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Behavioral Sciences

Evidence of Validity and Perspectives for Resilience Scales in Sport

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ABSTRACT – The aim of this review was to identify the scales used to measure resilience in athletes and to assess their psychometric and semantic adaptations for the sporting context. An electronic search was conducted in six databases, for 2008-2019, and 43 articles were selected. The results showed 11 scales applied to evaluate resilience in athletes. In the semantic field, 11 factors were identified, conceptually different, that define the property of the psychological system for sports resilience. This study concluded that scales identified in literature to assess athletes' resilience have been used indiscriminately. Only five had their psychometric properties evaluated for the sports context. Therefore, sport psychology lacks a sport-specific measure for resilience.

KEYWORDS: psychological assessment, sport psychology, athletes

Evidências de Validade e Perspectivas para Escalas de Resiliência no Esporte

RESUMO – O objetivo desta revisão foi identificar as escalas utilizadas para avaliar a resiliência em atletas bem como as adaptações psicométricas e semânticas para o contexto esportivo. Uma busca eletrônica foi conduzida em seis bases de dados, 2008-2019. Foram selecionados 43 artigos. Os resultados mostraram 11 escalas aplicadas para avaliar a resiliência em atletas. No campo semântico, foram identificados 11 fatores, conceitualmente distintos, que definem a propriedade do sistema psicológico para a resiliência esportiva. Este estudo concluiu que as escalas identificadas na literatura para avaliar a resiliência de atletas têm sido usadas de forma indiscriminada. Apenas cinco tiveram suas propriedades psicométricas avaliadas para o contexto esportivo. Portanto, a psicologia do esporte carece de uma medida específica do esporte para resiliência.

PALAVRAS-CHAVE: avaliação psicológica, psicologia do esporte, atletas

In psychological constructs studied by Sport Psychology, resilience has been identified as a fundamental element for the training of performance athletes and has been shown to be a strong component of human performance (Juarros et al., 2018). In general, it is common to refer to resilience as a personal strategy capable of producing a positive response to stressful situations experienced throughout life and to preserve mental health (Luthar et al., 2000; Reppold et al., 2012). The resilience stems from the recognition that there is great variability in the way individuals respond to situations and experiences (Reppold et al., 2012). Hence, it is important to explain the relations of resilience as a trait and present it as a process, in which protective factors (attributes) interact positively on a system of risk factors (vulnerability) in those who in situations of stress present greater emotional, cognitive, or social conflict (Luthar et al., 2000).

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The measurement of resilience in psychology is still a very controversial subject. According to Gurgel et al. (2013), to assess resilience, studies are based on different theoretical perspectives and associate resilience with quality of life, satisfaction, health and well-being, risk, resistance, and positive development. To Reppold et al. (2012) regarding the complexity of the phenomenon, multidimensionality, dynamic and contextual nature, the assessment of resilience cannot be based on a single or unifactorial scale. It should also not be understood as a stable condition of the subject, as it can be relativized in relation to risk factors and environmental protection (Gurgel et al., 2013; Reppold et al., 2012).

Although some studies have sought to identify the scales used to measure resilience in athletes, insufficient support is provided for an evaluation of these scales in sport. In García-Secades et al. (2014) eight resilience scales were identified to assess resilience in athletes. Of these, only the *Connor-Davidson Resilience Scale* ([CD-Risc], Connor & Davidson, 2003) and the Resilience Scale (Wagnild & Young, 1993) presented acceptable psychometric evidence for use with athletes (Cardoso & Sacomori, 2014; González et al., 2016). However, in García-Secades et al. (2014), methodological limitations prevented a more precise search of the scales used to assess resilience in the sports context ,such as the search for studies without adopting the keyword "athletes", the difficulty in identifying the selecting criteria for the eligibility articles, and a superficial analysis of the psychometric parameters of these scales. Thus, a conclusion of the instruments for assessing resilience in sport is compromised.

Also, after the framework Grounded Theory of Psychological Resilience and Optimal Sport Performance (Fletcher & Sarkar, 2012), there has been great investment in sport resilience research (Bicalho et al., 2020). Therefore, it is believed that there is much to be investigated on the evaluation of resilience in athletes. In this sense, other studies have shown that resilience scales are poorly suited to evaluate athletes as they disregard the stressors and the sports context in which they are inserted (Cowden et al., 2016; González et al., 2016; Gucciardi et al., 2011; Sarkar & Fletcher, 2013). These studies raise questions about the indiscriminate use of scales with inappropriate psychometric properties for the sports context, and the absence of an investigative study about the evaluation of resilience in athletes.

Thus, in order to advance the knowledge on the evaluation of resilience in athletes, it is necessary to expand the measurement perspective, including information appropriate to the sport context. Therefore, the purpose of this systematic review was to identify the scales used to measure resilience in high-performance athletes and to assess their psychometric and semantic adaptations for the sporting context.

METHOD

Searches were carried out in the databases *PubMed/ Medline, Web of Science, Taylor and Francis, Lilacs, Scopus, Human Kinetics,* and *Science Direct*, for original academic articles published. The combinations of keywords included the following descriptors/terms in English, Portuguese and Spanish, contained in the title, abstract, or keywords: resilience (*resiliência*), athletes (*atleta, deportista*), sport (*esporte, deporte*). The keyword resilience was combined with the "AND" connector in double or triple combinations according to the example: "*resilience* AND *athletes*"; "*resilience* AND *athletes* AND *sport*". The search was filtered by the title of the study and peer reviewed.

In order to be included in this review, the study was required to: (a) be published in English, Portuguese, or Spanish; (b) have assessed the resilience in athletes; and (c) have been published in indexed and peer reviewed journals between January 2008 and October 2019. The final search was conducted on October 1, 2019. Considering the central objective of this review, which is to understand the scales for evaluating resilience and their properties applied to performance athletes, the minimum period of 10 years was established. The period is reference to the date of publication of the first published theoretical framework of sports resilience, the Galli and Vealey Conceptual Model of Sport Resilience (2008).

The following studies were excluded: (a) annals and supplements for scientific events; (b) position statements, reviews, editorial and instrument validation articles; (c) articles with samples of non-athlete students, coaches, referees, doctors, businessmen; (d) articles that investigated mental toughness, beliefs, self-confidence, personality, and other associated constructs; (e) duplicate studies; and (f) articles with analysis from interviews, observation, and intervention without the direct use of a psychometric instrument. Studies that appeared repeatedly in more than one database or did not meet the predetermined inclusion criteria were excluded. At the end of this process, 181 articles were found. After refinement and application of the inclusion and exclusion criteria, 43 articles were accepted for analysis (Figure 1). Two other researchers supervised this process by re-performing the search and, therefore, a final certification was given for the process of searching and selecting articles. The entire process followed the recommendations of the PRISMA protocol.

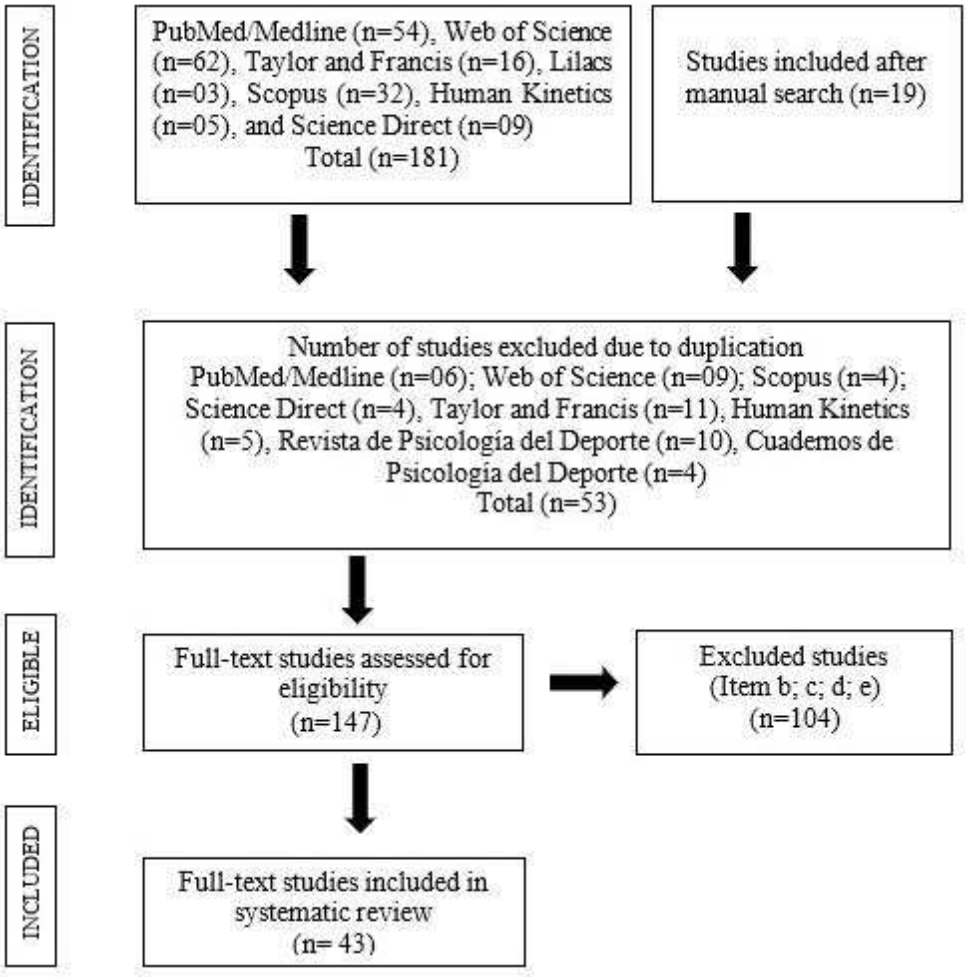

Figure 1. Procedures used in the Article Selection Process

The 43 articles were organized and numbered according to the increasing order of year of publication. The analysis of the articles was carried out in four stages. In the first stage, each article received a number between one (1) and forty-three (43). Methodological information was extracted from each article, containing the scale used (Table 1).

In the second stage, the information on the scales was collected in relation to: year of validation, number of items, Likert scale, number of subjects in the validation sample, age, place of validation, adaptations to the context of sport, and studies eligible in this review (Table 2). In the third stage, the scales with properties tested in sport were grouped and the evidence of validity was selected according to parameters proposed by Damásio and Borsa (2017) and presented in the validation of the scales (Table 3): RMSEA (root mean square error of the approximation; ≤ 0.06), $\chi 2$ (chi-square), CFI (comparative fit index; > 0.90) and Cronbach's alpha (coefficient of scale reliability; > 0.70).

Finally, in the fourth step, an analysis of the factors that make up each scale was performed, similar to the method proposed by Braun and Clarke (2006), focusing on the semantic content of each factor (Table 4). Thus, factors with similar semantic identification occupied the same position in the table. Scales with versions adapted to other languages but that maintained their original structures were counted only once.

Table 1
Characteristics of the Studies included in this Review.

Code	Year of publication	Authors	Objective	Scale to assess resilience	Number of Sample	Sample	Sport
1	2010	Hosseini & Besharat	Investigating the association of resilience with sport achievement and mental health in a sample of athletes.	Connor-Davidson Resilience Scale-25	139	96 males and 43 females (23±2.38 years old)	Basketball, boxing, epic, football, handball, karate, run, swimming, taekwondo, volleyball, Vshv, water polo, wrestling.
2	2010	Nezhad & Besharat	Investigating the association of resilience and hardiness with sport achievement and mental health in a sample of athletes.	Connor-Davidson Resilience Scale-25	139	96 males and 43 females (23±2.38 years old)	Basketball, boxing, epic, football, handball, karate, run, swimming, taekwondo, volleyball, Vshv, water polo, wrestling.
3	2012	Cevada et al.	Comparing resilience, quality of life, and anxiety in ex-athletes of artistic gymnastic and other sports with non-athletic individuals.	Resilience Scale	62	Male and Female (18 to 45 years old)	Artistic gymnastic and others not identified
4	2012	Galli & Reel	Examining adversarial growth in a sample of Division I NCAA athletes.	Posttraumatic Growth Inventory.	214	64 males and 150 females (20.79±1.55 years old)	Baseball, basketball, cross-country, diving, golf, gymnastics, soccer, skiing, softball, swimming, tennis, Track and field, volleyball, wrestling.
5	2014	García, Vallarino, & Monteiro	Describing resilience, optimism and burnout in judokas.	Resilience Scale	45	36 males and 9 females (19.95±5.34 years old)	Judo
6	2014	Cardoso & Sacomori	Examining resilience in the specific subgroup of Brazilian competitive athletes with physical disabilities	Resilience Scale	208	150 males and 58 females (29.86±7.45 and 30.53±10.38 years old)	Basketball, rowing, swimming, table tennis, tennis, track and field, weightlifting.
7	2014	Belem, Caruzzo, Nascimento, Vieira & Vieira	Analyzing the impact of coping strategies on the resilience of beach volleyball athletes.	Connor-Davidson Resilience Scale-25	48	24 males and 24 females (18±1.3 years old old)	Beach volleyball
8	2015	Boghrabadi, Arabameri, & Sheikh	Comparing the resilience and stress coping strategies among the elite team and individual athletes, and non-athletes.	Connor-Davidson Resilience Scale-25	180	Gender not identified (22.7±2.9 years old)	Archery, Badminton, basketball, handball, karate, Volleyball.
9	2015	Gillham, Gillham, & Hansem	Examining relationships among coaching success, servant leadership, team cohesion, athlete resilience and social behaviors.	Connor-Davidson Resilience Scale-10	322	130 males. 183 females and 9 not reporting (19.7±1.8 years old)	Badminton, basketball, cross-country, curling, golf, ice hockey, soccer, running, volleyball.
10	2015	Martin, Byrd, Watts, & Dent	Examining the ability of three related but distinct positive grit, hardiness, and resilience to predict sport engagement and life satisfaction.	Connor-Davidson Resilience Scale-25	75	74 males and 1 female (37±11.01 years old)	Wheelchair basketball
11	2016	Cuberos, Castro-Sanchez, Espejo-Garcés & Ortega	Determining resilient scores to athletes of different levels and sports modalities and relate the resilience scores, establishing patterns for this quality-ability depending on the sport practiced.	Connor-Davidson Resilience Scale-25	39	Males (22.62±4.14 years old)	Football, handball, skiing.
12	2016	Lu et al.	Examining the conjunctive effects of athletes' resilience and coaches' social support on the relationship between life stress and burnout.	Connor-Davidson Resilience Scale-25	218	159 males and 59 females (20.04±1.32 years old)	Archery, baseball, basketball, taekwondo, tennis, track and field.

Table 1
Cont.

Code	Year of publication	Authors	Objective	Scale to assess resilience	Number of Sample	Sample	Sport
13	2016	Nicholls, Morley, & Perry	Assessing the relevance Model of Motivational Dynamics to infer those peers influence behavioral engagement levels, which in turn is linked to coping and resilience among an athletic population.	Connor-Davidson Resilience Scale-10	351	178 males and 173 females (16.15±4.28 years old)	Individual and team sport.
14	2016	Pedro	Exploring the relations between wrestlers' resilience levels and engagement perception.	Resilience Scale	20	17 males and 3 females (16.8±1.96 years old)	Wrestlers
15	2016	Vallarino & Reche	Describing the prevalence and relationship between the symptoms of burnout, resilience and optimism in women hockey players	Resilience Scale	130	Females (18.5±4.3years old)	Field hockey
16	2016	García-Secades et al.	Analyzing the relationship among resilient qualities and coping strategies.	Resilience Scale	235	126 males and 109 females (20.7±4.3 years old)	Athletics, cycling, gymnastics, handball, soccer, rugby, triathlon, volleyball.
17	2016	Ueno & Suzuki	Investigating the relationship between resilience and burnout among Japanese athletes.	Resilience Scale for University Athletes	63	24males and 39 females (19.4±1.1 years old)	Badminton, baseball, lacrosse, softball, track and field.
18	2016	Bingol & Bayansalduz	Examining the exercise dependence level and psychological resilience of the athletes in different sport branches in terms of gender, sport branches and sports participation types as individual or team sports.	Ego Resiliency Scale	777	464males and 33 females (22.72±3.02 years old)	Basketball, boxing, football, handball, muay thai, taekwondo, volleyball, wrestling.
19	2016	Sánchez et al.,	Analyzing the relationships between resilience and sports injuries as a function of the competitive level.	Connor-Davidson Resilience Scale-25	43	39 males and 4 females (8 athletes less than 19 years old. 19 athletes between 19-24years old and 16 athletes greater than 24 years old)	Football, handball, winter sports (ski and snowboard).
20	2016	Laborde, Guillén, & Mosley	Investigating differences on positive PTLID (i.e., perseverance, positivity, resilience, self-esteem, and self-efficacy) between athletes and non-athletes, and athletes from individual and team sports.	Ego Resiliency Scale	600 non-athlete and 600 athletes	Non-athlete= 300 males and 300 females (21.94 years old) Athlete=300 males and 300 females (21.45 years old)	Archery, athletics, badminton, basketball, beach-volley, boxing, canary wrestling, cycling, fencing, field hockey, golf, gymnastics, handball, indoor soccer, judo, jump swimming, karate, padel, rhythmic gymnastics, roller hockey, rugby, sailing, soccer, surf, synchronized swimming, swimming, table tennis, taekwondo, tennis, triathlon, volleyball, water-polo, weight-lifting, windsurfing.
21	2016	Meggs et al.	Assessing resilience by a response to stress/adversity, including a physiological marker of perceived stress, a measure of resilience protective factors and a measure of performance as an indicator of adaptation following stress.	Academic Resilience Scale	41	27 males and 14 females (15.2 years old)	Swimming

Table 1
Cont.

Code	Year of publication	Authors	Objective	Scale to assess resilience	Number of Sample	Sample	Sport
22	2016	Cowden, Meyer-Weitz, & Asante	Investigating the relationships between mental toughness, resilience, and stress among competitive.	Resilience Scale for Adults	351	185 males and 166 females (28.9±13.87 years old)	Tennis
23	2016	Cowden & Meyer-Weitz	Investigating the relationships among the self-reflection and self-insight components of self-awareness, and resilience and stress in competitive South African tennis players.	Resilience Scale for Adults	333	175 male and 158 females (29.09±14.0 years old)	Tennis
24	2017	Secades et al.	Analyzing how the resilient profile influences the recovery-stress levels of competitive athletes.	Resilience Scale	235	126 males and 109 females (20.07±4.3 years old)	Athletics, cycling, gymnastics, handball, rugby, soccer, volleyball, triathlon.
25	2017	Ueno & Oshio	Examining the relationship among personality traits, day-to-day resilience, and athletes' resilience among Japanese athletes.	Resilience Scale for University Athletes	165	57 males and 108 females (19.4±1.2 years old)	Not identified
26	2017	Prats, Ortega, & González	Determining and analyzing the psychometric properties of AF5 and CD-RISC in an adolescent population of female basketball players; Describing and analyzing the existing relationships of self-concept and its dimensions; resilience and its categories and physical sports variables; Specifying the effect of hours of regular training and position in basketball on psychosocial dimensions (self-concept and resilience).	Connor-Davidson Resilience Scale-25	74	Female (14.5±0.997 years old)	Basketball
27	2017a	Ortega et al.	Establishing and analyzing the relationship between resilience, anxiety states and sports injuries, taking into account the level of competition.	Connor-Davidson Resilience Scale-25	185	167 males and 18 females (21.15±4.85 years old)	Soccer
28	2017b	Ortega et al.	Determining and analyzing the relationships between motivational climate, physical self-concept and resilience, based on gender.	Connor-Davidson Resilience Scale-25	148	86 males and 62 Females (23.09±6.731 years old)	Judo
29	2017	Deen, Turner, & Wong	Examining the REBT efficacy of decreasing self-reported irrational beliefs (iBs) and raising self-reported resilience levels.	Connor-Davidson Resilience Scale-10	5	3 males and 2 females (19.7±3.14 years old)	Squash players
30	2017	Juarros et al.	Analyzing the influence of internal training load on the perception of stress and recovery levels, as well as the possible modulating role played by resilience and optimism in the state of the swimmers during tapering stage.	Resilience Scale	82	males and 39 females (15.79±2.7 years old)	Swimming
31	2018	Pedro & Veloso	Exploring within Self-Determination Theory framework, coaches' autonomy support and athletes' engagement and their relationship and conribution towards resilience.	Resilience Scale	177	99 males and 78 females (16.36±3.79 years old)	Acrobatic gymnastic, aerobic gymnastic, artistic gymnastic, judo, soccer, trampoline gymnastic, volleyball, wrestling.
32	2018	Reche et al.	Identifying the prevalence and relationship between resilience and optimism in competitive fencers; and its relationship with variables such as age category, gender and sport level; in favor of establishing intervention strategies in athletes at their different levels and dedication.	Resilience Scale	87	52 males and 35 females (25.2±10.6 years old)	Fencing

Table 1
Cont.

Code	Year of publication	Authors	Objective	Scale to assess resilience	Number of Sample	Sample	Sport
33	2018	González et al.	Investigating hypothesized resilient responses by assessing resilient characteristics, inducing stress, and examining cortisol, affect, and performance.	Connor-Davidson Resilience Scale-10	116	Male and Female	Not identified
34	2018	Wagstaff et al.	Examining the extent to which the frequency of organizational stressors encountered relate to burnout and whether psychological resilience qualities moderate any such relationship in athletes and coaches.	Connor-Davidson Resilience Scale-10	372 athletes, 91 coaches	216 males and 156 females' athletes (21±5.91 years old) 69 males and 22 females' coaches (31.1±12.3years old)	Archery, basketball, cycling, equestrian, football, golf, rugby, rowing, tennis.
35	2018	Drew & Matthews	Investigating the prevalence of depressive and anxiety symptoms within student-athletes and to examine protective factors which may act as a buffer against mental ill-health.	Connor-Davidson Resilience Scale-10	185	120 males and 65 females (20.77±0.50 years old)	Basketball, camogie, canoeing, equestrian, gaelic football, golf, hurling, hockey, rugby, soccer, swimming, track and field, triathlon.
36	2019	González, Castillo, & Balaguer	Analyzing the relationship between resilience, basic psychological need satisfaction and thwarting and the quality of the sport experience, specifically taking as indicators of the latter the feelings of enjoyment and boredom in sports practice.	Resilience Scale	661	Female (14.74±3.91 years old)	Football, basketball
37	2019	Mohammadi	Evaluating the effect of coping styles on the relationship between psychological resilience and perceived stress among injured athletes.	Psychological Resilience Questionnaire (validation not reported)	300	Not identified	Not identified
38	2019	Codonhato et al.	Studying the relationship between resilience, stress and injury occurrence in the context of elite sports.	Connor-Davidson Resilience Scale-10	8	Female (20.4±2.5 years old)	Rhythmic gymnastics
39	2019	Edwards et al.	Providing a brief, evidence based, evaluative report on resilience workshops for professional rugby players.	Brief Resilience Scale	328	Male (25±4.7 years old)	Rugby
40	2019	Hrozanova & Pallesen	Implementing a psychological perspective on sleep quality in athletes, by investigating the Extent to which gender, mental resilience, negative affect, worry and perceived stress, uniquely contribute to sleep quality in a large sample of junior athletes.	Resilience Scale for Adults	632	317 males and 315 females (18±0.9 years old)	Not identified
41	2019	Peña & Briceño	Identifying the variables of resilience, self-esteem, coping and social support in a population of university athletes and check whether there is a relationship between these variables and sports injuries based on the presence or absence of injury.	Resilience Questionnaire for Children and Adolescents	137	73 males and 64 females (20.65±1.95 years old)	Aerobic gymnastics, baseball, basketball, fencing, handball, rugby, soccer, softball, volleyball, weightlifting.
42	2019	Sorkkila et al.	Examining whether there are different kinds of profiles that can be identified among student-athletes and how resilience and the likelihood of dropping out from sport or school differ between the profiles.	Brief Resilience Scale	491	251 males and 240 females (16±0.17 years old)	Football, gymnastics, ice hockey, skiing.
43	2019	Yang et al	Understanding the structural relationship among resilience, psychological skills and performance of high school taekwondo athletes	Adolescent Resilience Scale	359	237 males and 122 females	Taekwondo

Table 2
Characteristics of Scales Validation Studies used to assess Resilience in Athletes from 2008 to 2019

Scales used to evaluate resilience in athletes	Nº of Items	Likert scale	Validation sample	N	Age (years)	Country	Adap Sp.	Studies
Connor-Davidson Resilience Scale 10[1]	10	4	Undergraduate students.	532	18.8	USA	Yes	9, 13, 29, 33, 34, 35, 38
Connor-Davidson Resilience Scale 25[2]	25	7	G1-General population, G2-outpatients, G3-psychiatric patients, G4-generalized anxiety disorder, G5 and G6 clinical trial sample.	G1=577 G2=139 G3=43 G4=25 G5=22 G6= 22	43.8	USA	Yes	1, 2, 7, 8, 10, 11, 12, 19, 26, 27, 28
Resilience Scale [3]	25	7	Community shelter for older adults	810	71.1	USA	Yes	3, 5, 6, 14, 15, 16, 24, 30, 31, 32, 36
Post Traumatic Growth Inventory [4]	21	5	Undergraduate students	604	17-25	USA	No	4
Resilience Scale for University Athletes[5]	24	5	University students	377	19.7 ±1.20	Japan	Yes	17, 25
Ego Resilience 89 Scale[6]	14	4	General population	210	18-23	USA	No	18, 20
Academic Resilience Scale[7]	6	7	High school students	412	11-12	Australia	No	21
Brief Resilience Scale[8]	6	5	G1 and G2-undergraduate student, G3- cardiac rehabilitation patients, G4-women with fibromyalgia and group control.	G1=128 G2=64 G3=112 G4=50	G1=20.4 (±4.0) G2=19.8 (±3.0) G3=62.8 (±10.5) G4=47.3 (±8.2)	USA	Yes	39, 42
Adolescent Resilience Scale [9]	27	3	High school students	G1=618 G2=796 G3=420	No identif.	Korea	No	43
Resilience Scale for Adults[10]	33	7	G1-Belgian students, G2-Norwegian students	G1=363 G2=315	G1=18.9 (±1.5) G2=22.13 (±3.27)	Belgium	No	22, 23, 40
Resilience Questionnaire for Children and Adolescents[11]	32	5	Children and adolescents	542	11 to 13 years	Mexico	No	41

Notes. * both scales were used in the study; #use of the resilience scale adapted for another country; Study 37 did not report the validation of the scale used; *N*= Number of volunteers in the validation sample; *Adap. Sp.*= Adaptation for sport. *Validation studies*: (1) Campbell-Sills & Stein (2007); (2) Connor & Davidson (2003); (3) Wagnild & Young (1993); (4) Tedeschi & Calhoun (1996); (5) Ueno & Shimizu (2012); (6) Block & Kremen (1996); (7) Martin & Marsh (2006); (8) Smith et al. (2008); (9) Shin et al. (2009); (10) Friborg et al. (2005); (11) Gonzales-Arratia (2016); *Studies identified in the review*: (1) Hosseini & Besharat (2010); (2) Nezhad & Besharat (2010); (3) Cevada et al. (2012); (4) Galli & Reel (2012); (5) García et al. (2014); (6) Cardoso & Sacomori (2014); (7) Belem et al. (2014); (8) Boghrabadi et al. (2015); (9) Gillham et al. (2015); (10) Martin et al. (2015); (11) Cuberos et al. (2016); (12) Lu et al. (2016); (13) Nicholls et al. (2016); (14) Pedro (2016); (15) Vallarino & Reche (2016); (16) García-Secades et al. (2016); (17) Ueno & Suzuki (2016); (18) Bingol & Bayansalduz (2016); (19) Sánchez et al. (2016); (20) Laborde et al. (2016); (21) Meggs et al. (2016); (22) Cowden et al. (2016); (23) Cowden & Meyer-Weitz (2016); (24) Secades et al. (2017); (25) Ueno & Oshio (2017); (26) Prats et al. (2017); (27) Ortega et al. (2017a); (..28) Ortega et al. (2017b); (29) Deen et al. (2017); (30) Juarros et al. (2018); (31) Pedro & Veloso (2018); (32) Reche et al. (2018); (33) González et al. (2018); (34) Wagstaff et al. (2018); (35) Drew & Matthews (2018); (36) González et al. (2019); (37) Mohammadi (2019); (38) Codonhato et al. (2019); (39) Edwards et al. (2019); (40) Hrozanova & Pallesen (2019); (41) Peña & Briceño (2019); (42) Sorkkila et al. (2019); (43) Yang et al. (2019).

Table 3
Psychometric Properties of the Resilience Scales evaluated in Athletes

Resilience Scales	RMSE	fit, χ 2	CFI	Cronbach's Alpha (α)
Connor Davidson-Resilience Scale 10 (1 Factor) [1]	.063 90% .045 and .082	80.10	.947	≥ .70
Connor Davidson-Resilience Scale 25 (1 Factor)[2]	.085, 90% .079 and.091	913.66	.753	
Connor Davidson-Resilience Scale 22 (1 Factor)[3]	.086	699.98	.793	
Connor Davidson-Resilience Scale 25 (5 Factors)[4]	0.075 (90% 0.70 and .081)	916,09	.814	
Resilience Scale (2 factors)[5]	.071	932.69	.909	Global= .86 Factor 1=.86 Factor 2=.62
Resilience Scale [6]	–	–	–	Factor1=.89 Factor2= .59
Resilience Scale (2 factors)[7]	.071	867.991	.915	Factor 1=.808 Factor 2=.765
Resilience Scale for University Athletes[8]	.07	5.41	.98	Global = .80
Brief Resilience Scale[9]	.07	18.32	.993	

Notes. RMSEA = root mean square error of approximation (≤ 0.06); fit, χ 2 = chi-square; CFI = comparative adjustment index (> 0.90); α = coefficient of scale reliability (> 0.70); ([1-4]) Parameters adopted for adults – Gucciardi et al. (2011); ([5]) Gonzalez et al. (2019); ([6]) García et al. (2014); ([7]) Ruiz, et al. (2012); ([8]) Ueno and Shimizu (2012); Ueno and Koshio (2015); ([9]) Neves et al. (2018).

Table 4
Analysis of the Number of Factors the Scales used to evaluate Resilience in Athletes.

Scale factors	Scales used to evaluate Resilience in Athletes (number of items by factor)										
	CR-Risc-10	CD-Risc-25	ER	PTGI	RSUA	ERS	ARS	BRS	AdRS	RSA	RQCA
Unifactorial	10					14	6	6			
Personal competence, high standards, and tenacity		8	17	5						4	
Confidence in one's instincts, autonomy, tolerance of negative affect		7									14
Self-control, strength and personal growth		3		4					7	10	
Positive adaptation, new possibilities, acceptance of self and life		5	8	3					7		
Spirituality Influences		2		2							
Positive relationship with others, social competence				7						6	7
Athletic motivation and challenge					4						
Athletic mental toughness					4						
Athletic self-understanding					4						
Athletic physical toughness					4						
Environmental domain (social support teammates, family and friends)					8				7	13*	11

Notes. *social resources and family cohesion; CD-Risc-10-Connor Davidson Resilience Scale (Campbell-Sills & Stein, 2007); CD-Risc-25-Connor Davidson Resilience Scale (Connor & Davidson, 2003); ER- Resilience Scale (Wagnild & Young, 1993); PTGI – Posttraumatic Growth Inventory (Tedeschi & Calhoun, 1996); RSUA- Resilience Scale for University Athletes (Ueno & Shimizu, 2012); ERS-Ego Resilience Scale89 (Block & Kremen, 1996); ARS-Academic Resilience Scale (Martin & Marsh, 2006); BRS-Brief Resilience Scale (Smith et al., 2008); AdRs-Adolescent Resilience Scale (Shin et al., 2009), RSA-Resilience Scale for Adults (Friborg et al., 2005); RQCA-Resilience Questionnaire for Children and Adolescents (Gonzales-Arratia, 2016).

RESULTS

In the 43 studies included, most of them were conducted with sample athletes of both genders (79.06%), with 100-500 athletes (58.5%) and combined collective and individual sports (46.51%) (Table 1).

A sum of 11 scales was used to evaluate resilience in athletes (Table 2). Most of them were validated in the USA (54.54%). In total, the properties of just five out of eleven scales were tested to assess resilience in sport and, of these, only one with Brazilian athletes (Neves et al., 2018).

The *Connor-Davidson Resilience Scale-CD-Risc* (Connor & Davidson, 2003) was developed based on the framework of Kobasa (1979), Lyons (1991) and Rutter (1985). It portrays the concept of resilience from the perspective of seeing change or stress as a challenge/opportunity, tolerance of negative affect and developing strategy with clear goal, strong selfesteem/confidence, adaptability when coping with change, social problem solving skills, humor in the face of stress, strengthening effect of stress, taking on responsibilities for dealing with stress, secure/stable affectional bonds, and previous experiences of success and achievement. The score ranges from 0 to 100. The total score is calculated from the sum of the points marked on the scale. Individuals with a higher score are considered more resilient. The CD-Risc 25´s psychometric parameters were: $\chi^2 = 142.80$, $df = 5$, $p < 0.0001$, $\alpha = 0.89$. The CD-Risc 10 (unifactorial) is a reduced version of the scale. Campbell-Sills and Stein (2007) showed psychometric parameters: $\chi^2 = 93.77$, RMSEA = 0.056, CI 90% [0.042, 0.069], CFI = 0.23, SRMR = 0.34, CFI = 0.96.

The *Resilience Scale-RS* (Wagnild & Young, 1993) was developed based on Rutter's theory (1985) about positive psychosocial adaptation in relevant life events. The score ranges from 25-175. In score, 145 indicates a high level of resilience; 121-145, moderate levels; scores below 121, low resilience. The scale´s psychometric parameters were: RMSEA = 0.040.

The *Posttraumatic Growth Inventory-PTGI* (Tedeschi & Calhoun, 1996) was developed based on the experiences of post-traumatic events of university students. The students assess the positive impact on themselves after experiencing negative events. The total score corresponds to the post-traumatic growth index. The scale´s psychometric parameters were: $\chi^2 = 2{,}938.63$, CFI = 0.98, $\alpha = 0.94$.

The *Resilience Scale for University Athletes-RSUA* (Ueno & Shimizu, 2012) was developed based on the concept of resilience as a process, skill, and result in which an individual adapts well, despite difficult and threatening situations (Masten et al., 1990). This scale assesses resilience with two main factors (personal and environmental) and six subfactors (athletic motivation and challenge, athletic mental toughness, athletic self-understanding, athletic physical toughness, social support teammates and social support for friends). The higher subscale scores indicate higher levels of resilience. A normative to athlete score was not identified as an interpretation parameter. The scale´s psychometric parameters were: RMSEA = 0.06, $\chi^2 = 6.29$, $p = 0.18$, CFI = 0.98, $\alpha = 0.80$.

The *Ego-Resilience Scale-ERS* (Block & Kremen, 1996) assesses the "resilient self" as someone capable of controlling themselves, being more competent in interpersonal relationships and using emotions positively when faced with stressful situations. The original theory was developed in a thesis, unpublished, by Block in 1951. The scale´s psychometric parameters were: RMSEA = 0.40, $\chi^2 = 77.19$, CFI = 0.926, SRMR = 0.38, $\alpha = 0.76$.

The *Academic Resilience Scale-ARS* (Martin & Marsh, 2006) was developed based on the Student Motivation and Engagement (Martin, 2001) which reflects the thoughts, feelings, and behaviors that support academic involvement in school. The score is calculated from the sum of items and the higher the result, the greater the academic resilience. The scale´s psychometric parameters were: $\chi^2 = 2{,}938.63$, $df = 1{,}504$, CFI = 0.97, NNFI = 0.97, $\alpha = 0.89$.

The *Brief Resilience Scale-BRS* (Smith et al., 2008) was developed in the behavioral psychology approach. To the authors, the scale is the only measure that specifically evaluates resilience in its original and most basic meaning: recovering from stress. The BRS is scored by the reverse coding of items 2, 4, and 6 and by the mean of the six items. The scale´s psychometric parameters range from $\alpha = 0.80$ to 0.91 according to the population.

The *Adolescent Resilience Scale-AdRS* (Shin et al., 2009) assesses resilience as a dynamic process that results in adaptation in the context of significant adversities. There is only one version, developed in Korean and published in the native language. The total score is calculated by the sum of the items, but there is no normative indication for data interpretation. The scale´s psychometric parameters were: $\alpha = 0.84$.

The *Resilience Scale for Adults-RSA* (Friborg et al., 2005) was developed in the positive psychology approach, with resilience being understood as a positive adaptation within a situation of adversity and considering the antecedent protective factors that increase the probability of a good result (Luthar et al., 2000). Higher scores indicate higher levels of resilience. The scale´s psychometric parameters were: RMSEA = 0.043, $\chi^2 = 480 = 825.6$, $p < 0.001$, CFI = 0.959, $\alpha = 0.84$.

The *Resilience Questionnaire for Children and Adolescents-RQCA* (González-Arratia, 2016) was a development from concept of resilience, "the ability to adapt and adjust through the combination and/or interaction between the attributes internal and external, which enable him to overcome risk and adversity in a constructive way" (González-Arratia & Valdez, 2007). In this questionnaire, internal factors are characteristics of disposition or temperament, intelligence, sense of humor, empathy and internal locus of control.

External factors are family cohesion and the affection with which the child is protected and loved, at least by a parent. Higher scores indicate higher levels of resilience. The scale´s psychometric parameters were: $\alpha = 0.91$.

Considering the specificity of stressors in the sports environment, among the scales identified in this study, only the *Resilience Scale for University Athletes* (Ueno & Koshio, 2015; Ueno & Shimizu, 2012) was elaborated from a sample of university athletes. The scales CD-Risc, BRS, and ER went through the factor assessment process in the sports context (García et al., 2014; González et al., 2019; Gucciardi et al., 2011; Neves et al., 2018). Table 3 shows the specific psychometric parameters indicated in the respective validation studies.

After evaluating the semantics of each factor in the scales identified in this study, 11 factors were observed with different semantics that represent the complexity of the resilience construct (Table 4).

The concepts and definitions of each factor identified from the semantic evaluation of the scale factors were: *Personal competence, high standard and tenacity* – reflects the notion of independence, self-determination, invincibility, mastery, resourcefulness, perseverance. *Confidence in one's instincts, autonomy, tolerance of negative affect* – corresponds to confidence in instincts, ability to deal with difficulties, tolerance of negative affect, and autonomy development. *Self-control, strength and personal growth*: perception of continuous growth, feeling self-resilient, emotional control and strengthening in the face of stressful situations. *Positive adaptation, new possibilities, acceptance of self and life:* refers to the positive acceptance of change and safe relationships, the ability to visualize new possibilities after a stress/trauma situation, reflects adaptability, balance, flexibility; recognition and acceptance of multiple aspects of the self, including good and bad qualities. *Spirituality Influences:* related to spiritual influences; temporary change of spiritual belief, weakening or strengthening of belief through a tragic situation; *Positive relationship with others, social competence:* possessing quality relationships with others, having affectionate, satisfying, and trusting relationships with others, caring for the well-being of others, being able to have strong empathy, affection, and intimacy; understands the giving and receiving of human relationships; *Athletic motivation and challenge:* related to the search for challenging situations in the sports context, to be motivated by the challenge*; Athletic mental toughness:* ability to overcome situations of defeat or frustration in the sports context; *Athletic self-understanding:* knowing your abilities and limitations as an athlete; *Athletic physical toughness:* ability to withstand the physical pain of training and competitions; *Environmental domain (social support teammates, family and friends)*: ability to effectively manage life and the surrounding world, having a sense of mastery and competence in managing the environment, controlling a complex set of external activities, making effective use of opportunities, being able to choose or create contexts suited to personal needs and values, involving the social support of teammates and friends.

DISCUSSION

Resilience has shown to be associated with sports performance (González et al., 2018; Meggs et al., 2016) and research with athletes increased in recent years (Bicalho et al., 2020). Personal characteristics such as positivity, competitiveness, focus, persistence, commitment, maturity and motivation for sport presented evidence to contribute for the athlete to deal better with stressful situations (González et al., 2019; Nicholls et al., 2016; Pedro, 2016; Sarkar & Fletcher, 2014). Social support has also been an important component of sports resilience, especially family support and the role of the coach (Gillham et al., 2015; Pedro & Lu et al., 2016; Veloso, 2018). In performance sports, athletes that have a good level of resilience recover better from injuries (Ortega et al. 2017a; Peña & Briceño, 2019) and are less likely to have burnout (Codonhato et al. 2018; García et al., 2014; Juarros et al., 2018; Ueno & Suzuki, 2016; Vallarino & Reche, 2016).

However, concern emerges regarding the assessment of resilience in athletes where researchers have emphasized the inadequate parameters of scales. (Deen et al., 2017; García-Secades et al., 2016; Gucciardi et al., 2011; Lu et al., 2016; Nichol et al., 2016; Secades et al., 2017). In the current study, eleven different scales used to assess the resilience in athletes were identified. The large amount of scales used in sport proves the point of Reppold et al. (2012), who demonstrates that there is controversy on which scales to choose out of so many to effectively measure resilience. Still, in a review study by García-Secades et al. (2014), a total of 8 scales adopted by researchers were identified. Five years later, besides four scales (CD-RISC, ER, ERS, RSA) from García-Secades et al. (2014), seven more scales used to assess resilience were identified.

As mentioned, the use of so many scales to assess the same construct raises questions. First, it induces randomness in the choice of scales, generating theoretical and methodological divergence between studies, which makes it difficult to consolidate the results in sport (García-Secades et al., 2014; Reppold et al., 2012). Most theoretical elements of scales come from the perspective of positive psychosocial adaptation in relevant life events considering post-traumatic events, well-being or recovering from stress (Block & Kremen,

1996; Luthar et al., 2000; Martin, 2001; Rutter, 1985; Smith et al., 2008; Ueno & Shimizu, 2012).

Second, in high performance sports , athletes consciously expose themselves to difficult situations in order to raise their performance (Fletcher & Sarkar, 2012). Yet, resilience scales have traditionally been based on clinical populations. Consequently, most of the scales assess resilience as a form of post-traumatic stress recovery. This is a bias, since resilience in sport is the consequence of agitation states caused by athletes' exposure to stressors managed by personal resources and social support (Fletcher & Sarkar, 2012). Moreover, in view of the complexity of this construct, it is important to recognize that the items on the scales consider risk and protection factors. Therefore, scales need to consider different age, socioeconomic conditions, local culture or sport performance level.

The scales were developed in different contexts and countries. Studies have shown the need for cross-cultural validation to verify the scale´s replicability in other contexts (Brown, 2015; Damásio, 2012). It is noteworthy that only five scales were examined in sports (García et al., 2014; Gonzalez et al., 2019; Gucciardi et al., 2011; Ruiz et al., 2012; Ueno & Shimizu, 2012) and, of these, only one in Brazil (Neves et al., 2018). The psychometric evaluation of these scales in athletes shows that the items do not contemplate resilience in sports culture with the same reliability as other contexts. This reinforces the need for cross-cultural validation to consider specificities of each country in relation to engagement in sport, characteristics of the sport and the level of influence of resilience for excellence in sports performance. So, it is necessary to advance on a scale that contemplates the resilience specifics of the sports culture.

The result of this review indicates that CD-Risc-25 (Connor & Davidson, 2003) and ER (Wagnild & Young, 1993) were the most used in research that investigates resilience in athletes (51.16%). However, in sports studies that verify the psychometric properties, CD-Risc-25 had problems on factorial loads. As pointed out by González et al. (2016), the athletes are influenced by the instructions, because they prompt participants to speculate how they would react to adversity if they had not previously experienced an adverse situation in recent times. This instruction could promote an inauthentic response because responses are not based on a lived experience. The authors also highlight that CD-risc-10 does not have items that capture the process of resilience or the experience of adversity and positive adaptation. Therefore, the scale does not qualify to assess resilience in athletes and its use can compromise the analysis of resilience in sport.

Similar criticisms are given for the ER (Wagnild, & Young, 1993). Ruiz et al. (2012) evaluated the Resilience Scale in soccer players and stated that it does not present adequate factor loads for Factor II (Acceptance of self and life). The same results were checked in a sample of judokas (Garcia et al., 2014). Given the limitations of the resilience measure in athletes, and other psychometric issues associated with the assessment of resilience in athletes, researchers reinforce the need to develop sport-specific items in a new scale to assess psychological resilience (García-Secades et al., 2016; Sarkar & Fletcher 2013).

It is also observed that, when evaluated in the sports context, only the CD-Risc-10 presented acceptable psychometric indices (Gucciardi et al., 2011). Although the CD-Risc-10 was pointed out as an adequate scale, it has limitations such as focusing solely on resilient qualities at individual levels, limited evidence for the selection and inclusion of some items. It is unifactorial and has considerable conception of coping strategies. It is consensus that sport resilience is a multifactorial construct and an ideal scale needs to evaluate the construct as a dynamic process, contextualized in different types of risk and protective factors (García-Secades et al., 2016; Reppold et al., 2012; Sarkar & Fletcher, 2013).

The multifactorial constitution of resilience was confirmed by considering the eleven factors that emerged in this review. Approximately 64% of the scales are multifactorial, which reinforces the complexity of this construct. When observing the semantic and factorial constitution of the resilience scales, the differences between the scales become apparent. Among these, the scales analyzed had two or more factors, which include personal (e.g., personal competence, confidence in one's own instinct, acceptance of oneself and life, self-control/personal strength, athletic self-understanding, athletic motivation, and challenge) and environmental aspects (e.g., relationships with others, adaptation to changes, athletic physical resistance, and social support). These results confirm the nature of sport resilience which embraces personal skills and social support, from family and team, as presented in Grounded Theory of Psychological Resilience and Optimal Sport Performance by Fletcher and Sarkar (2012).

Literature has shown that shorter scales have been better accepted in psychology (Gosling et al, 2013; Sartes & Souza-Formigoni, 2013). Regarding the number of minimum items per factor, there is still divergence in the psychometric community. Damásio (2012), for example, indicates that four or more items per factor are adequate. In the international literature, the recommendation is a minimum of three items per factor (Brown, 2015; Fabrigar et al. 1999). In this review, the scales have between two items per factor (Spirituality Influences) to 14 items per factor (autonomy). Considering the literature presented, a factor represented by two items may not be evaluating the component (Brown, 2015; Damásio, 2012; Fabrigar et al., 1999). On the other hand, a large scale with many items allocated to the same factor can be redundant. In high performance sport, scales with three to five items per factor have been increasingly sought to adapt to a faster application and an accurate assessment of the psychological component.

This study has limitations to be considered. Seven databases were chosen based on the indexing of the main

sport psychology journals. Even so, some studies may not have been included due to their indexation. However, it is known that this is a common limitation in systematic review studies. In addition, this study identified two scales published in another language (Japanese and Korean). Although these languages have not been applied in the search for articles, this result indicates that resilience studies in Asia are growing and new revisions may include a fourth language to understand the impact of the resilience researchers in these countries. Considering the specificities in the sport context, this study presents an expanded assessment analysis of resilience in athletes. The resilience scales analysis in sport increases the understanding of the construct in relation to previous reviews (Fletcher & Sarkar, 2013; García-Secades et al., 2014; Gurgel et al., 2013)

This study concludes that scales identified in literature to assess athletes' resilience have been used very indiscriminately. Only five had their psychometric properties evaluated for the sports context. The analysis demonstrates that resilience scales were validated for the general population and present inconsistent psychometric evidence when evaluating specific samples of athletes. From this systematic review, it is possible to identify that resilience in sport is a multifactorial construct and contextualized with the environment. Therefore, the sport psychology literature lacks a sport-specific measure of resilience.

Furthermore, only one scale was tested with Brazilian athletes and literature does not recommend the psychometric indices. Future studies should deepen the development of specific scales for the sports context, including an appropriate assessment of the adversities faced by athletes throughout their sports career, understanding their experiences of failures and successes in the relationship of the development of sports resilience.

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