Rev Bras Cineantropom Desempenho Hum

original article

https://doi.org/10.1590/1980-0037.2025v27e89926

Resilience, stress and recovery among paralympics athletes during pre-competitive phase

Resiliência, estresse e recuperação em atletas paralímpicos na fase pré-competitiva

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Abstract – This study investigated whether the level of resilience of Paralympic athletics athletes in a pre-competitive period was impacted by sociodemographic and stress variables. 107 Paralympic athletics athletes (92 men and 15 women) with a mean age of 32.25 ± 12.80 years participated in a regional championship. The instruments used were the Connor-Davidson Resilience Scale (CD-RISC) and the Sport Stress and Recovery Questionnaire (RESTQ-76 Sport). Data were analyzed using cluster analysis, chi-square test and multivariate analysis of variance (p <.05). The results revealed that there was no difference between the sociodemographic and stress variables in relation to the resilience profile. Compared with the low resilience cluster, the high resilience Paralympic athletics athletes had higher scores for the global recovery score (p=.023). It was concluded that sociodemographic and stress variables do not seem to be intervening factors for the level of resilience, but resilience seems to be an intervening factor for the recovery of Paralympic athletics athletes in the pre-competitive period.

Key words: Paralympic sport; Psychological resilience; Psychological stress; Sport psychology.

Resumo – *Este estudo investigou se o nível de resiliência de atletas de atletismo paralímpico em período pré-competitivo foi impactado por variáveis sociodemográficas e de estresse. Um total de 107 atletas de atletismo paralímpico (92 homens e 15 mulheres), com média de idade de 32,25 ± 12,80 anos, participaram de um campeonato regional. Os instrumentos utilizados foram a Escala de Resiliência Connor-Davidson (CD-RISC) e o Questionário de Estresse e Recuperação Esportiva (RESTQ-76 Sport). Os dados foram analisados por meio de análise de cluster, teste qui-quadrado e análise de variância multivariada (p<0,05). Os resultados revelaram que não houve diferença entre as variáveis sociodemográficas e de estresse em relação ao perfil de resiliência. Em comparação com o cluster de baixa resiliência, os atletas de atletismo paralímpico de alta resiliência tiveram pontuações mais altas para o escore de recuperação global (p=0,023). Concluiu-se que as variáveis sociodemográficas e de estresse não parecem ser fatores intervenientes para o nível de resiliência, mas a resiliência parece ser um fator interveniente para a recuperação de atletas de atletismo paralímpico no período pré-competitivo.*

Palavras-chave: *Esporte paralímpico; Resiliência psicológica; Estresse psicológico; Psicologia do esporte.*

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Received: June 02, 2024
Accepted: April 03, 2025

How to cite this article
Freire GL, Fiorese L, Moraes JFVN, Xavier SES, Oliveira DV, Nascimento Júnior JRA. Resilience, stress and recovery among paralympics athletes during pre-competitive phase. Rev Bras Cineantropom Desempenho Hum 2025, 27:e89926. DOI: https://doi.org/10.1590/1980-0037.2025v27e89926

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Scientific Editor
Diego Augusto Santos Silva

INTRODUCTION

Paralympic sport can be an environment for stressful situations, due to the challenges, difficulties and adversities present in this context[1,2]. High loads arising from training and high demand from competitions that demand maximum levels of performance from Paralympic athletes can generate great physical and mental exhaustion[2]. Typically, Paralympic athletics athletes are submitted to an intense calendar that involves multiple competitive stages during the year, that is, it has a short pre-competitive period and a long competitive season. Thus, during the pre-competitive period, the intensification of the training load is a strategy commonly used by coaches and coaching staff in different sports, to achieve optimal performance levels before the competitive period[3].

Thus, facing stressful situations (e.g. pre-competitive period) in a positive way can play an important role in preventing recurrent stress-related problems within and outside the sport context, a characteristic of resilient individuals[4,5]. According to The Grounded Theory of Psychological Resilience and Ideal Sports Performance developed by Fletcher and Sarkar[6], resilience within the sports environment is considered a dynamic and multifactorial process that involves the individual's ability to present a healthy development, even after to experience adverse situations, while potentially avoiding unwanted aspects of the stress process, such as muscle stiffness, tension and decreased attention and focus[4,5].

Sarkar4 states that resilience is an extremely important psychological factor, as it helps athletes in the process of adaptation and overcoming the stressful demands arising from the high-performance sporting context. Machida et al.[7] observed in wheelchair rugby athletes that the social support of family members, teammates and coaches was essential for the development of resilience among athletes. Similar findings were pointed out by Freire et al.[8] when observing in Brazilian Paralympic swimming and athletics athletes that commitment to the coach is associated with increased resilience in these athletes. However, despite the increase in literature related to the resilience of Paralympic sport[7,8], no study has yet analyzed the role of resilience in coping with stress and recovery in Paralympic athletes.

This scenario resilience, stress and recovery are relevant components within Paralympic sport, as Paralympic athletes must use and optimize a range of mental skills to withstand the pressures they experience within the training and competition environment. Thus, resilience emerges as an extremely important psychological factor, as it helps athletes in the process of adaptation and overcoming stressful demands and, therefore, helps in the athlete's engagement in the sporting context. Resilience can also influence stress levels in a positive way, possibly reducing the risk of this variable in the performance of athletes and, in relation to recovery, resilience can optimize its regulatory function on stress. Therefore, the aim of this study was to investigate resilience, stress and recovery in Paralympic athletics athletes in the pre-competitive period through cluster analysis.

METHODS

Study design and procedures

This is a descriptive study with a cross-sectional design and methodological investigation[9]. The study was developed through the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology

(STROBE)[10] for observational studies. The procedures adopted in this research are in accordance with the ethical criteria in research with human beings in accordance with the resolution (466/12) of the National Health Council under opinion No. 3.732.444. Then, the researcher contacted the directors and coaches of the teams, in order to clarify the objectives and procedures of the research and obtain approval. Data collection took place during the North/Northeast Athletics Stage in 2020, held in the city of Recife-PE. The instruments were applied at the hotel where the athletes were accommodated on days and times made available by the athletes and coaches. Questionnaires were administered without the presence of coaches. The average filling time was between 20-35 minutes. To avoid sources of bias, a single evaluator applied the questionnaires.

Participants

107 Paralympic athletics athletes participating in the North/Northeast Athletics 2020 Stage of the Brazilian Paralympic Circuit took part in this study. Among them, 92 were male and 15 were female, with a mean age of 31.25 ± 12.80 years, with practice time of 21.49 ± 2.90 years and 7.28 ± 9.58 hours training weekly. Of these Paralympic athletes 28 had intellectual disabilities, 6 visually impaired and 73 physically impaired. Participants were selected in a non-probabilistic way and for convenience. Participants were selected according to the following inclusion criteria: 1) To be an athlete for more than 1 year; 2) Have already participated in state or national level competitions; and 3) Be an athlete within the functional classifications of the respective modalities. Only individuals who have signed the Informed Consent Form and who verbally expressed their desire to participate in the study participated in the study.

Measures

Recovery and stress

To identify stress and recovery levels at four different time points in the season the RESTQ-76 Sport (Recovery and Stress Questionnaire for Sports)[11] was used, in its validated version for Portuguese[12]. This instrument is composed of 77 items answered in a 07-point Likert-type scale (from 0 –"Never" to 06 –"Always"). Results are grouped in 10 stress subscales (general stress, emotional stress, social stress, conflicts/pressure, fatigue, lack of energy, physical complaints, disturbed breaks, emotional exhaustion and injuries) and 09 recovery subscales (success, social recovery, physical recovery, general well-being, quality of sleep, being in shape, personal accomplishment, self-efficacy and self-regulation). Total scores are obtained separately for each of the 19 dimensions and range from 0 to 6. Score interpretation was the same for both stress and recovery; therefore, higher scores indicate higher levels of that variable. Cronbach's alpha of the instrument for the present study was from α =.70; .76 and .82 for stress and α = .70; .77; .77 for recovery, indicating strong reliability[13].

Resilience

To verify Paralympic athlete's resilience levels, the Brazilian version of 10-items Connor-Davidson Resilience Scale was used[14]. This scale is composed

of 10 items in a 5-point Likert-type scale. The result is a single-factor score varying from 0 to 40 points, with higher scores indicating higher resilience levels. Scale's reliability was α=.87, indicating adequate data reliability[13].

Data analysis

Before conducting the cluster analysis, we standardized the raw scores of resilience. Parathletes were grouped/classified using hierarchical and non-hierarchical cluster analysis. Firstly, the nearest neighbor hierarchical cluster analysis was conducted, using the squared Euclidian distance as a measure of dissimilarity. The R-square value was used as the criteria for retaining the number of clusters. From this analysis, two clusters were retained. For the validation and classification of the participants in the two clusters retained, a k-Means non-hierarchical cluster analysis was conducted. According to Cumming and Duda[15] f criteria, z scores below -.5 are considered to be at a low level; z scores between –.5 and +.5 at a moderate level, and z scores over +.5 at a high level. Additionally, the clusters obtained were analyzed based on gender, disability and type of event through bivariate analysis, using Pearson's chi-squared with 2 x 2 contingency tables and setting statistical significance at $p < .05$.

We then carried out various Multivariate Analyses of Variance (MANOVAs) to examine the differences between the clusters for parathletes' perception of stress and recovery. The effect size (d) was also calculated using the model proposed by Cohen[16] for differences in the values of two independent groups. According to Cohen's criteria, a value of $d = .20$ represents a small effect size; $d = .50$, average; and $d = .80$, large. All analyses were conducted using SPSS 22.0 and p values < .05 were viewed as a statistically significant result.

RESULTS

Preliminary analysis

Data were first examined for missing values. There was no lack of values, as the main researcher ensured that all surveys were fully completed during data collection. Data were then examined for univariate and multivariate outliers, with no outliers found within the sample. Finally, data were examined for normality with distortion values ranging from -.83 to -.28 and kurtose values ranging from -1.15 to .1.04, indicating reasonable normality[17].

Descriptive statistics and correlation

Table 1 presents the intercorrelations, scale ranges, means, standard deviations and reliability estimates for all variables. The mean scores on the 1–5 response scale of the resilience revealed that Paralympic athletics they were developing their resilience through sports ($M = 30.14$ SD= 5.63). The mean score on the 0–6 response of the REST-Q revealed that participants perceived high recovery (Mrange=3.89 to 2.68) and low stress (Mrange=3.79 to 1.98). The correlations revealed that resilience not was significantly with the variable of stress and recovery.

Table 1. Summary of intercorrelations, scale ranges, means, standard deviations and reliability estimates.

Variables	RES	Stress											Recovery								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Resilience	-	.06	.04	.02	-.01	.03	.01	-.07	.18	.12	.08	.17	.10	.18	.03	.07	.15	.07	.09	.02	.12
2. General stress		-	.49**	.57**	.41**	.57**	.58**	.11	-.11	-.08	-.02	.06	-.12	-.07	.32**	.41**	.26**	.25**	.19**	.23*	.33**
3. Social stress			-	.46**	.42**	.45**	.45**	.08	.13	.04	.13	.27**	.06	.10	.29**	.31**	.41**	.22*	.36**	.41**	.50**
4. Conflict/Pressure				-	.16	.59**	.62**	-.04	-.13*	-.30*	-.10	.06	.22*	-.13	.52**	.16	.13	.09	.02	.15	.14
5. Fatigue					-	.45**	.46**	.04	-.22**	.01	-.12	.18	-.20*	-.16	-.16	.19*	.14	.30**	.19*	.45**	..37**
6. Lack of energy						-	.55**	.27**	.09	.12	.19*	.10	.17	-.11	.25**	.22*	.40**	.46**	.46	.32**	.62**
7. Physical complaints							-	.01	-.17	-.27**	-.11	.21*	.03	-.21*	.32**	.09	.08	.42**	.09	.22*	.29**
8. Disturbed breaks								-	.52**	.27**	.82**	-.01	.09	.17	.12	-.25**	.56**	.27**	.37**	.17	.52**
9. Emotional exhaustion									-	.46**	.91**	.28**	.34**	.38**	.26**	-.08	.60**	.05	.42**	-.02	.41**
10. Injury										-	.43**	.30**	.13	.32**	-.12	-.01	.36**	.13	.50**	.11	.41**
11. Overall stress											-	.18	.27**	.26**	.22*	-.17	.66**	.16	.46**	.06	.52**
12. Success												-	.25**	.22*	.14	.08	.38**	.12	.43**	.02	.36**
13. Social recovery													-	.26**	.47**	.10	.21*	.02	.11	.02	.14
14. Physical recovery														-	.34**	.27**	.29**	-.13	.05	.24*	.16
15. General well-being															-	.19*	.23*	.08	.17	.10	.22*
16. Sleep quality																-	.16	.06	.06	.19*	.17
17. Being in shape																	-	.38**	.49**	.24*	.80**
18. Pers. Accomplishment																		-	.28*	.12	.66**
19. Self-efficacy																			-	.27**	.66**
20. Self-regulation																				-	.53**
21. Overall recovery																					-
Mean score	30,14	2,98	1,98	2,51	2,94	2,45	2,82	2,85	3,13	3,79	5,99	3,36	3,89	3,30	3,46	2,99	3,57	3,62	2,68	2,86	12,76
Standard deviation	5,63	1,10	0,90	1,17	1,20	1,15	1,16	0,87	1,25	0,84	1,85	0,82	1,59	0,72	1,11	0,65	1,02	0,89	0,84	0,70	2,42
Scale range	1-5	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6
Alpha coefficient	0,87	0,70	0,77	0,71	0,75	0,71	0,77	0,70	0,79	0,77	0,75	0,80	0,76	0,75	0,77	0,79	0,71	0,79	0,81	0,70	0,75

Note. *$p < .05$. **$p < .01$.

Cluster analysis

According to the added criteria, two clusters were extracted from the standardized resilience scores. The first group included 67 tall athletes (62.6%) who had resilience scores, which was called high resilience. The second group had 40 athletes (37.4%), who had a low resilience score. This cluster was called low resilience (Figure 1).

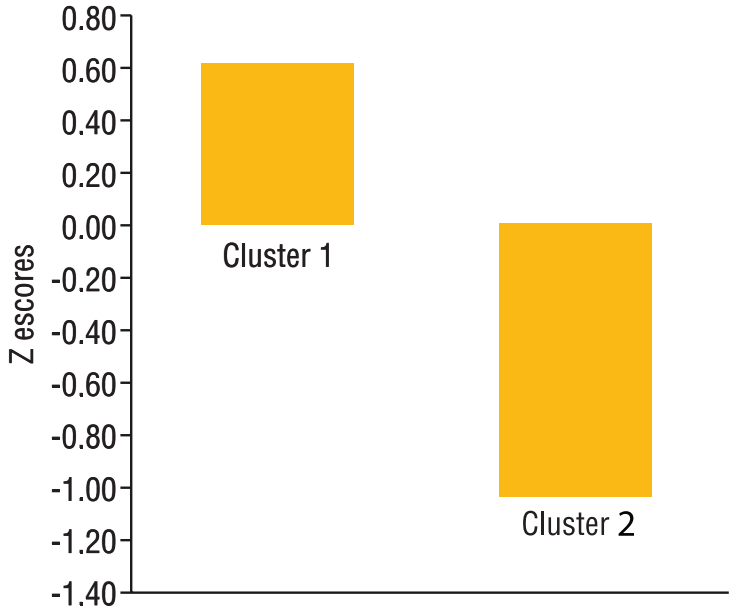

Figure 1. Graphic representation of the resilience profiles of Brazilian parathletes through cluster analysis.

Differences between groups for demographic variables

Table 2 shows the association of the resilience profile with gender, type of disability and type of test. The high resilience cluster had a higher proportion of men (89.6%), while the low resilience cluster had a higher proportion of girls. Through the analysis of standardized residues, there is no association between genders. The high resilience cluster had a higher proportion for the physically disabled (71.6%), through the analysis of standardized residues, there is no association between the type of disability. The high resilience cluster had a higher proportion of Paralympic athletes who competed in field events (50.7%), through the analysis of standardized residues, there is no association between the type of event.

Table 2. Sex and sports characteristics based on resilience profiles.

Variables	Clusters		*X2*	*P*
	High resilience (n=67)	Low resilience (n=40)		
Sex				
Male	60 (89.6)	32 (80.0)	1.896	0.169
Residuals	1.4	-1.4		
Female	7 (10.4)	8 (20.0)		
Residuals	-1.4	1.4		

Note. *X2* = Chi-squared value.

Table 2. Continued...

Variables	Clusters		X2	P
	High resilience (n=67)	Low resilience (n=40)		
Disability				
Intellectuals	17 (25.4)	11 (27.5)	.411	.522
Residuals	-.2	.2		
Visual	2 (3.0)	4 (10.0)		
Residuals	-1.5	1.5		
Physical	48 (71.6)	25 (62.5)		
Residuals	1.0	-1.0		
Type of event				
Track	33 (49.3)	21 (52.5)	.106	.745
Residuals	-.3	.3		
Field	34 (50.7)	19 (47.5)		
Residuals	.3	-.3		

Note. *X*2 = Chi-squared value.

Table 3 shows that there was no significant difference in age (p = .251), practice time (p = .588) and hours of training per week (p = .115) according to the resilience profiles.

Table 3. Comparison of the age, years of experience, and hours of practice per week for the resilience clusters.

Variables	Clusters		P	d
	High resilience (n=67)	Low resilience (n=40)		
	M (*SD*)	*M* (*SD*)		
Age	30.14 (13.01)	33.10 (12.39)	.251	.23
Years of experience	19.77 (34.94)	24.37 (52.62)	.588	.10
Hours of practice per week	6.14 (2.74)	9.17 (15.20)	.115	.27

Note. A MANOVA was performed; *M* = Mean; *SD* = Standard deviation.

Differences for stress and recovery

When the cluster of high and low resilience was compared with the dimensions of stress and recovery (Table 4), there was a significant difference between groups only in the global score of recovery (p=.023). As shown in Table 4, Paralympic athletes with high resilience had higher overall recovery score (M=13.50; SD=2.28) compared to low resilience. The effect size can be considered large (d >0.50).

Table 4. Comparison of the two clusters on stress and recovery.

Variables	Clusters		P	D
	High resilience (n=67)	Low resilience (n=40)		
	M (*SD*)	*M* (*SD*)		
Stress				
General stress	2.91 (1.18)	3.00 (1.04)	.186	.08
Emotional stress	2.80 (1.81)	3.09 (1.01)	.405	.19
Social stress	1.89 (.92)	2.04 (.89)	.525	.16
Conflict/Pressure	2.42 (1.23)	2.57 (1.13)	.363	.12
Fatigue	2.80 (1.30)	3.02 (1.14)	.324	.17
Lack of energy	2.31 (1.07)	2.54 (1.19)	.505	.20

Note. A MANOVA was performed; *M* = Mean; *SD* = Standard deviation. * $p < .05$.

Table 4. Continued...

Variables	Clusters		*P*	*D*
	High resilience (n=67)	Low resilience (n=40)		
	M (*SD*)	*M* (*SD*)		
Stress				
Physical complaints	2.90 (.86)	2.83 (.89)	.675	.07
Disturbed breaks	2.91 (1.23)	3.27 (1.22)	.150	.29
Emotional exhaustion	3,91 (1.51)	3.86 (1.74)	.295	.01
Injury	3.68 (.79)	3.86 (.87)	.283	.21
Overall stress	5.82 (1.81)	6.10 (1.88)	.449	.15
Recovery				
Success	3.43 (.79)	3.25 (.86)	.257	.21
Social recovery	3.91 (1.51)	3.86 (1.74)	.872	.03
Physical recovery	3.35 (.70)	3.21 (.75)	.317	.19
General well-being	3.04 (.65)	2.91 (.65)	.540	.02
Sleep quality	3.72 (.93)	3.33 (1.12)	.312	.17
Being in shape	3.69 (.90)	3.50 (.88)	.058	.21
Personal accomplishment	2.76 (.82)	2.55 (.85)	.287	.25
Self-efficacy	2.89 (.67)	2.83 (.76)	.209	.08
Self-regulation	2.79 (.87)	2.70 (.79)	.672	.10
Overall recovery	13.50 (2.28)	12.22 (2.59)	.023*	.62

Note. A MANOVA was performed; *M* = Mean; *SD* = Standard deviation. *$p < .05$.

DISCUSSION

The aim of the present investigation was to analyze the role of resilience, stress and recovery in Paralympic athletics athletes during a pre-competitive period. This investigation provides evidence for the understanding of these three variables, which is still a gap in the Paralympic sport psychology literature. The main result of the study indicates that Paralympic athletes with high levels of resilience show higher levels of general recovery (Table 4), while stress, general stress and sociodemographic variables were not shown to intervene on resilience for this group of athletes.

One of the main findings of this study refers to higher levels of resilience by Paralympic athletes who obtained higher recovery scores (Table 4). These results are in line with the theoretical model of resilience in sport 6 which shows that resilience is a complex process that encompasses adversity, agitation and positive outcomes. Therefore, high levels of recovery resilience will benefit the agitation process, leading to a greater ability to deal with adversity within the pre-competitive environment[4,6-8]. These findings corroborate past research showing that resilience plays an important role in high performance sport, indicating that the ability to adapt and overcome adversity favors greater autonomous involvement in sport[4,5,8,18].

In a recent systematic review de Melo and Noce[19] observed that athletes have individual components that help them to deal with adverse situations in a positive way, are observed with characteristics of greater positivity, competitiveness, commitment, maturity, persistence and passion for the sport. Codonhato et al.[18] verified in athletes without disabilities that resilience plays a fundamental role for the athlete to recover from the stressful demands of the competitive sporting context, which is a determinant factor for sporting success. These cognitive aspects can promote the facilitation of responses that promote the achievement of better sports performance[4].

Regarding stress levels, the results showed that no differences were observed between the resilience perception profiles (Table 4). This fact may be related to the fact that we are dealing with an individual sport, and with this, resilience protects individuals from potential negative psychological effects resulting from high-performance sports, since positive adaptation refers to the ability of individuals to maintain the normal level of functioning of your psychological abilities 4,6,19,20. These findings are in line with the study by Morgan et al.[20] where the authors demonstrate the concept of resilience in sport as a dynamic psychosocial process (eg coaches, teammates, family) that protects athletes from the potential negative stressor effect that they can find.

A central element of the model proposed by Fletcher and Sarkar[6] is the assessment of stressful environments. Paralympic athletes who see a stressful event as a challenge to be overcome is a positive form of evaluation, although Paralympic athletes do not observe adversity negatively (e.g., locomotion, public transport, architecture of cities and training centers), they too wouldn't see them as a challenge for which they improve, since they do not depend on them. Thus, sport psychologists who work with Paralympic athletes should promote a positive way for these athletes to interpret everyday adversities.

It is noteworthy that for the sociodemographic variables (Table 2 and 3), no differences were observed between the profiles of perception of resilience of Paralympic athletes (high and low). It is noteworthy that studies on resilience are still very recent. Thus, there is still a lot to be explored and understood in relation to sociodemographic variables and the mental health of Paralympic athletes. First, Freire et al.[8] observed in Brazilian Paralympic swimming and athletics athletes that sex, age group and modality do not seem to be intervening factors in resilience. On the other hand, Codonhato[18] observed in athletes without disabilities that the role of resilience has different intensities related to sex and type of sport. Finally, Wagstaff et al.[21] claim that the influence of sociodemographic, sociocultural and context factors in which the athletes are inserted still needs to be further explored within the theoretical model 6, given its importance for the resilience of athletes.

Despite the findings presented in this study, it is extremely important to highlight some limitations. First, the scarcity of studies on the subject with Paralympic athletes, which makes it impossible to compare the findings and establish parameters. Depending on the size of the sample and the recruitment of only one modality, it is not possible to generalize the results to the entire Paralympic context. However, the sample can be considered relevant because the athletes competed in the main regional competition in the country. According to the study, it presented a cross-sectional design, evaluating Paralympic athletics athletes in just one moment of the season, making it impossible to analyze the cause-and-effect relationships between the variables. In addition, it is suggested that future research is also carried out with athletes from other sports, in order to compare the groups (collective vs. individual), as well as the involvement of other psychological variables and with a longitudinal design to verify possible changes in resilience, stress and recovery of a group over a competitive season.

CONCLUSION

Overall, our findings using cluster analysis suggested that only global recovery status impacts resilience in Paralympic athletes in the pre-competitive period.

Specifically, Paralympic athletes with high resilience were more able to recover from the stressful demands of the sports environment. From a practical point of view, the importance of coaches, psychologists and people linked to athletes is highlighted to provide a pleasant atmosphere during training and competitions.

Compliance with ethical standards

Funding

This study was financed in part by the Pernambuco Science and Technology Support Foundation.

Data Availability Statement

Research data is only available upon request.

Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee –Federal University of Vale do São Francisco and the protocol (no. 3.732.444) was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: GLMF, JRANJ. Performed the experiments: GLMF, JRANJ. Analyzed the data: GLMF, JRANJ, JFVNM. Contributed reagents/materials/analysis tools: GLMF, JRANJ, JFVNM, DVO, LF, SESX. Wrote the paper: GLMF, JRANJ, JFVNM, DVO, LF, SESX.

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