Do psychological attributes predict resilience? A study with high-performance athletes

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Abstract

In the field of sport psychology, resilience is related to athlete performance. Hence, we sought to investigate how much of the resilience of high-performance athletes could be predicted by positive attributes and personality traits. The sample comprised 108 athletes between 14 and 25 years of age belonging to a sports club of Porto Alegre (Rio Grande do Sul State, southern Brazil) and who participated in one of seven sports. The instruments used evaluated: resilience, self-esteem, optimism, life satisfaction, cognitive hope, positive and negative affect, self-efficacy, and personality. The statistical analyses performed were Pearson's correlation test ($p \leq 0.001$) and multiple linear regression analysis. Our findings indicated that self-efficacy, positive affect, and self-centered hope constituted the model that best explained resilience (41% of the variance). These results may support future interventions aimed at promoting resilience in athletes.

Keywords: Resilience; Positive Psychology; Personality; Athletes.

Introduction

In the area of health, the concept of resilience has been prominent in research on health promotion strategies[1-5]. Although there is no consensus in the literature about its definition, resilience can be considered a multidimensional construct, a process of positive adaptation in the face of typically unfavorable contexts. Its key question refers to the individual's ability to overcome adverse conditions posing a significant threat to their well-being, development, or mental health[6,7].

The concept of resilience is currently understood as a process that allows individuals to develop healthily, even in adverse scenarios, which means reacting positively to stressful events[8]. Risk factors are variables that increase the probability of an individual acquiring a particular disease when exposed to them. In general, these factors contribute differently to emotional adjustment and may have a direct action or mediate other variables, although they rarely have an isolated impact on human development[7]. Protective factors, nonetheless, can be defined as an influence that prevents, limits, or reduces risk factors over time[9].

Although resilience is associated with risk and protection factors, it is not only the sum of aspects related to the adaptation of people. Exposure to risks can occur ambivalently since some variables have a protective aspect

in one situation and increase the individuals' vulnerability in another. In addition, the response patterns of each individual can also vary in relation to the type of adversity and the context, thereby making resilience a situational characteristic and not a stable measure or personality trait. Therefore, as a dynamic process, it may be present in certain moments of life and not in others, characterizing it as a complex variable[7,10].

In order to advance knowledge on this theme, researchers have sought to shed more light on what may predict or be associated with resilient behavior[11-13]. However, in the literature, there is no consensus on the strength and direction of the association between resilience and sociodemographic variables, including income, education, and sex[14-17].

In different contexts, some of the psychological constructs most often associated with resilience refer to dispositional attributes (e.g., personality) or mental health indicators (e.g., stress or burnout). In sport psychology, one study with 165 Japanese athletes concluded that resilience is negatively related to burnout among athletes[18] and similar findings have also been reported elsewhere, such as in a study with 238 Swedish soccer players[19]. Nevertheless, when evaluating personality traits in Brazilian athletes from different sports, Rabelo[20] reported that the search for a common psychological profile among athletes is questionable, given the peculiarities of each sport modality. Despite this consideration, other authors have emphasized the importance of investigating positive internal resources (e.g., optimism) in favor of resilient development among athletes[21]. In fact, evidence has shown that optimistic athletes cope more healthily with the harmful effects of stressors[22]. Along these lines, Aranzana and collaborators[23] evaluated 82 swimmers aged 13-29 (M = 15.79; SD = 2.707) and found that high resilience and optimism significantly reduced internal training load (related to the athlete's physiological stress) during the gradual reduction stage of training (pre-competitive periods).

Other variables empirically associated with a better ability to withstand competitive sports stress are well-being, self-esteem, support network, self-efficacy, and hope[24-26] Illustratively, Lu and colleagues[27] demonstrated that resilience and coaches' social support jointly moderated athletes' stress-burnout relationship. In turn, Bayköse et al.[28] assessed 237 college athletes (132 males; mean age = 20.49 ± 2.44) and found a significant and moderate relationship between self-esteem and resilience in high-performance athletes ($r = 0.58$; $p < 0.001$). Regarding the assessment of self-efficacy and resilience in sports contexts, evidence has shown that among individuals undergoing high psychological pressure training, high levels of general self-efficacy and perceived resilience were predictor variables for the ability to acquire sports skills compared to those with lower scores in these variables[29]. In fact, Couto and collaborators[30] demonstrated that athletes with higher self-efficacy perform more efficiently in the sport practiced.

Research in sport psychology has also indicated that emotional self-regulation (control of positive and negative affect) and the perception of life satisfaction can make the athlete more resilient[31-34]. Therefore, it is evident that better understanding resilience is a crucial effort in psychological studies as it favors improving individuals' quality of life, health, and adaptation[35,36].

In sports, developing this potentiality in athletes is a fundamental purpose since competitiveness is a daily reality for high-performance athletes[37], as these individuals are exposed, besides training and competitions, to a series of conflicts with which they must learn to deal. In addition to the frequent renunciations, they experience for the sake of the sport, some athletes face situations considered risky to their well-being over time, including the absence of clear goals, lack of perspective (low engagement), and loss of pleasure in the sport (experience of few positive affections)[38-42].

Nonetheless, for future development of effective interventions that promote resilience in this population, it is necessary to better understand which variables can predict resilience among high-performance athletes. Given the above, this study sought to evaluate whether positive attributes (self-esteem, hope, optimism, well-being, and self-efficacy) and personality traits can predict resilience scores among high-performance athletes.

Methods

Participants

The sample was composed of 108 high-performance athletes belonging to one of Brazil's main social sports clubs, located in Porto Alegre (Rio Grande do Sul State, southern Brazil). The participants were part of teams from one of seven sports (basketball, fencing, artistic gymnastics, swimming, judo, rowing, and volleyball). The exclusion criteria were not to present the research consent form, be uninterested in participating, and not answer all the instruments. All athletes of the sports included in the study (swimming, rowing, volleyball, fencing, basketball, judo, and artistic gymnastics) were invited to participate.

The number of participants in the study meets the sample size calculated from the study by dos Santos and Reppold[43] who indicated a minimum number of 94 participants so that the results could be considered significant. The correlation value used as criteria for the sample number was 0.321, with 5% significance and 90% power.

Instruments

Resilience Scale: The Resilience Scale is a 25-item instrument used to assess an individual's ability to deal positively with adversity. The instrument is answered utilizing a 7-point Likert-type scale, and its score ranges from 0 to 175. In the validation study of the instrument for Brazil, it showed good psychometric properties: Cronbach's alpha = 0.80, adequate intraobserver reliability, conceptual equivalence, and evidence of validity based on internal structure[44].

The Personality Factors Battery (BFP, acronym in Portuguese): This instrument evaluates personality and is based on the Big Five Theory. It covers the following dimensions: agreeableness, openness, conscientiousness, and neuroticism. The test has 126 items that are answered using a seven-point Likert-type scale and has good accuracy rates and validity evidence based on content, internal structure, and external variables[45].

Rosenberg's Self-Esteem Scale: This instrument assesses an individual's overall self-esteem and has ten items answered using a 4-point Likert-type scale. The sentences are based on statements about the person's judgment and value about themselves[46]. The national adaptation and validation study of the scale showed that the instrument has psychometrically adequate indices, with one-factor solution analysis, which explains 54.6% of the total variance and Cronbach's alpha equal to 0.90[46].

Life Orientation Test-Revised (LOT-R): This instrument is composed of 10 items, four of the statements being considered filter items, not counted in the final score. The remaining six statements refer to optimism and pessimism. Using a 5-point Likert scale, the respondent evaluates how much they feel according to the item. It is the main international instrument for assessing optimism; it was adapted and validated for Brazil, with good psychometric evidence, with Cronbach's alpha equal to 0.80 and a unidimensional structure, which explains 51% of the total variance of the scores[47].

Cognitive Hope Scale: This scale was based on the Hope Index and, despite having an affective component included, is focused on the cognitive dimension of the construct[48]. It assesses hope using altruism and self-centeredness, and the total score is the sum of these dimensions. The original scale has 16 items. In the version adapted and validated for Brazil, the scale includes five items of self-centered hope[49]. It is composed of 21 questions (six altruistic hope and 15 self-centered hope). In each item, the respondent indicates how much they wish the described fact to happen and how much they believe it will happen using a 5-point Likert scale. The instrument presents good psychometric properties in Brazil, with a growing body of validity evidence and adequate internal consistency (Cronbach's alpha was 0.86 for self-centered hope and 0.80 for altruistic hope). Interpretation of the scores is performed separately for altruistic and self-centered hope[49].

Positive and Negative Affect Scale (PANAS): This instrument is used to assess the experience of positive and negative affect, which are emotional components of subjective well-being[50]. It is composed of a list of 20 words that express emotions, with 10 items of each type of affect. The respondent evaluates how much they

felt the emotions described in the last few weeks using a 5-point Likert scale. The PANAS is the most widely used instrument internationally to assess affect, and in the Brazilian context, research has proved its adequacy in terms of accuracy and validity evidence[50].

Life Satisfaction Scale: This scale is utilized to evaluate people's life satisfaction level, which can be defined as the cognitive aspect of subjective well-being. It is composed of five items relating to how one perceives their life up to the moment and answered using a 7-point Likert-type scale. It has already been adapted for the Brazilian sample, with studies showing adequate psychometric properties, good accuracy estimation, and validity evidence[51].

General Self-Efficacy Scale: Based on the social learning theory, it allows one to evaluate self-efficacy in general, indicating how well an individual considers themselves capable of performing tasks proposed to them. Specifically, its items involve statements about how much the respondent believes in their ability to overcome challenges and solve problems. The instrument is composed of 20 statements that are answered on a 5-point Likert scale and shows adequate estimation accuracy (Cronbach's alpha = 0.89) and evidence of validity[52].

Data collection procedure

This study involved a quantitative and instrumental method with a transversal design[53]. The project was approved by the Research Ethics Committee of the Federal University of Health Sciences (UFCSPA; opinion no. 1.637.523) and met all ethical precepts involving research with human beings. To participate, athletes older than 18 signed a free and informed consent form. Athletes under 18 years of age handed in an informed consent form signed by their legal guardian and an assent form. Data collection took place in two meetings: the first one lasted between 20 and 35 min and consisted of applying the seven positive psychology scales in a spiral fashion; in the second, the BFP was filled out (30-45 min). Data collection took place between 2016 and 2018 and was carried out at the sports club's facilities in the psychology sector.

Statistical analysis

The data analyzed were described utilizing mean and standard deviation when quantitative and frequency and percentage when qualitative. Normality was verified using the Shapiro-Wilk test. Comparisons of means were performed using Student's t test and analysis of variance (ANOVA) with Tukey's test for multiple comparisons. Correlations of resilience with the other instruments were assessed using Pearson's correlation test, and the impact of each attribute of positive psychology and personality traits on resilience was measured using multiple linear regression analysis with stepwise selection. The data were stored in a spreadsheet and analyzed using the statistical software SPSS (version 23). The statistical significance adopted was 5% ($p < 0.05$).

Results

As for the characterization of the sample, 67.6% of the participants were male (n = 73) and 32.4% were female (n = 35). Education ranged from: incomplete elementary school (24.1%; n = 26), incomplete high school (48.1%; n = 52), complete high school (12%; n = 13), and incomplete higher education (15.7%; n = 17). The participants' age ranged from 14 to 25, with a mean of 16.5 (SD = 2.4). The distribution of athletes by sport was as follows: swimming (25.9%; n = 28), rowing (16.6%; n = 18), volleyball (16.7%; n = 18), fencing (12%; n = 13), basketball (13%; n = 14), judo (9.3%; n = 10), and artistic gymnastics (6.5%; n = 7). In order to characterize the variables analyzed, the mean and standard deviation values of the sample for each construct evaluated are listed in TABLE 1.

TABLE 1 - Averages and standard deviation of the high performance athletes' sample (n=108).

Variables	Mean	Standard deviation
BFP-Neuroticism	3.51	0.86
BFP-Extraversion	4.26	0.88
BFP-Agreebleness	5.02	0.62
BFP-Conscientiousness	4.85	0.76
BFP-Openness	4.34	0.68
Self-esteem	30.19	4.38
Optimism	23.40	3.47
Positive Affect	35.38	6.94
Negative Affect	20.92	6.31
Self-centered Hope	279.11	43.28
Altruist Hope	80.18	26.08
Life Satisfaction	24.29	5.39
Self-efficacy	76.47	10.54
Resilience	131.08	13.55

The Resilience Scale score was weakly correlated with age ($r = 0.246$; $p \leq 0.001$). No difference was observed in the mean score regarding sex: men had a mean score of 132 and women 129 ($t = -1.33$; $p = 0.18$). The ANOVA showed a significant difference in the resilience scores concerning sports ($p = 0.01$), as shown in TABLE 2. Tukey's test, specifically, showed that athletes practicing Judo scored significantly higher on the Resilience Scale than those practicing fencing (141 + -10 vs. 121 + -11, respectively). The other modalities did not differ.

TABLE 2 - Resilience Scale scores according to the sport category.

Category	N	%	Mean	Standard deviation
Judo	10	9.3	141.10[a]	10.03
Rowing	18	16.6	134.72[ab]	11.54
Swimming	28	25.9	133.03[ab]	12.87
Basketball	14	13	131.57[ab]	12.99
Artistic gymnastics	7	6.5	128.85[ab]	14.32
Volleyball	18	16.7	126.00[ab]	10.50
Fencing	13	12	121.84[b]	17.61

*[a,b]Means followed by equal letters do not differ from each other (Tukey's test; $p < 0.05$).

The correlations between personality traits and positive attributes for the resilience scores are provided in TABLE 3. The variables that had significant correlations with resilience were later included in the model investigated through regression analysis. Thus, four variables were excluded from the model: openness, socialization, altruistic hope, and negative affect.

TABLE 3 - Correlations between the Positive Psychology constructs and BFP with resilience.

Variables	Resilience	
	Correlation (r)	p value
BFP-Neuroticism	- 0.29	0,01
BFP-Extraversion	0.32	0.01
BFP-Agreebleness	-0.13	0.17
BFP-Conscientiousness	0.27	0.01
BFP-Openness	0.14	0.14
Self-esteem	0.46	0.01
Optimism	0.35	0.01
Positive Affections	0.51	0.01
Negative Affections	- 0.14	0.13
Self-centered Hope	0.51	0.01
Altruist Hope	0.06	0.52
Life Satisfaction	0.25	0.01
Self-efficacy	0.58	0.01

*n = 108.

A multiple regression analysis was performed to verify how much of the variability in resilience could be explained by the positive attributes evaluated and by personality traits. The results presented in TABLE 4 indicated that neuroticism, extroversion, socialization, optimism, self-esteem, and life satisfaction were not significant predictors for resilience in this sample.

TABLE 4 - Variables excluded by multiple linear correlation.

Variables Excluded	ß	T	P-valor
BFP-Neuroticism	-0.03	-0.44	0.65
BFP-Extraversion	0.13	1.68	0.09
BFP-Conscientiousness	0.01	0.14	0.88
Self-esteem	0.05	0.50	0.61
Optimism	-0.13	-1.41	0.16
Life Satisfaction	0,00	0.04	0.96

As listed in TABLE 5, the variables significantly predictive of resilience were self-efficacy, positive affect, and self-centered hope. The final model composed of these variables explained 41% of the variability in resilience (R^2 = 41%).

TABLE 5 - Predictor variables of resilience.

Predictor variables	ß	T	P-valor
Self-Efficacy	0.35	3.58	0.00
Positive Affect	0.22	2.49	0.01
Self-Centered Hope	0.20	2.17	0.03

Discussion

Our findings indicated that high-performance athletes presented similar mean resilience scores in the different sports modalities evaluated. Of the seven sports investigated, the only ones that differed significantly from each other were fencing and judo. Judokas showed higher scores on the Resilience Scale than fencers. Although this data is unprecedented, this may have occurred due to a possible influence of the socioeconomic variable in this association. Notably, in the club where the data collection was carried out, judo is a sports modality with monthly fees and equipment significantly more accessible than fencing. However, the hypothesis of the intervening effect of social class could not be tested because data on the participants' socioeconomic status were not collected, thereby being a limitation of this study.

The analysis of the relationship between resilience and sociodemographic data was only significantly correlated with resilience, this result being in a positive direction and weak magnitude ($r = 0.24$; $p \leq 0.01$). In fact, the literature indicates no consensus on the association between these variables[17,54].

Regarding the association between personality traits and resilience, our findings showed that there were significant correlations, weak and positive, between resilience and the factors extroversion ($r = 0.32$) and achievement ($r = 0.27$) and negative with neuroticism ($r = 0.29$), also of weak magnitude. This corroborates Solís-Cámara and collaborators[55] surveyed youth in the same age group as this study and concluded that the participants with higher resilience also had lower neuroticism. Similarly, Ueno and Suzuki[18] assessed Japanese athletes and found that personality traits were significantly associated with resilience, being positive for extroversion, amiability, conscientiousness, and openness, and negative for neuroticism. The authors concluded, however, that none of the personality traits evaluated integrated the final prediction model of resilience, which was also the case for our study.

As for the relationship between positive attributes and resilience, our findings revealed a significant correlation between resilience and self-efficacy ($r = 0.58$), positive affect ($r = 0.51$), self-centered hope ($r = 0.51$), self-esteem ($r = 0.46$), optimism ($r = 0.35$) and, to a lesser extent, life satisfaction ($r = 0.25$). Nonetheless, in the regression analysis, only self-efficacy, positive affect, and self-centered hope were retained in the final model for predicting resilience in high-performance athletes.

In this regard, it is noted that, in the sporting context, self-efficacy, the variable with the most significant predictive power in the model, is a construct of broad scientific interest. In the literature, self-efficacy is described as a variable that promotes resilience in the face of adversity and as a component[56,57]. In this regard, Couto and colleagues[30] investigated how athletes perceived the presence of fans in futsal, the consequences for performance, and the role of self-efficacy. The data indicated that the athletes with higher self-efficacy were the ones who acted more safely and efficiently, regardless of how the fans behaved, which can be considered resilient behavior.

In our study, the hope construct was assessed using the Cognitive Hope Scale, which encompasses two dimensions: agency and routes. Agency refers to an individual's motivation to follow a goal to be achieved, and routes refer to the planned paths to achieve that goal[59]. The scale is composed of two factors: self-centered hope and altruistic hope. The results indicated that resilience correlated only with self-centered hope, which had the power to predict 20% of the variance

in resilience. Boyatzis and McKee[59] reported that hope promotes resilience by increasing individuals' sense of control over their destiny. Corroborating this finding, Amblard and Cruz[60] identified, in the report of adolescent athletes of high performance, the perceived need for overcoming and hope as anchor points in favor of life projects related to sport.

Positive affect had, in the final model of the regression analysis, the power to predict 23% of the variance of resilience. This is corroborated by research indicating that positive emotions improve athlete performance[61]. In this regard, Gilchrist and collaborators[61] demonstrated that positive emotions are valuable as their effects outweigh the transient experience of the emotion. Therefore, in the sport context, in order for the athlete to remain in the sport and feel good during their daily practice, it is pivotal that they experience more positive affect than negative affect. These positive experiences can serve as the basis for developing physical, social, and psychological resources, which help individuals thrive in their environment and meet the challenges of goal pursuit[62].

One finding that raises concern is the evidence that the negative affections were not related to resilience, which is an aspect to be considered for evaluating the efficiency of the variables that influence the training results, since the relationship between coach and athlete interconnects affect, thoughts, and behaviors[63]. Sometimes, coaches use hostile behaviors in training as a trigger for better sports performance without a scientific basis for such practice; such behaviors can directly affect the athlete's self-efficacy and self-esteem. Given this context, this study indicated a significant and moderate correlation between self-esteem and resilience, which is essential data to be considered in the practice of interventions in the sports context. Although self-esteem is not a predictor of resilience, other studies have reported that this variable helps face adverse situations and may be a mediator variable of other relationships. In this perspective, the study conducted by Bezerra and Bindé[64] with 56 soccer athletes in northeastern Brazil revealed a strong inverse proportional relationship between self-esteem and stress and a directly proportional relationship between stress and the incidence of sports injuries, illustrating the importance of developing psychological programs of prevention and coping with stress in the sports context.

Despite the methodological rigor in conducting this study, some limitations exist when discussing the results. One is the cross-sectional design, which only allows correlational analyses between the investigated constructs. Ideally, a longitudinal study must be designed to evaluate possible differences in the pattern of relationships between the variables correlated with resilience over time. Another limitation is that we did not foresee the data collection regarding the participants' socioeconomic status, the athlete's time in their sport modality, and the training load.

As for the sport psychology theme, the reduced number of publications addressing the theme investigated in this study stands out. On the one hand, this circumstance reduced the possibility of comparing the data obtained with previous studies. On the other hand, it illustrates the scientific relevance of this article in improving intervention practices in sports psychology and shedding more light on the factors to be considered in the search for better performance through psychological interventions. Our findings showed that self-efficacy, positive affect, and self-centered hope contribute to developing resilience in the sports context. Thus, considering the typical daily life of high-performance athletes amidst competitions, training, and eventual injuries[31]. the promotion of resilience may be a variable of great relevance for the healthy permanence of the athlete in the sport. The literature indicates that athletes with better quality of life perceive themselves as resilient[54]. Therefore, this condition is a promising outcome of interventions towards a healthier, happier, and more engaged life in sport. In this perspective, the evidence presented herein and unpublished in the literature becomes a theoretical foundation of relevance for planning future interventions in sport psychology.

Conclusion

This study demonstrated that positive psychology factors such as self-efficacy, positive affect, and self-centered hope could predict 41% of the resilience variable in high-performance athletes. These findings are significant as they may subsidize future interventions by psychology teams seeking to promote these variables and athletes' mental health. Despite our promising findings, some limitations must be pointed out, including not measuring the socioeconomic data of the sample and its transversal character. From this perspective, it is fundamental to conduct further research that supports the practices of the sports psychologist indicates the constructs with the greater predictive power of resilient behavior.

Resumo

Atributos psicológicos predizem resiliência? Um estudo com atletas de alto rendimento.

No campo da Psicologia do Esporte, a resiliência é relacionada à performance de esportistas. Assim, buscou-se investigar o quanto da resiliência de atletas de alto rendimento poderia ser predita por atributos positivos e traços de personalidade. A amostra incluiu 108 atletas, entre 14 a 25 anos de idade que participavam de uma entre sete modalidades esportivas, pertencentes a um clube de Porto Alegre (RS). Os instrumentos utilizados avaliavam: Resiliência, Autoestima, Otimismo, Satisfação de vida, Esperança Cognitiva, Afetos Positivos e Negativos, Autoeficácia e Personalidade. As análises estatísticas realizadas foram Testes de Correlação de Pearson ($p \leq 0,001$) e Análise de Regressão Linear Múltipla. Os resultados indicaram que autoeficácia, afetos positivos e esperança autocentrada constituíram o modelo que melhor explicou a resiliência, explicando 41% da variância. Esses achados podem subsidiar futuras intervenções que visem à promoção da resiliência em atletas.

Palavras-chave: Resiliência; Psicologia Positiva; Personalidade; Atletas.

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