DOI: 10.4025/jphyseduc.v28i1.2843

Original Article

WHAT COPING STRATEGIES ARE USED FOR ATHLETES OF MMA MORE RESILIENT TO STRESS?

QUAIS ESTRATÉGIAS DE ENFRENTAMENTO SÃO UTILIZADAS POR ATLETAS DE MMA MAIS RESILIENTES AO ESTRESSE?

Isabella Caroline Belem[1], Viviane Aparecida Pereira dos Santos[2], Nayara Malheiros Caruzzo[3], Patrícia Aparecida Gaion Rigoni[3], Jorge Both[4] e José Luiz Lopes Vieira[3]

[1]Universidade Paranaense, Umuarama-PR, Brasil.
[2]Fundação Faculdade de Filosofia Ciências e Letras de Mandaguari, Mandaguari-PR, Brasil.
[3]Universidade Estadual de Maringá, Maringá-PR, Brasil.
[4]Universidade Estadual de Londrina, Londrina-PR, Brasil.

ABSTRACT
This study aimed at investigating the association among resilience, stress and coping strategies of MMA athletes. 50 male MMA athletes with a mean age of 25,0±4,80 years participated in the study. A socio-demographic inquiry, the Connor-Davidson Resilience Scale, the Athletic Coping Skills Inventory, and the Recovery-Stress Questionnaire for Athletes (RESTQ-76) were used as instruments. The descriptive statistics, the Chi-Square test in one factor and 2x2, Fisher's exact test, and the binary logistic regression ($p<0,05$) were used for data analysis. The stress levels were low, and the athletes showed high recovery levels considering the subscales referred to as 'self-efficacy' ($p=0.048$) and 'self-regulation' ($p=0.048$). Resilient athletes are more likely to use strategies of 'adversity confrontation' (OR=6.47), 'concentration' (OR=11.67), and 'coachability' (OR=5.49). In conclusion, the resilient athletes have lower stress levels because they concentratedly face the conflicts that arise from the sport environment, in addition to learn with their training.
Keywords: Resilience. Coping strategies. Stress. Athletes.

RESUMO
Este estudo analisou a associação entre resiliência, estresse e estratégias de coping de atletas de MMA. Participaram 50 atletas de MMA do sexo masculino, com idade de 25,0±4,80 anos. Utilizou-se uma ficha de identificação, a Escala de Resiliência de Connor-Davidson, o Inventário Atlético de Estratégias de Coping e o Questionário de Estresse e Recuperação para Atletas (RESTQ-76). Para análise dos dados, utilizou-se estatística descritiva, teste Qui-Quadrado um fator e 2x2, Exato de Fisher e Regressão Logística Binária ($p<0,05$). Os níveis de estresse foram considerados baixos e os atletas demonstraram níveis elevados de recuperação, nas subescalas de "auto eficácia" ($p=0,048$), "autorregulação" ($p=0,048$). Atletas resilientes têm maiores chances de utilizar as estratégias de "confronto com as adversidades" (OR=6,47), "concentração" (OR=11,67) e "treinabilidade" (OR=5,49). Conclui-se que atletas resilientes são menos estressados pois enfrentam os conflitos advindos do ambiente esportivo de forma concentrada e aprendendo com seu treinamento.
Palavras-chave: Resiliência. Estratégias de *coping*. Estresse. Atletas.

Introduction

The sport context is an environment in which managing stress and adversity is needed to achieve great results. Elite athletes commonly face a number of stressful factors that may influence their performance along their athletic careers, such as high physical, tactical, and psychological demands[1-2], injuries[3], anxiety[4], mood changes[5], and high training loads[6]. In MMA (Mixed Martial Arts), in addition to pain, injury and fatigue that may be triggered by training and competition; the weight loss phase in view of the fights may be a further stressful factor due to the need to follow a very strict diet with several restrictions[7].

According to De Rose Junior[8] each sport modality has its particularities and different exigency levels, besides the physical, technical, tactical and psychological demands, which always aim the competition. These charges often become a source of stress and tend to hinder the athletes' performance. Competition stress occur at all competitive levels, age and

experience of the athlete; the way of handling and responding to stress is what determines the performance[1]. One psychological characteristic that may help the athletes to overcome the stressful factors that emerge from sport and to keep a good performance during competitions is resilience, which is considered as the capacity to positively adapt to the experience of adversity or trauma[9-11].

Richardson et al.[12] developed the Resilience Model, which clarifies that, when going through an adversity (risk factor), the individuals suffer an interruption in their biopsychospiritual balance (comfort zone), initiating the resilience process. This interruption will be negative if the subjects do not have sufficient protective factors, such as coping strategies, self-esteem, optimism, intrinsic motivation and problem-solving ability. When the individuals have such factors, they can overcome the stressful event and, in the coping process, become able to acquire new protective factors, which results in learning from the situation[13].

For Gally and Vealey[9], the Resilience Model is suitable for being used in the sport context, since it reinforces the importance of the challenges that emerge from sport participation through the rupture and recovery processes that help the athletes' development. In addition, it is able to promote the development of many qualities that help the athlete to become resilient and perform well both in and out of sport[10]. Studies on resilience in the sport context point to a positive relationship related to sport achievement and psychological welfare[14], mental health[15], quality of life, emotional aspects[16], good recovery after sport failures[17] and mental toughness[18]. Furthermore, high resilience levels have been shown to act as a protective factor against the negative stress effects in sport[9]. The use of coping strategies was also considered essential for resilient athletes[11]. This is due to the fact that, based on cognitive and behavioral efforts[19], the athletes face the challenging situations required for the performance of their activities[20] and adapt to changes in contextual demands[20] that emerge from the sport environment.

Although the literature[9,10,17,18] has shown the importance and impact of resilience, stress and coping strategies for sport performance, there are no indications that this relationship has been studied in MMA athletes. Specifically in this modality, research investigated the quantity and severity of injuries[21], the training methods[22], attractiveness, aggression[23] and the physiological profile of the fighters[24]. However, there is still a gap concerning the investigation on the psychological aspects of MMA fighters, specifically the relationship among resilience, stress and coping strategies. The model developed by Richardson et al.[12], which deals with resilience in general, and the one by Gally and Vealey[9] that investigates resilience in sport, point to risk and protection factors that help individuals to develop a resilient profile. In such models, the stressful agents, whether from sport or not, are mentioned as risk factors to which athletes are subject. On the other hand, coping strategies are pointed out as a form of protection, that is, a mean to be used to recover or deal with the adversities encountered. However, currently there are no studies that have analyzed the relationship of these variables with MMA fighters.

In view of the above mentioned, this study aimed at investigating the association among resilience, stress and coping strategies of MMA athletes.

Methods

Participants

The target population of this study was composed by the 11 teams registered in the Mixed Martial Arts Federation of Paraná State. All the athletes (n = 62) were invited to participate; 50 athletes, who have competed nationally (n = 35) and internationally (n = 15), voluntarily agreed to participate in the research. The athletes were all male individuals, aged

25.0 ± 4.80; they had been practicing the modality for 7.80 ± 4.70 years, 4.40 ± 1.70 hours of daily training and 23.0 ± 9.70 hours per week; they had been participating of official competitions for 5.20 ± 3.90 years.

Tools

Resilience was evaluated by using the Connor-Davidson Resilience Scale (CD-RISC-10)[25], which was validated for Brazil by Lopes and Martins[26]. The instrument is composed of 10 items, with a Likert scale from 0 to 4 points, and assesses the perception of the individuals in relation to their ability to adapt to changes, and overcome obstacles, illness, injury or other difficulties. The score ranged from 0 to 40 points and the closer to 40, the greater the resilience capacity of the athlete. The scale has been considered adequate because the items reflect the ability to recover from negative challenges and experiences,[25] and it has been pointed out as having psychometric evidence that indicates its use in sport[27] with Cronbach's alpha coefficient reliability and validity (α = 0 , 85). In the present study, the scale showed α = 0.67.

The Recovery-Stress Questionnaire for Athletes (RESTQ-76) validated for the Portuguese language by Kellmann Kallus Samulski Costa & Simola[28] measures the occurrence of stress and recovery, both in and out the sport context. The questionnaire comprises 77 items, an introductory one (item number 1), which was not included in the final score. The instrument is subdivided into categories, comprising 19 subscales: general stress (general stress, emotional stress, social stress, conflicts/mental stress, fatigue, lack of energy, somatic complaints); specific stress (interval disorders, emotional exhaustion, injuries); general recovery (success, social recovery, physical recovery, general welfare, sleep quality), and specific recovery (fitness, personal acceptance, self-efficacy and self-regulation). The values of the scales are calculated by the average scores of the respective items. Each subscale of the RESTQ-76 Sport consists of four items evaluated by a Likert scale with values ranging from 0 to 6 points (0 = never to 6 = always), which indicates the incidence of events and reported activities. Considering Brazilian validation[28], a substantial reliability was obtained in 16 out of the 19 RESTQ-Sport scales (Cronbach's alpha> 0.70). In this study, Cronbach's alpha values were satisfactory at all scales (α = 0.85 for the general scale; ranging from α = 0.84 to α = 0.86 for the instrument scales).

With the purpose of assessing the coping strategies, the Athletic Coping Skills Inventory (ACSI-28) developed by Smith et al.[29] and validated for the Portuguese language by Coimbra[30] was used. It consists of 28 items on a 4-point Likert scale, ranging from 'almost never' to 'almost always.' The results are classified into 7 subscales that evaluate the following psychological competences: maximum performance under stress, worry absence, adversity confrontation, concentration, purposes, confidence and motivation for achievement and coachability. The Brazilian validation[30] showed an internal consistency with Cronbach's alpha of α = 0.81, whereas in the present study the Cronbach's alpha value was of α = 0.54 (a range from α = 0.48 to α = 0.66 for the instrument scales).

A socio-demographic inquiry was used in order to complement the information about the athletes; it embraced questions related to age, marital status, category, practice period, daily training period, weekly training period and period of participation in competitions.

Procedures

The project was authorized by the MMA Federation of Paraná State; after that it was submitted to the Standing Committee on Ethical Research with Humans (Opinion No. 267.975/2013) of the State University of Maringá-Paraná. The collections occurred at the training sites, after the training sessions through prior appointment. Most of the athletes were in the pre-competitive period (n = 31), and the others in the general preparation period (n =

19). All subjects signed the Free Informed Consent Form. The application of the instruments was performed by the researcher individually and had an average duration of 30 minutes.

Statistical analysis

Considering the description of the results, it was used median and quartiles, as well as absolute and relative frequency. In order to establish the cut-off point and categorize the results of the instruments, a weighting equation was adapted from the model used by Lemos[31]. This equation was used to categorize the resilience (resilient/ high and non-resilient/low; results ≥ 30.00), stress and recovery levels (high and low, results ≥ 5.00) and coping strategies (used and not used; results ≥ 2.75). The mathematical formula of the weighting equation is a percentage index that ranges from -100.00% to + 100.00%, that is, 200 points of variability, in which the numerical values of the instruments are changed. The number of items of each instrument is taken into account, as well as the number of issues involved in the dimension.

The Chi-square factor was used in order to compare the proportions (coping strategies - used or not used; high stress/recovery and low stress/recovery). The association among resilience, coping strategies, stress and recovery was carried out by using either the 2x2 Chi-square test or Fisher's exact test. For the multivariate analysis through a binary logistic regression, it was considered the significance level of $p < 0.05$ and a confidence interval (CI) of 95%, with odds ratio (OR) calculation. Considering the regression model, the variables were introduced by using the 'enter' method. The resilience was the independent variable, which was categorized as either a high resilience level (resilient individuals) or a low resilience level (non-resilient individuals). The dependent variables embraced the coping strategies, stress and recovery that showed significance in the association ($p < 0.05$).

Results

The athletes' resilience level was of 31.0 (28.0-34.0) points, which can be considered high. The coping strategies (Table 1) most frequently used by athletes were 'confidence and motivation' ($p = 0.011$), and 'coachability' ($p = 0.001$); and the least used was the strategy referred to as 'worry absence' ($p<0.005$).

Table 1. Comparison of the frequencies seen and expected from the use or not of coping strategies by the MMA athletes (n = 50).

Coping strategies	Used		Not used		p
	f(seen)	*f(expected)*	*f(seen)*	*f (expected)*	
1. Maximum performance	22	25	28	25	0,396
2. Worry absence	15	25	35	25	0,005**
3. Adversity confrontation	25	25	25	25	1,000
4. Concentration	28	25	22	25	0,396
5. Purposes	27	25	23	25	0,572
6. Confidence and motivation	34	25	16	25	0,011*
7. Coachability	37	25	13	25	0,001**

*Significant difference*p<0,05; **p<0,01
Source: The authors

Most athletes showed low stress levels in the dimensions of general stress and sport-specific stress ($p < 0.001$) (Table 2). High levels of sport-specific recovery were seen, especially in the 'self-efficacy' ($p = 0.048$) and 'self-regulation' ($p = 0.048$) subscales. With regard to general recovery, low levels of 'success' ($p = 0.024$), 'physical recovery' ($p = 0.005$) and 'sleep quality' ($p < 0.0001$) were seen.

Table 2. Comparison of the frequencies seen and expected related to stress and recovery levels of the MMA athletes (n = 50).

Stress and Recovery		High		Low		P
		f(seen)	*f(expected)*	*f (seen)*	*f (expected)*	
1. General stress	GS	02	25	48	25	<0,0001**
2. Emotional stress	GS	03	25	47	25	<0,0001**
3. Social stress	GS	03	25	47	25	<0,0001**
4. Conflicts/Emotional stress	GS	08	25	42	25	<0,0001**
5. Fatigue	GS	06	25	44	25	<0,0001**
6. Lack of energy	GS	01	25	49	25	<0,0001**
7. Somatic complaints	GS	04	25	46	25	<0,0001**
8. Success	GR	17	25	33	25	0,024*
9. Social recovery	GR	27	25	23	25	0,572
10. Physical recovery	GR	15	25	35	25	0,005**
11. General welfare	GR	25	25	25	25	1,000
12. Sleep quality	GR	05	25	45	25	<0,0001**
13.Interval disorders	SS	05	25	45	25	<0,0001**
14. Emotional exhaustion		01	25	49	25	<0,0001**
15. Injuries	SS	16	25	34	25	0,011*
16. Fitness	SR	26	25	24	25	0,777
17. Personal acceptance	SR	31	25	19	25	0,090
18. Self-efficacy	SR	32	25	18	25	0,048*
19. Self-regulation	SR	32	25	18	25	0,048*

GS: General stress; GR: General recovery; SS: Sport-specific stress; SR: Sport Specific recovery; * Significant difference *p <0.05; ** p <0.01
Source: The authors

The association between the resilience level and the coping strategies (Table 3) showed that high-resilient athletes most use the strategies of 'adversity confrontation' (p = 0.03), 'concentration' (p = 0.01) and 'coachability' (p = 0.02).

Table 3. Association between resilience and the coping strategies of MMA athletes (n = 50).

Coping strategies		Resilience				*p*
		High		Low		
		%	*F*	%	*F*	
1. Maximum performance	Used	48,7	19(17)	27,3	03	0,306
	Not used	51,3	20(21)	72,7	08	
2. Worry absence	Used	23,1	09(09)	54,5	06(03)	0,065
	Not used	76,9	30(27)	45,5	05(07)	
3. Adversity confrontation	Used	59,0	23(20)	18,2	02(06)	0,037*
	Not used	41,0	16(20)	81,8	09(06)	
4. Concentration	Used	53,8	21(17)	9,1	01(05)	0,014*
	Not used	46,2	18(21)	90,9	10(06)	
5. Purposes	Used	51,3	20(21)	63,3	07(06)	0,515
	Not used	48,7	19(18)	36,4	04(05)	
6. Confidence and motivation	Used	74,4	29(27)	62,5	05(08)	0,140
	Not used	25,6	10(13)	37,5	06(03)	
7. Coachability	Used	82,1	32(29)	45,5	05(08)	0,023*
	Not used	17,9	07(10)	54,5	06(03)	

*Significant difference *p<0.05 (the expected values are shown in F column, between parentheses)
Source: The authors

There was an association between the high resilience levels and recovery activities in the scales referred to as 'general welfare' (p = 0.03), 'self-regulation' (p = 0.04) and 'physical

recovery' (p = 0.02). No associations were found among the resilience and stress levels of the athletes (Table 4).

Table 4. Association among resilience and the MMA athletes' stress and recovery.

Stress and Recovery		Resilience (n= 50)				*p*
		High		Low		
		%	*F*	%	*F*	
1. General stress	High	2,6	01(02)	9,1	01(0)	0,395
	Low	97,4	38(37)	90,9	10(10)	
2. Emotional stress	High	5,1	02(02)	0,0	00(0)	1,000
	Low	94,9	37(27)	100	11(11)	
3. Social stress	High	2,6	01(2)	18,2	02(01)	0,118
	Low	97,4	38(37)	81,8	09(10)	
4. Conflicts/Stress	High	10,3	04(04)	9,1	01(01)	1,000
	Low	89,7	35(35)	90,9	10(10)	
5. Fatigue	High	10,3	04(04)	9,1	01(01)	1,000
	Low	89,7	35(35)	90,9	10(10)	
6. Lack of energy	High	2,6	01(01)	0,0	00(0)	1,000
	Low	97,4	38(38)	100	11(11)	
7. Somatic complaints	High	7,7	03(03)	9,1	01(01)	1,000
	Low	92,3	36(36)	90,9	10(10)	
8. Success	High	35,9	14(13)	18,2	02(04)	0,466
	Low	64,1	25(27)	81,8	09(08)	
9. Social recovery	High	48,7	19(16)	18,2	02(05)	0,092
	Low	51,3	20(23)	81,8	09(06)	
10. Physical Recovery	High	35,9	14(11)	0,0	00(03)	0,022*
	Low	64,1	25(28)	100	11(08)	
11. General welfare	High	59,0	23(20)	18,2	02(06)	0,037*
	Low	41,0	16(20)	81,8	09(06)	
12. Sleep quality	High	10,3	04(03)	0,0	00(0)	0,563
	Low	89,7	35(36)	100	11(10)	
13. Interval disorders	High	10,3	04(03)	0,0	00(0)	0,563
	Low	89,7	35(36)	100	11(10)	
14. Emotional exhaustion	High	2,6	01(01)	0,0	00(0)	1,000
	Low	97,4	38(38)	100	11(11)	
15. Injuries	High	30,8	12(11)	18,2	02(03)	0,189
	Low	69,2	27(28)	81,8	09(08)	
16. Fitness	High	51,3	20(18)	27,3	03(05)	0,158
	Low	48,7	19(21)	72,7	08(06)	
17. Personal acceptance	High	59,0	23(22)	45,5	05(06)	0,503
	Low	41,0	16(17)	54,5	11(05)	
18. Self-efficacy	High	56,4	22(20)	27,3	03(06)	0,171
	Low	43,6	17(19)	72,7	08(06)	
19. Self-regulation	High	71,8	28(25)	36,4	04(07)	0,041*
	Low	28,2	11(14)	63,3	07(04)	

*Significant difference *p<0,05. (the expected values are shown in F column, between parentheses)
Source: The authors

The logistic regression model (Table 5) showed that resilient athletes were more likely to use the strategies of 'adversity confrontation' (OR = 6.47), 'concentration' (OR = 11.67) and 'coachability' (OR = 5.49). High resilience levels act as a protective factor so as to the athletes feel a greater recovery considering their 'general welfare' at 82% (OR = 0.18; 95% CI: 0.03-0.98), when compared to athletes with low resilience levels.

Table 5. Resilience impact on the recovery and use of coping strategies by the MMA athletes.

	OR	CI of 95%	*P*
Adversity confrontation	6,47	1,23; 34,01	0,027*
Concentration	11,67	1,35; 100,14	0,025*
Coachability	5,49	1,30; 23,18	0,021*
General welfare	0,15	0,03; 0,81	0,027*
Self-regulation	0,17	0,02; 1,54	0,11
Physical recovery	0,22	0,05; 0,92	0,38

*Significant difference (p<0,05). OR: *Odds Ratio*; CI95%: Confidence Interval of 95%.
Source: the authors

Discussion

The present study aimed at investigating the association among resilience, stress and coping strategies of MMA athletes, a modality that has recently been highlighted in the sport context. The results indicated that resilience explains the choice of coping strategies, as well as the athletes' recovery (Table 5). The strategies referred to as 'confidence', 'motivation', 'coachability' were more frequently used by the athletes (Table 1), whereas 'worry absence' was the least used one (Table 1). In addition, athletes showed low stress levels and higher levels of general and specific recovery in relation to sport (Table 2). The most resilient athletes use more coping strategies to face adversity, coachability and concentration, besides showing a greater recovery related to general welfare (Table 5).

In general, it was seen that the MMA athletes use the 'confidence and motivation' strategy (Table 1). Such a strategy is important because, once the athletes feel more motivated and confident, they tend to strive more to improve their skills and, thus, they get better results in the fights. The use of this strategy is related to low anxiety levels, greater confidence in their abilities to perform functions during training and competitions[36] and greater mental strength because, when they are more motivated, they formulate more realistic goals[37].

More confident and motivated athletes look for ways to face the problems when dealing with stressful factors, such as competition or training. Confidence is important in the sense that athletes generally take great physical risks because they rely on their athletic abilities, and also due to their will to overcome challenges[38]. The characteristics of this modality require a greater amount of resources to cope with the growing demands of the environment[39].

The coachability factor (Tables 1, 3 and 5) was also considered essential for the athletes of such a modality, since they must be willing to learn with their training. In addition, resilience and coping strategies lead to positive outcomes, such as learning, new perspectives, and motivation to help others[13].

When using the coachability strategy, the athlete becomes available to learn through training and focuses on effort and work[33]. In this sense, the perception of positive results, which occurs after the athletes experience adversity, is considered a key factor to develop resilience[34], since when facing an unfavorable situation this strategy helps them to add new skills and perspectives as a more positive view of life, better social relationships, self-regulation, independence and a greater confidence[35].

Concentration was also one of the most important factors for resilient athletes (Tables 3 and 5). This is because they need to be focused to avoid negative results and seek to outline their strategy in view of the fights, in addition to change their training methods, since when they concentrate they better control their emotions and achieve a good performance[32]. Fletcher and Sarkar[10] found that the ability to concentrate is an important aspect of resilience,

and that it is necessary that the athletes focus on both, themselves and their training, that is, focus on the process rather than just the outcome of the events.

It was seen that the athletes with high resilience levels face the adversities found in the sport environment (Tables 3 and 5). Considering training, MMA athletes daily face a series of challenging situations and have their technique constantly corrected. It is possible that together these elements lead the athletes to develop a resilient profile. Being resilient, athletes tend to better confront stressful and challenging situations, having a great capacity for learning, an essential element in the development of a resilient profile[13].

According to Gally and Vealey,[9] the use of a variety of coping strategies that seek confrontation with adversity is of paramount importance to help athletes to deal with a variety of unpleasant emotions. Resilient individuals face better stressful situations and reinforce their coping strategies in the process; this allows them to achieve personal growth as a result of psychological and physiological changes, which teaches them to cope well with difficulties[12].

The positive resilience results also occurred when considering the recovery activities of the athletes (Tables 4 and 5). This ability to recover occurs because, according to Luthar and Cicchetti,[40] resilient athletes tend to remain more stable; they have healthy levels of psychological functioning and physical competence, which provides positive adaptations to situations understood as stressful, leading them to a optimal performance in sports[7].

The athletes with higher levels of resilience showed good levels of general welfare (Tables 4 and 5). According to the resilience model, some qualities such as good mood, optimism and sense of welfare are protective factors against the negative effects when facing stressful events[12]. High resilience levels help the individual to use positive emotions to face unfavorable experiences, which increases the likelihood of success, both in and out of sport.

In the present study, no associations between resilience and stress were found (Table 4). It is believed that this result is due to the low stress level generally shown by most of the athletes, including those who were in a competitive period, together with the experience that the athletes have with sport practice. These results contradict the one pointed out by Jorge, Santos, Stefanello[1], who consider them as common to athletes who participate in competitions.

However, these results are in accordance with what the resilience model points out for sport. For Gally and Vealey[9], resilient individuals use their previous negative experiences as learning and develop resilient qualities; when similar stress sources occur, such as losing a fight, this individual deals better with this stressful factor in order to maintain homeostasis (balance). Although this modality makes the athletes face constant stress risk factors, it can be assumed that such athletes were able to positively adapt to this sport demands by facing the adversities through the use of both, the coping strategies and the resilient qualities acquired in this process.

The main limitation of the present study was the lack of ranking for comparisons of the results between performance and resilience. MMA federations have recently been created in Brazil; however they are still in the process of organizing, so it is still difficult to find information on the exact number of registered teams and on the athletes who participate in national and international competitions. The State of Paraná is among the Brazilian states that most stimulates outstanding athletes in the MMA national and international scenario.

Further researches that do a follow-up throughout the training is suggested, especially during the weight loss phase, since at this stage the athletes have a strict diet and elevated training loads, which may raise the stress levels and increase the chances of injury. It is also suggested that comparisons are carried out regarding the performance of the athletes in competitions and resilience in order to understand how these variables are related.

Conclusions

The athletes showed high resilience levels, thus indicating that they are resilient to stress that emerge from the sport context. In addition, athletes with a high resilience level showed a high occurrence of recovery activities, especially in relation to their general welfare, which was extremely important, considering that a large part these athletes were in the pre-competitive period. High resilience levels help MMA athletes to cope with conflicts in the sport environment in order to concentrate and learn from their training.

As practical implications, it is suggested that coaches periodically evaluate the athletes' stress and recovery status, so as to adjust the training and, thus, not to overload them in order to reduce stress levels and the possibility of injury occurrence. In addition, it is important that coaches provide the athletes with challenging activities, which will assist them to develop the ability to deal with adverse situations, encouraging the use of coping strategies and a resilient profile.

References

1. Jorge SR, Santos PB, Stefanello JMF. O cortisol salivar como resposta fisiológica ao estresse competitivo: uma revisão sistemática. Rev Educ Fis UEM 2010; 21(4): 677-686.
2. Simim MAM, Samulski DM, Ferreira RM. Análise do estresse em atletas de futebol para amputados. Rev Educ Fis UEM 2010; 21(2): 237-244.
3. Carson F, Polman RCJ. The facilitative nature of avoidance coping within sports injury rehabilitation. Scand J Med Sci Sports 2010; 20: 235–240.
4. Dias C, Cruz JF, Fonseca AM. International The relationship between multidimensional competitive anxiety, cognitive threat appraisal, and coping strategies: A multi-sport study. Int Rev Sport Exerc Psychol 2012; 10(1): 52–65.
5. Molinero O, Salguero A, Márquez S. Análisis de la recuperación-estrés en deportistas y relación con los estados de ánimo: un estudio descriptivo. Cuad Psicol Deporte 2011; 11(2): 47-55.
6. Bresciani G, Cuevas MJ, Garatachea N, Molinero O, Almar M, De Paz JA, et al. Monitoring biological and psychological measures throughout an entire season in male handball players. J Sports Sci 2010; 10(6): 377-384.
7. Massey Wv, Meyer Bb, Naylor Ah. Toward a grounded theory of self-regulation in mixed martial arts. Psychol Sport Exerc 2013; 14:12-20.
8. De Rose Júnior, D. A competição como fonte de estresse no esporte. Rev. Bras. Ciên. e Mov., Brasília, DF, v. 10, n. 4, p. 19-26, 2002.
9. Galli N, Vealey RS. "Bouncing Back" From Adversity: Athletes' Experiences of Resilience. The Sport Psychologist 2008; 22: 316-335.
10. Fletcher D, Sarkar M. A grounded theory of psychological resilience in Olympic champions. Psychol Sport Exerc 2012; 13: 669-678.
11. Nicholls AR, Morley D, Perry JL. The model of motivational dynamics in sport: resistance to peer influence, behavioral engagement and disaffection, dispositional coping and resilience. Front Psychol 2016; 6:1-9.
12. Richardson GE, Neiger BL, Jensen S, Kumpfer KL. The Resiliency model. Health Educ. 1990; 21(6): 33-39.
13. Richardson GE. The Metatheory of Resilience and Resiliency. J Clin Psychol 2002; 58(3): 307–321.
14. Nezhad MAS, Besharat MA. Relations of resilience and hardiness with sport achievement and mental health in a sample of athletes. Procedia Soc Behav Sci 2010; 5: 757–497.
15. Hosseini SA, Besharat MA. Relation of resilience with sport achievement and mental health in a sample of athletes. Procedia Soc Behav Sci 2010; 5: 633–638.
16. Cevada T, Cerqueira LN, Moraes HS, Santos TM, Pompeu FAMS, Deslandes AC. Relação entre esporte, resiliência, qualidade de vida e ansiedade. Rev Psiquiatr Clín 2012; 39(3): 85-89.
17. Martin-Krumm CP, Sarrazin PG, Peterson C, Famose JP. Explanatory style and resilience after sports failure. Pers Individ Dif 2003; 35: 1685–1695.

18. Cowden RG, Meyer-Weitz A, Asante KO. Mental toughness in competitive tennis: relationships with resilience and stress. Front Psychol 2016; 7: 1-9. Lazarus R, Folkman S. Stress, appraisal, and coping. New York: Springer, 1984.
19. Sarkar M, Fletcher D. How Should We Measure Psychological Resilience in Sport Performers? Meas Phys Educ Exerc Sci 2013; 17: 264–280.
20. Calmeiro L, Tenenbaum G, Eccles D. Event-sequence analysis of appraisals and coping during trap shootin perfomance. J Appl Sport Psychol 2010; 22: 392-407.
21. Bastidas N, Levine JP, Stile FL. The "sweet science" of reducing periorbital lacerations in mixed martial arts. Ann Plast Surg 2012; 68(1): 43-5.
22. Amtmann, J. Anticipating and training for the worst-case metabolic scenario: a comment on Del Vecchio, Hirata, and Franchini. Percept Mot Skills 2011; 114(1): 123-124.
23. Brewer G, Howarth S. Sport, attractiveness and aggression. Pers Individ Dif 2012; 53(5): 640–643.
24. Paillard T. Physiological Profile Of Fighters Influences Training Organisation In Combat Sports: Response To Del Vecchio, Hirata, And Franchini. Percept Mot Skills 2011; 113(3): 803-804.
25. Campbell-Sills L, Stein MB. Psychometric Analysis and Refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-Item Measure of Resilience. J Trauma Stress. 2007;20(6):1019–28.
26. Lopes VR, Martins MCF. Validação fatorial da Escala de Resiliência Connor-Davidson (Cd-RISC-10) para brasileiros. Rev Psicol Organ Trab 2011; 11(2): 36-50.
27. Gonzalez SP, Moore EWG, Newton M, Galli NA. Validity and reliability of the Connor-Davidson Resilience Scale (CD-RISC) in competitive sport. Psychol Sport Exerc [Internet]. Elsevier Ltd; 2016;23:31–9.
28. Kellmann M, Kallus K, Samulski DM, Costa L, Simola RAP. Questionário de estresse e recuperação para atletas. In: Manual do usuário. Belo Horizonte: Escola de Educação Física, Fisioterapia e Terapia Ocupacional/UFMG; 2009.
29. Smith RE, Smoll FL, Schutz RW, Ptacek JT. Development and Validation of a Multidimensional Measure of Sport-Specific Psychological Skills: The Athletic Coping Skills Inventory-28. J Sport Exerc Psychol 1995; 17: 379-398.
30. Coimbra DR. Validação do questionário "Athletic Coping Skills Invetory-28 (Acsi-28)" para a língua portuguesa do Brasil. [Dissertação de Mestrado em Educação Física]. Juiz de Fora: Faculdade de Educação Física e Desportos, Universidade Federal de Juiz de Fora; 2011.
31. Lemos CAF. Qualidade de vida na carreira profissional de professores de Educação Física do magistério público estadual/RS. [Dissertação de Mestrado em Educação Física]. Florianópolis: Centro de Desportos, Universidade Federal de Santa Catarina; 2007.
32. Meyers M, Stewarts C, Laurent M, Leunes A, Bourgeois A. Coping skills of olympic developmental soccer athletes. Int J Sports Med 2008; 29(12): 987–93.
33. Vieira LF, Caruzzo NM, Aizava, PVS, Rigoni PAG. Análise da síndrome de burnout e das estratégias de coping em atletas brasileiros de vôlei de praia. Rev Bras Educ Fís Esp 2013; 27(2): 269-276.
34. Fontes RCC, Brandão MRF. A resiliência no âmbito esportivo: uma perspectiva bioecológica do desenvolvimento humano. Motriz Rev Educ Fís 2013; 19(1): 151-159.
35. Machida M, Irwin B, Feltz D. Resilience in competitive athletes with spinal cord injury: the role of sport participation. Qual Health Res 2013; 23(8): 1054-65.
36. Cresswell S, Hodge K. Coping Skills: Role Of Trait Sport Confidence And Trait Anxiety. Percept Mot Skills 2004; 98: 433-438.
37. Weissensteiner JR, Albernethy B, Farrow D, Gross J. Distinguishing psychological characteristics of expert cricket batsmen. J Sci Med Sport 2012; 15(1): 74-79.
38. Crust, L.; Keegan, R. Mental toughness and attitudes to risk-taking. Pers Individ Dif 2010; 49(3): 164-168.
39. Chen MA, Cheesman DJ. Mental toughness of mixed martial arts athletes at different levels of competition. Percept Mot Skills 2013; 116(3): 905-917.
40. Luthar SS, Cicchetti D. The construct of resilience: Implications for interventions and social policies. Dev Psychopathol 2000; 12(4): 857–885.

Received on Aug, 03, 2016.
Reviewed on Mar, 15, 2017.
Accepted on Apr, 24, 2017.

Endereço para correspondência: Isabella Caroline Belem. Pç Mascarenhas de Moraes, 4282 – Zona III. Umuarama, PR. CEP 87502-210. E-mail: isabellabelem@unipar.br