrade, Rodrigo Batalha Silva, and Fábio Hech Dominski

College of Health and Sport Science, Santa Catarina State University, Brazil

Abstract:
This study, through a systematic review, analyzed scientific production concerning sport psychology in mixed martial arts. The review was conducted in accordance with the PRISMA statement, and the search was performed using the SciELO, ScienceDirect, PsycInfo, and Web of Science databases. Of the 79 studies screened, eight satisfied the eligibility criteria, with explicit addressal of the topics of fear, aggression, emotional control, confidence, mental toughness, motivation, arousal, coping, rational emotive behavioral therapy for MMA athletes, fighting experience and MMA competition. Consequently, the scarce scientific production was found to evidence the need for further research in this modality. It is suggested that studies that investigate other variables of sport psychology such as mood, anxiety, and burnout.

Key words: combat sports, martial arts, athletes, self-regulation, fear

Introduction
Mixed martial arts (MMA) is a new and popular fighting style in which fighters use a variety of techniques sourced from other martial arts to knock out their opponents or force them to submit. It has already become a favorite combat sport among young adults, surpassing the popularity of boxing and wrestling (Nancy, 2009).

In sports, for an athlete to be successful, high levels of physical fitness are required, which relates to the development of various capacities such as strength, power, agility, and flexibility (Costa, Medeiros, & Fukuda, 2011; Schick, et al., 2010); however, along with improving the body’s capabilities, sporting success also requires the strengthening of mental and psychological aspects (Andrade, Bevilacqua, Coimbra, Pereira, & Brandt, 2016; Brandt, Bevilacqua, & Andrade, 2017; Brandt, et al., 2014; Cunningham & Turner, 2016; Massey, Meyer, & Naylor, 2013; Palmi & Sole, 2016).

Mental skills training helps athletes to control anxiety (Mamassis & Doganis, 2004), increase confidence (Myers, Payment, & Feltz, 2004), and control emotions (Lazarus, 2000). In combat sports and martial arts, mental training exercises are used to calm athletes before competitions, reinforce self-mastery and self-knowledge, and to help them overcome challenges, thereby mentally conditioning a fighter through the reduction of his/her anxious reactions and leading to an increase in the athlete’s sporting performance (Devonport, 2006).

Although the importance of mental abilities in combat sports has been proven, little investigation has been conducted into this topic. For example, Brazil is considered a sporting power, being relatively prominent in diverse modalities of fighting and combat sports, particularly judo and MMA but, nevertheless, Correia and Franchini (2010) found only 75 articles on fighting and combat sports in their search of 11 of the most important Brazilian and Latin American journals, and none of these concerned sport psychology or MMA athletes.

Considering the recent increase in the number of international publications on combat sports, the significant market involved in combat sports, and the growing number of practitioners and increasing worldwide popularity of these sports, particularly in regard to MMA (Zembura & Zysko, 2015), analyzing existing studies on the psychological aspects of MMA practitioners and athletes will allow us to obtain valuable publication-related data, such as the journals that have published such articles, publication years, the research methods applied, and the main issues investigated. Thus, the aim of the present study was to analyze, through a systematic review, scientific production concerning the application of sport psychology and its sub-areas to MMA.

Methods
To appropriately conduct the abovementioned systematic review of the relevant literature, the
criterias recommended by the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes) were adopted and adhered to (Moher, et al., 2016).

Search strategy
To begin this investigation, first a search was conducted among journals indexed in the electronic databases of SciELO, ScienceDirect, PsycInfo – PsycARTICLES, and Web of Science – Core Collection for scientific production concerning the application of sport psychology to MMA.

To search for relevant articles, the following terms related to MMA were used as primary descriptors: “Mixed Martial Arts OR Ultimate Fighting.” These were combined, using the Boolean operator “AND,” with the following terms related to sport psychology: “Psychology OR Sport Psychology OR Exercise Psychology OR Mood OR Mood States OR Anxiety OR Stress OR Motivation OR Mental Training OR Mental Toughness OR Coping OR Burnout OR Emotions OR Aggressiveness” (Table 1).

The search for articles was conducted until June 2, 2017. No time limit was set on the publication of the articles searched; we wanted to include all production on the topic. The databases searched were selected due to their well-known international coverage and representativeness, as they index most of the main scientific journals related to sport.

Eligibility criteria
The inclusion criterium for articles were: studies that address themes related to sport psychology (e.g., mood, anxiety, stress, motivation, mental training, coping, burnout, emotions, and aggressiveness) in MMA athletes or practitioners. By applying this criterium, we excluded studies that did not investigate MMA athletes or practitioners, while also excluding conference abstracts, book chapters, and articles not available in full-text.

Selecting and extracting data
The selection of studies was performed independently by three reviewers. It commenced with the analysis of the titles of the articles by applying the aforementioned search strategy, followed by the analysis of selected abstracts, and, after this, by the analysis of the selected full-text articles. Any disagreements that arose among reviewers were resolved by consensus.

To facilitate analysis and discussion, the following data were extracted from the publications: study identification, year of publication, authors, countries in which authors' institutions were located, language of publication, keywords, journal impact factor (IF), participants, study design, topic, and results/conclusions of the studies.

Results
The search returned 79 articles. After excluding duplicates (n = 46) and those found to be unsuitable (n = 19) upon reading their titles, 14 articles were advanced to the abstract-reading phase. At this stage, five more studies were excluded, leaving nine for the full-text reading phase. Finally, eight studies were used for the final review (Figure 1).

The selected studies are presented in Table 2, with the author(s) and year of publication, study title, journal, and IF included.

| Search terms                      | SciELO | Science Direct | WoS  | PsycInfo |
|----------------------------------|--------|----------------|------|----------|
| "mixed martial arts" AND psychology | 0      | 1              | 5    | 17       |
| "mixed martial arts" AND "sports psychology" | 0      | 1              | 0    | 0        |
| "mixed martial arts" AND "exercise psychology" | 0      | 0              | 0    | 1        |
| "mixed martial arts" AND mood | 0      | 0              | 1    | 0        |
| "mixed martial arts" AND "mood states" | 0      | 0              | 0    | 0        |
| "mixed martial arts" AND anxiety | 0      | 1              | 2    | 2        |
| "mixed martial arts" AND stress | 1      | 2              | 14   | 1        |
| "mixed martial arts" AND motivation | 0    | 1              | 4    | 2        |
| "mixed martial arts" AND "mental training" | 0      | 0              | 0    | 0        |
| "mixed martial arts" AND "mental toughness" | 0      | 0              | 1    | 1        |
| "mixed martial arts" AND coping | 1      | 0              | 1    | 0        |
| "mixed martial arts" AND burnout | 1      | 0              | 1    | 0        |
| "mixed martial arts" AND emotions | 0     | 0              | 7    | 2        |
| "mixed martial arts" AND aggressiveness | 0     | 0              | 5    | 4        |
| Total | 3 | 6 | 41 | 29 |

Table 1. Search results according to the terms used in SciElo, Science Direct, Web of Science (WoS) and PsycInfo databases
The first study relating to sport psychology in MMA was published in 2011, while the year with the highest number of publications was 2013, with three studies. The studies analyzed were published in English (n = 7) and Portuguese (n = 1).

In regard to study participants, the number of athletes investigated ranged from three to 136; most were males aged between 20 and 30 years and characterized as professional athletes (Table 3).

The following topics were addressed in the studies: coping strategies for fighters; fighters’ experiences during fights; the use of behavioral therapy to enhance self-belief and self-acceptance; the difference in mental toughness between fighters of different standards; fighters’ emotions; the factors and psychological techniques used by fighters in training and competition; and the aggressiveness, self-esteem, stress, and mental health of fighters (Table 3).
Regarding the results of the studies, it was reported that for the fighters whose main money source was MMA fighting, high levels of stress were common, and they used a variety of coping strategies to alleviate this tension. Motivation and constant evaluation were found to be particularly useful for helping them regulate internal and external factors. It was also identified that chaotic situations experienced in the ring was the most important aspect of fighting; it was also found that athletes’ greatest fear was the fear of losing and being injured. Additionally, professional athletes were found to have higher scores on mental toughness than semi-professional and amateur athletes (Table 4).

**Discussion and conclusions**

Sport psychology is a relatively new area of research (Gouveia, 2001) and this may explain why only a few studies on sports psychology and MMA were found. Thus, as stated by Devonport (2006), sport psychology professionals have a wide field in which to make interventions in terms of psychological training. This problem contrasts with two important aspects: the growth of MMA practice and demands of athletes and coaches in the sport, and the evident needs in terms of the mental preparation of MMA athletes for undergoing the toughness of training and competition.

Furthermore, it is self-defeating that researchers are not publishing studies concerning sport psychology in MMA—if researchers are not interested and do not research and publish, the sport will not come to recognize the importance of sport psychology.

To conduct further analysis, the following categories were adopted for the investigation: bibliometric analysis of publications; fear, aggression, and emotional control in MMA participants; confidence and mental toughness in MMA participants; fighting experience and competition in MMA; and motivation and arousal in MMA athletes.

### Bibliometric analysis of publications concerning the application of sport psychology to MMA

Out of the selected articles for this phase of research, six were published by US researchers, one by the United Kingdom and one by the Brazilian researchers. Similar results were also found in relation to journals, with five from the United-States-based journals, two from Europe, and one from Brazil. Only one journal did not present an IF provided by the Journal Citation Reports (JCR).

In terms of research participants, the most investigated category in the studies were professional athletes (n = 6), which was followed by

| Reference       | Results/Conclusions                                                                 |
|-----------------|-------------------------------------------------------------------------------------|
| Belem et al., 2016 | Fighters whose main source of money is MMA has high levels of stress. MMA fighters with a higher training volume use a variety of coping strategies aimed at setting goals and have a greater coping skills confrontation with adversity. |
| Cunnigham et al., 2016 | Significant reduction in total irrationality and self-depreciation and an increase in United States of America, which was maintained during six months post-Rational Emotive Behavior Therapy for two out of three athletes. Social validation data revealed positive changes in emotion management and performance in all athletes. The mechanisms by which REBT promoted changes in self-depreciation and USA are discussed as are recommendations regarding the future implementation of REBT with athletes. |
| Rosario et al, 2014 | Athletes have reported that aggressiveness is important when used correctly. When aggressiveness is manifested, it is allowed because of the MMA rules. Aggressiveness in the athletes does not exceed the limits of the academy. |
| Jensen et al., 2013 | For fighters, the fighting experience is characterized by a chaotic and intense situation with opponents they respect and by fears that represent a significant departure from everyday life. The competition represents the opportunity to evaluate not only the ability to fight, but also the mental toughness. Fighters face similar challenges from other sports, but there are unique aspects to MMA. |
| Chen et al., 2013 | Professional athletes obtained higher scores on mental strength compared to semi-professionals and amateurs. Amateurs presented higher scores than the semi-professionals. The convergent validity data showed mixed results and were not favorable for the validation of PPI-A. |
| Massey, et al., 2013 | Motivation and ongoing evaluation have only helped fighters in internal and external self-regulation in training and competition. The external factors associated with self-regulation consisted of maintaining an ascetic routine through environmental regulation, social support and structured amnesty. |
| Massey et al., 2015 | The use of stages of behavior change, developing embodied emotions and the use of psychological strategies, facilitated the self-regulation and the fighters’ performance. |
| Vaccaro, et al., 2012 | Athletes fear being injured and losing fights and they need to demonstrate masculinity to counter this fear. |
amateur athletes (n = 3) and one study investigated coaches. Further, the number of participants in the studies showed a high amplitude, with a minimum of three and a maximum of 136.

Regarding methodological characteristics, during analysis of the data it was verified that five studies had adopted a qualitative approach. Many researchers in sport psychology have used qualitative research as an alternative to traditional methods; this is because the qualitative approach allows researchers to study the statements and actions of individuals, thus reflecting a new paradigm in research (Culver, Gilbert, & Trudel, 2003).

It should be noted that despite the small number of publications on sport psychology and MMA athletes, and the fact that it is a recently developed sport, researchers have shown interest in evaluating the psychological aspects of these athletes, especially in 2013, when three articles on this topic were published.

**Fear, aggression, and emotional control in MMA**

The pioneering study on psychological aspects relating to MMA, which was conducted by Vaccaro, Schrock, and McCabe (2011), involved 121 interviews with fighters and coaches in an attempt to investigate their emotional control. Although they were given the label of “braves”, during the interviews the fighters reported experiencing fear; specifically, in interviews conducted at training academies and before fights, they reported being “nervous”, “worried”, and having “pre-fight tension” and “butterflies in their stomachs” (Vaccaro, et al., 2011).

One of the most reported fears was the “fear of injury and losing the fight”. The fear of injury is based on the inactivity and recovery time these athletes must undergo following a serious injury in a training or competition. These injuries occur as a result of the very characteristic of the sport: causing physical damage to the opponent (Vaccaro, et al., 2011). It should be noted that athletes fear being injured both in preparation for a fight and during the competition itself. When there is a climate of fear and worry, physical reactions such as muscle twisting or straining, as well as limitations in athlete concentration, can result. Further, in MMA, the risk of injury is especially high, as during training and competition athletes are subjected to head trauma, twisting, spraining, or luxation of joints, and muscle and bone injuries (Buse, 2006; Sheldon & Aimar, 2001).

The fear of losing arises when athletes think of the shame of “losing at home”, “being knocked out early in the fight”, and “losing in front of friends and family”. As a result of the culture of masculinity that the sport promotes these athletes cannot openly demonstrate this type of fear, since they would be branded as “chickens”, “cowards”, “pussies”, etc. (Vaccaro, et al., 2011). Fear of losing causes feelings of shame in an individual, which is based on the fear of ridicule or suffering an embarrassing situation. These feelings arise the moment they are observed and judged by their peers or by themselves (Ribeiro, Oliveira, & Silva, 2013).

Nevertheless, fighters can apply methods of controlling their fear. These athletes use certain strategies: planning the fight and other events beforehand; treating the fight as another day at the gym or as a part of their job; considering themselves to be much better fighters than the opponent, or by setting his/her opponent to be inferior; and provoking fear in their adversaries, whether at the time of weigh-in or during casual encounters before the fight (Vaccaro, et al., 2011).

MMA has as a characteristic of being a sport involving intense physical contact and demanding a certain level of aggressiveness from its practitioners; hence, aggression can be considered to constitute an important positive aspect of training and competition. However, excessive aggression can be detrimental to athletes. As such, it is necessary that athletes know how to use their aggressiveness in their favor, using the appropriate amount for particular moments and taking care that, when training, such aggressiveness does not exceed the limits of the training environment (Rosario, Kerr, & Rhodius, 2014).

Similar results have been found in ice hockey athletes, a sport also characterized by intense physical contact and high levels of aggressiveness. Studies have shown that players with high aggressiveness exhibit better technical performance in competition than less aggressive players (Gee & Leith, 2007; McCarthy & Kelly, 1978; Sheldon & Aimar, 2001).

Another concern of researchers is whether athletes with high levels of aggressiveness are overly aggressive outside academy environment; however, Rosario, Kerr, and Rhodius (2014) found that MMA athletes did not exhibit aggressiveness outside the academy.

It is not yet clear in the literature whether martial arts practice can help control aggression, or does it increase aggression. Although there is some evidence of the use of martial arts to control aggressiveness (Abrahams, 2004; Zivin, et al., 2001), certain studies have shown that martial arts practice may increase antisocial behavior (Endresen & Olweus, 2005), while others have highlighted the possibility that physical strength and martial arts violence are related to violent behavior and increased aggressiveness (Kusnierz, Cynarski, & Litwiniuk, 2014).

Nevertheless, when comparing levels of aggressiveness in a sample of boxing, capoeira, jiu-jitsu, and non-martial arts athletes, it was proven that non-
practitioners presented higher levels of aggressiveness than practitioners. This suggests that aggressiveness can be conditioned by the specificity of the training of the modality, or by the qualifications of the coaches (Kusnierz, et al., 2014).

MMA competitions are also characterized by extreme levels of physical contact and exhaustion; fighters commonly describe the physical requirements of the sport as being as challenging as the physical threat their opponent imposes. While accepting the inevitable risk of injury, fighters fear injuries that may shorten, or even terminate, their careers (Jensen, Roman, Shaft, & Wrisberg, 2013).

Lastly, in a recent study, Cunningham and Turner (2016) found that rational emotive behavior therapy (REBT) was effective in two out of three investigated athletes in reducing self-deprecation and raising self-acceptance. This finding can have important implications for athletes, but further research is required regarding the application of REBT to this sphere.

Confidence and mental toughness in MMA

Mental toughness makes an important psychological contribution to athletes’ performance, and studying the levels of mental toughness of elite MMA fighters can provide valuable information concerning their psychological needs (Chen & Cheesman, 2013; Sheard, Golby, & van Wersch, 2009). Investigating this, Sheard, Golby, and Van Wersch (2009) developed a model of mental toughness containing three constructs: confidence, constancy, and control; by applying this, they were able to obtain a better understanding of the psychological demands of those MMA fighters.

Chen and Chessman (2013) found significant differences in the mental toughness scores of fighters at different competitive levels. Most notably, professional fighters scored by 9.8% higher than semi-professionals, and by 9.3% higher than amateur fighters. Furthermore, there were also differences between fighters when analysis was performed using a confidence and mental-toughness determination subscale: those with a greater experience in the sport scored higher on this subscale. In this way, high levels of confidence and determination were shown to be vital attributes for athletes who want to compete at a high level (Chen & Chessman, 2013).

Professional fighters have also been shown to have greater positive cognition than fighters of other levels. The ability to stay positive, maintain a sense of pleasure during activity, overcome adversity, and block negative thoughts are central elements for good mental toughness; thus, professional MMA athletes should have higher positive expectations of combat, which in turn generates greater confidence in their ability to cope with competition (Chen & Cheesman, 2013; Golby, Sheard, & Wersch, 2007).

In two related studies by Massey et al. (2013), and Massey, Meyer, and Naylor (2015), the psychological aspects and strategies used by fighters in their training and competition routines were verified.

In the first article, the psychological factors involved in MMA athletes’ training and competition were illustrated. The researchers conducted interviews with nine MMA fighters, inquiring into their psychological demands, their strong and weak psychological points, their psychological skills, and their strategies for gaining success in MMA. After the data collection, the authors used the grounded theory technique to analyze the psychological factors involved in training and competition in MMA.

To address stressing agents encountered in training and competition, MMA athletes were found to regularly use coping strategies; further, Belem et al. (2016) verified that coping strategies relating to goal setting are more regularly used by fighters with higher training volumes. In fact, coping strategies are used by athletes of different modalities to manage internal or external demands that are evaluated as being stressors. Their use also decreases anxiety levels, providing the athlete with an improved sense of well-being, self-confidence, and motivation (Belem, et al., 2016; Jowett & Spray, 2013).

Fighting experience and competition in MMA

In order to examine MMA athletes’ fighting experience, Jensen et al. (2013) applied existential phenomenological analysis to qualitative interviews with seven MMA fighters. After reviewing the content of the interviews, four themes were identified in regard to the fighters’ characterization of their MMA experiences: cage reality, purpose, fighting skill, and community.

In most MMA competitions, the fighters compete in an area similar to a boxing ring; however, the MMA fighting space can be octagonal and surrounded by grids, and is usually called a “cage” (Jensen, et al., 2013; van Bottenburg & Heilbron, 2006). The transition experienced upon entering the cage from outside to fight has been described by fighters as unique and impossible to simulate in training.

Another aspect fighters mentioned concerning the cage is its unpredictability. The dangerous environment and the chaotic nature of the fight can trigger different situations, making events inside it a “roller coaster”, where a single error can define the outcome of the fight. However, when athletes can control this environment, they enter the “flow feeling” state (Jensen, et al., 2013).

The flow feeling can be defined as an intrinsically involving mental state that occurs when the
individual in question perceives a sense of balance in regard to their capacities. When an athlete enters the flow state, there is a sense of complete immersion in the performance of the activity, often accompanied by a higher perception, which tends to encourage persons to push themselves to their limits (Gomes, Miranda, Brandão, & Bara Filho, 2012).

**Motivation and arousal of MMA athletes**

The analyzed literature shows that before beginning preparation for a training period, the fighter must commit to an ascetic routine. This routine should be self-regulated and designed to promote optimal performance in training and competition. Specifically, the routine should consist of regulating the environment (e.g., removing distractions), securing social support (e.g., from coaches and training partners), and scheduling structured amnesty periods (e.g., going to parties). Furthermore, once training begins, fighters experience physical pain and psychological stress, and these should be regulated to promote the best performance in training and competition (Massey et al., 2013, 2015).

The need to remain motivated despite encountering adversity and undergoing the constant evaluation of their performance in training plays a major role in individuals' ability to self-regulate. Further, self-efficacy is enhanced when pain, fatigue, and stress are regarded as challenging, which can result in good performance. On the other hand, when pain, fatigue and stress are perceived as threats, self-efficacy decreases and performance levels fall (Massey et al., 2013).

In the second article, Massey et al. (2015) divided the self-regulation strategies of fighters into three major themes: behavioral processes of change, embodied emotions, and psychological strategies. In the first theme, athletes reported that changes in their behaviors and attitudes were necessary while they were in the training and competition period; examples of such changes included avoiding non-prescribed foods, along with having “cheat days”, and securing social support during training, such as from training partners or relatives and friends (Massey et al., 2015).

In regard to embodied emotions, athletes report that the intensity and repetition of training as well as the emotional stress caused by such factors cause their bodies and minds to be more prepared to react in the right way, thereby increasing self-regulation capacity during competition (Massey et al., 2015).

Several psychological strategies are used by fighters to optimize performance in the sport. To control intensity and arousal, techniques such as deep breathing, imagery, self-talk, listening to music, and meditation are used, and these also help to control pain and distress during training and competition. To increase confidence, athletes reported using fight simulation and self-talk. Finally, for strategic planning, athletes stated they used videos of previous fights, imagery, goal setting, and the creation of a fight plan (Massey et al., 2015).

Despite the application of the mentioned techniques, there are few cases in which coaches use sport psychology with their athletes. On the rare occasions when it is used, sport psychology is often given only through the application of a small number of mental-training techniques for specific crises experienced by coaches and athletes (Coimbra et al., 2008; Zakrajsek, Martin, & Wrisberg, 2015).

Thus, observing the results of the few published articles, it can be verified that relevant high-performance-sport topics have not been investigated in this population; for example, aspects such as mood, anxiety, and burnout were not found. This, therefore, evidences the need for further studies.

Studies involving analysis of scientific production highlight the issues commonly addressed in the area in question, as well as those that require further investigation by the researchers. The results of our systematic review show that scientific production on sport psychology related to MMA is in a formative stage, thus evidencing the urgent need for research in this modality.

Our research verified that the subjects in this field that have been investigated thus far include fear, aggressiveness, emotional control, confidence, mental toughness, motivation, coping, REBT, arousal, and fighting and MMA competition experience. Further, the identified investigations contain important themes concerning the psychological aspects of MMA athletes and provide an initial description of how these athletes react in training and competition situations.

However, further research in this modality and addressing this population is required. It is suggested that studies that would investigate other variables of sport psychology, such as mood, stress, and anxiety, should be performed. In doing so, such surveys could help coaches to better prepare their athletes to engage in MMA in training and competition.
References

Abrahams, C. (2004). InSpire guidance-based martial arts program: A self-esteem intervention for at risk elementary and middle school students. *Compelling Counseling Interventions: Vistas*, (4), 193-200. Available from URL: http://counselingoufitters.com/vistas/vistas04/20.pdf

Andrade, A., Bevilacqua, G.G., Coimbra, D.R., Pereira, F.S., & Brandt, R. (2016). Sleep quality, mood and performance: A study of elite Brazilian volleyball athletes. *Journal of Sports Science and Medicine*, 15(4), 601-605.

Belem, I., Costa, L.C.A., Both, J., Passos, P.C.B., & Vieira, J.L.L. (2016). O estresse no MMA: as estratégias de enfrentamento podem melhorar o desempenho dos lutadores? *[Stress in MMA: Can coping strategies improve the performance of fighters?] Revista Brasileira de Medicina do Esporte*, 22, 287-290.

Brandt, R., Bevilacqua, G.G., & Andrade, A. (2017). Perceived sleep quality, mood states, and their relationship with performance among Brazilian elite athletes during a competitive period. *Journal of Strength and Conditioning Research*, 31(4), 1033-1039.

Brandt, R., Liz, C.M., Crocetta, T.B., Arab, C., Bevilacqua, G., Dominski, F.H., & Andrade, A. (2014). [Mental health and associated factors in athletes during the open games of Santa Catarina. In Portuguese.] *Revista Brasileira de Medicina do Esporte*, 20, 276-280.

Buse, G.J. (2006). No holds barred sport fighting: A 10 year review of mixed martial arts competition. *British Journal of Sports Medicine*, 40(2), 169-172.

Chen, M.A., & Cheeseman, D.J. (2013). Mental toughness of mixed martial arts athletes at different levels of competition. *Perceptual and Motor Skills*, 116(3), 905-917.

Coimbra, D.R., Gomes, S.S., Carvalho, F., Ferreira, R., Guillen, F., Miranda, R., & Bara-Filho, M.G. (2008). Importância da Psicologia do Esporte para treinadores. *[The importance of sports psychology for coaches. In Portuguese.] Conexões*, (6esp), 419-429.

Correia, W.R., & Franchini, E. (2010). Produção acadêmica em lutadas, artes marciais e esportes de combate. [Academic papers about fight, martial arts and combat sports]. *Motriz*, 16(1), 1-9.

Costa, P.B., Medeiros, H.B.O., & Fukuda, D.H. (2011). Warm-up, stretching, and cool-down strategies for combat sports. *Strength and Conditioning Journal*, 33(6), 71-79.

Culver, D.M., Gilbert, W.D., & Trudel, P. (2003). A decade of qualitative research in sport psychology journals: 1990-1999. *Sport Psychologist*, 17(1), 1-15.

Cunningham, R., & Turner, M.J. (2016). Using Rational Emotive Behavior Therapy (REBT) with mixed martial arts (MMA) athletes to reduce irrational beliefs and increase unconditional self-acceptance. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, 34(4), 289-309.

Devonport, T.J. (2006). Perceptions of the contribution of psychology to success in elite kickboxing. *Journal of Sports Science and Medicine*, 5(CSISI), 99-107.

Endresen, I.M., & Olweus, D. (2005). Participation in power sports and antisocial involvement in preadolescent and adolescent boys. *Journal of Child Psychology and Psychiatry*, 46(5), 468-478.

Gee, C. J., & Leith, L.M. (2007). Aggressive behavior in professional ice hockey: A cross-cultural comparison of North American and European born NHL players. *Psychology of Sport and Exercise*, 8(4), 567-583.

Golby, J., Sheard, M., & Wersch, A.V. (2007). Evaluating the factor structure of the psychological performance inventory. *Perceptual and Motor Skills*, 105(1), 309-325.

Gomes, S.S., Miranda, R., Brandão, M.R.F., & Bara Filho, M.G. (2012). O fluxo no voleibol: relação com a motivação, autoeficácia, habilidade percebida e orientação às metas. *[Flow in volleyball: Relationship with motivation, self-efficacy, perceived ability and goal orientation. In Portuguese.] Revista da Educação física / UEM*, 23(3), 379-387.

Gouveia, M.J. (2001). Tendências da investigação na psicologia do desporto, exercício e actividade física. *[Research trends in sport psychology, exercise and physical activity. In Portuguese.] Análise Psicológica*, 19, 5-14.

Jensen, P., Roman, J., Shaft, B., & Wrisberg, C. (2013). In the cage: MMA fighters’ experience of competition. *The Sport Psychologist*, 27(1), 1-12.

Jowett, N., & Spray, C.M. (2013). British Olympic hopefuls: The antecedents and consequences of implicit ability beliefs in elite track and field athletes. *Psychology of Sport and Exercise*, 14(2), 145-153.

Kusnierz, C., Cynarski, W.J., & Litwiniuk, A. (2014). Comparison of aggressiveness levels in combat sports and martial arts male athletes to non-practising peers. *Archives of Budo*, 10, 8.

Lazarus, R.S. (2000). How emotions influence performance in competitive sports. *Sport Psychologist*, 14(3), 229-252.

Mamassis, G., & Doganis, G. (2004). The effects of a mental training program on juniors pre-competitive anxiety, self-confidence, and tennis performance. *Journal of Applied Sport Psychology*, 16(2), 118-137.

Massey, W.V., Meyer, B.B., & Naylor, A. II. (2015). Self-regulation strategies in Mixed Martial Arts. *Journal of Sport Behavior*, 38(2), 192-211.

McCarthy, J.F., & Kelly, B.R. (1978). Aggression, performance variables, and anger self-report in ice hockey players. *Journal of Psychology*, 99(1), 97-101.
Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., & Prisma Group. (2016). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews, 4*(1).

Myers, N.D., Payment, C.A., & Feltz, D.L. (2004). Reciprocal relationships between collective efficacy and team performance in women’s ice hockey. *Group Dynamics – Theory, Research and Practice, 8*(3), 182-195.

Nancy, C. (2009). The uses and gratifications of viewing mixed martial arts. *Journal of Sports Media, 4*(1), 25-53.

Palmi, J., & Sole, S. (2016). Mindfulness-based interventions in sports psychology. *Revista De Psicologia Del Deporte, 25*(1), 147-155.

Ribeiro, V.B., Oliveira, S.R.G., & Silva, F.G. (2013). Predictores psicológicos, reações e o processo de intervenção psicológica em atletas lesionados. [Psychological predictors, reactions and process of psychological intervention in injured athletes. In Portuguese.] *Ciências & Cognição, 18*, 70-88.

Rosario, D., Kerr, J.H., & Rhodius, A. (2014). The experience of aggression among mixed martial arts athletes interpreted through reversal theory. *International Journal of Sport Psychology, 45*(2), 79-99.

Schick, M.G., Brown, L.E., Coburn, J.W., Beam, W.C., Schick, E.E., & Dabbs, N.C. (2010). Physiological profile of mixed martial artists. *Medicina Sportiva, 14*(4), 182-187.

Sheard, M., Golby, J., & van Wersch, A. (2009). Progress toward construct validation of the sports mental toughness questionnaire (SMTQ). *European Journal of Psychological Assessment, 25*(3), 186-193.

Sheldon, J.P., & Aimar, C.M. (2001). The role aggression plays in successful and unsuccessful ice hockey behaviors. *Research Quarterly for Exercise and Sport, 72*(3), 304-309.

Vaccaro, C.A., Schrock, D.P., & McCabe, J.M. (2011). Managing emotional manhood: fighting and fostering fear in mixed martial arts. *Social Psychology Quarterly, 74*(4), 414-437.

van Bottenburg, M., & Heilbron, J. (2006). De-sportization of fighting contests. The origins and dynamics of no holds barred events and the theory of sportization. *International Review for the Sociology of Sport, 41*(3/4), 259-282.

Zakrjesk, R.A., Martin, S.B., & Wrisberg, C.A. (2015). Sport psychology services in performance settings: NCAA D-I certified athletic trainers’ perceptions. *Sport Exercise and Performance Psychology, 4*(4), 280-292.

Zembura, P., & Zysko, J. (2015). An examination of mixed martial arts spectators’ motives and their sports media consumption in Poland. *Journal of Human Kinetics, 46*(1), 199-210.

Zivin, G., Hassan, N.R., DePaula, G.F., Monti, D.A., Harlan, C., Hossain, K.D., & Patterson, K. (2001). An effective approach to violence prevention: Traditional martial arts in middle school. *Adolescence, 36*(143), 443-459.

Submitted: November 24, 2017
Accepted: July 26, 2019
Published Online First: May 15, 2020

Correspondence to:
Alexandro Andrade, Ph.D.
College of Health and Sport Science,
Santa Catarina State University-UDESC,
Rua Pascoal Simone, 358
Coqueiros; 88080-350, Florianópolis, SC-Brazil.
email: alexandro.andrade.phd@gmail.com