



Modulatory role of sport factors on amateur and competitive athletes' aggressive and antisocial behaviors

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ABSTRACT

Aggressiveness and unethical behaviors are an important problem in sports today. Understanding how to properly measure and manage an athlete's aggressive tendency is a crucial lesson to be learned within the rulesets of a sporting environment. This study aims at validating the Italian version of the Competitive Aggressiveness and Anger Scale (CAAS), specifically developed to measure aggressiveness and anger in athletes. The second aim is to investigate how aggressive and antisocial behaviors are modulated by sex, competitive level (i.e., amateur and competitive), sport contact (i.e., contact and no-contact), and sport type (i.e., team and individual). Two hundred and ninety-six athletes (mean age = 22.42 years, SD = 2.86) were asked to fill out a survey about sociodemographic variables, sport specific data, attitudes to moral decisions, past cheating behavior, and aggression. The Italian version of the CAAS presented a good fit of the data, adequate internal consistency and its construct validity was supported via convergent and discriminant validity. Both aggressiveness and anger dimensions of CAAS positively related with acceptance of cheating and gamesmanship, and past cheating behavior, while only the aggressiveness dimension of the CAAS negatively related with prosocial attitude. Competitive male athletes practicing contact sport showed the highest levels of aggressiveness, while competitive athletes practicing team sport showed the highest level of anger. This study represents the first empirical construct validity evidence of CAAS among Italian athletes and provides a deeper understanding of how athletes' aggressive tendencies and antisocial behavior differ across athlete populations.

1. Introduction

The topic of aggressiveness has received extensive attention from the scientific community in the past few decades, both within and outside sport contexts [1], in the attempt to uncover the factors affecting the propensity of aggressive behaviors and attitudes. Genotype has been suggested to influence the intensity with which an individual reacts aggressively to a stressor [2,3]. Monoamine

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oxidase A (MAOA) gene, which encodes the key enzyme for the degradation of serotonin and catecholamines, has earned the nickname “warrior gene”, because it has been linked to aggression in observational and survey-based studies [4,5]. Another candidate gene underpinning aggressive behavior codes for the catechol-*O*-methyltransferase (COMT). COMT, which is involved in catabolizing catecholamines, is involved in the regulation of mood contributing to aggression [6]. Sex differences have been also investigated, showing that males engage in more physically aggressive behaviors than females [7,8]. Additionally, individuals who score high on dimensions such as emotional intelligence, self-efficacy, and self-control present less aggressive behaviors [9,10].

Aggressive behavior can be accompanied by negative feelings, including fear, frustration, guilt, and anger [11]; it can be expressed both physically (e.g., tackling someone) and verbally (e.g., trash talking), and categorized as hostile [12] and instrumental [13]. Hostile aggression refers to those behaviors that aim to hurt someone, whereas instrumental aggression describes those aggressive tendencies that are functional to an intended outcome [14], and it seems to be more socially accepted than its hostile counterpart [15].

Within the sport framework, aggressiveness is a behavior aimed at harming the opponents, whether it happens mentally, physically, or strategically. Tackling someone to injure them is considered hostile aggression, whereas tackling someone to stop them from scoring would be interpreted as instrumental aggression. Often, athletes' aggressive behaviors are legitimized by the type of sport (i.e., contact sports). Indeed, athletes involved in sports with high levels of physical contact tend to show more aggressive tendencies compared to athletes engaged in low- or no physical contact sports [7,16,17], possibly due to different perceived legitimacy of aggressive behaviors [18,19]. Also, the competitive level and the type of sport (in terms of individual vs. team) the athletes engage in are relevant factors in determining aggressive tendencies. Indeed, as the competitive level rises, athletes tend to show increased instrumental aggressive behaviors, decreased instances of hostile ones, and increased acceptance of aggressive tendencies [20,21]. Further, athletes who come from individual sports (e.g., tennis) report lower degrees of aggressiveness in comparison to team sport players (e.g., hockey) [22]. Finally, the role of aggressiveness in relation to performance is still somewhat trivial, suggesting that aggressive behaviors can be both functional and dysfunctional to someone's sport performance, depending on which variables (e.g., strength, precision) one considers [23].

As aggressiveness poses as an inevitable component of competition in sport [24], a general view of this construct may be problematic, and its definition should be context-dependent. Hence, specific tools are warranted to preserve construct validity [25]. The Competitive Aggressiveness and Anger Scale (CAAS) [25] is one of the few scales that have been developed specifically to measure aggressiveness and anger in competitive athletes, and it has been widely used in previous literature. Yet, to compare responses across cultures and populations of different language, it is essential that researchers verify whether the translated questionnaire assesses equivalent constructs [26], therefore calling for a validation of the Italian version of the CAAS.

In sporting contexts, there are boundaries limiting exaggerated aggressive behavior, either by judgments about what is appropriate and correct, or by the rules of the sport, which vary depending on the sport and its specific factors.

To this note, understanding how to properly measure, manage, contain, amplify, and express an athlete's aggressive tendency is a crucial lesson to be learned within the rulesets of a sporting environment [27]. Rule violations in sports can be interpreted in radically different ways depending on social and cultural settings [28], but also based on the kind of sport that athletes are playing in. For example, rule violation in open skill sports, where a lack of skills or simply bad luck can result in an intentional violation of the ruleset, may not be judged as immoral. On the other hand, breaking the rules intentionally are usually seen as a more appropriate attribution of moral blame, which may also lead to additional sanctions such as warnings (i.e., yellow cards) or even ejections from the game [28]. As rule violation can come in many forms, cheating is one of the most common ones, and it can raise various ethical dilemmas on morality and moral behavior in sport contexts [29].

Antisocial behaviors (i.e., acts that intend to harm or put someone in disadvantage [30]), including gamesmanship (i.e., those behaviors that do not necessarily violate the rules, but go against the spirit of the contest to gain a ‘dishonorable’ advantage [31]) and cheating behaviors, have been extensively investigated to identify their facilitators and inhibitors. One of the most common facilitators of antisocial behaviors is moral disengagement, which refers to those psychological mechanisms that people use to justify transgressive acts [32,33], minimizing personal responsibility to behave unethically towards others (without experiencing self-sanctions). Moral disengagement has been positively associated with antisocial behaviors [34–36] and an increased propensity to use performance-enhancing drugs [37], mediating also the relationship between motivational factors and antisocial behaviors towards one's opponents and their own teammates [38]. Both achievement goal theory and self-determination theory have provided constructs that positively predict antisocial behaviors in sport, with ego orientation, performance-oriented climate, and controlled motivations being positively related to acceptance and acts of cheating, and gamesmanship [38–41]. Additionally, athlete's attitudes towards antisocial behaviors have been used to accurately predict the number of yellow cards players would receive in future tournaments as a result of rule violations [41]. In contrast to antisocial behaviors, prosocial ones, defined as acts to benefit or help another person [42], have been associated with athlete's task orientation and perceived character-building competencies [30,43].

Although both personal and social factors underpinning aggression and moral attitudes have received extensive interest from the scientific community, only a few studies have investigated the specific roles of sex, sport factors, and their influence on athletes' aggressive tendencies and antisocial behaviors. A more in-depth understanding of how such tendencies and behaviors differ across athlete populations, and which factors are associated with them, would support athletes, sport organizations and stakeholders to reduce dysfunctional behaviors on- and off-field, while fostering functional ones. Thus, the availability of a validated tool that can be used in the Italian-speaking population is crucial to correctly assess aggression in competitive athletes.

To this end, the purpose of the study was twofold: (1) to translate and validate the Italian version of the CAAS [25], and (2) to investigate how aggressivity and antisocial behaviors are modulated by sex, competitive level (i.e., amateur vs. competitive), sport contact (i.e., contact vs. no-contact), and sport type (i.e., team vs. individual). Based on available literature, we expected that the scores of the Italian version of CAAS would be positively related with the scores of a general measure of the same construct, as well as with the

scores of antisocial behaviors. In addition, we expected that athletes' scores in aggressiveness and antisocial behaviors would be affected by sex and sport factors. Specifically, based on previous findings, we expected that males' athletes who engage in team sports and who engage in contact sports would show higher levels of aggressiveness and willingness to engage in and accept antisocial behaviors, compared to their respective counterparts.

2. Methods

2.1. Participants

The study involved a total of 296 athletes (45,9 % females) aged between 18 and 30 years ($M = 22.42$, $SD = 2.86$). Based on a self-assessment, participants were classified by level of competition (111 amateur and 185 competitive athletes), type of sport (136 individual and 160 team sport athletes), and level of contact (132 contact and 164 no-contact sport athletes).

2.2. Procedure

We recruited participants using a convenience sampling procedure. Specifically, the questionnaire was disseminated via email and word-of-mouth by a link on an online platform. The local ethical committee of the University of Rome "Foro Italico" approved the study protocol (protocol number: CAR 41/2020), in agreement with the Declaration of Helsinki. All participants were debriefed on their participation rights, including the anonymity of their responses and the right to confidentiality and withdrawal; they received a full explanation of the aims of the study and, then, provided written informed consent prior to data collection.

2.3. Measures

Participants were asked to first provide information on sociodemographic variables, such as age and sex, and sport-specific data (i. e., competitive level, sport type, and level of physical contact during sport practice). Afterwards, participants were asked to fill in four questionnaires in the order listed below.

Attitudes to Moral Decisions in Youth Sport Questionnaire (AMDYSQ [31]): Athletes' attitudes to moral decisions were measured with the AMDYSQ. This questionnaire measures two antisocial attitudes, "acceptance of cheating" (4 items; e.g., 'It is okay to cheat if nobody knows') and "acceptance of gamesmanship" (5 items; e.g., 'I sometimes try to wind up the opposition'), and one prosocial attitude, "keeping winning in proportion" (4 items; e.g., 'Winning and losing are a part of life'). Participants rated all items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). It was specifically developed to measure attitudes in youth sport populations, focusing specifically on the distinction between cheating behaviors and other types of behaviors that do not require the breaking of the contest's rules, but may still be described as immoral, instrumental, or antisocial (i.e., gamesmanship). The Italian version of the AMDYSQ [43] has been considered a reliable and valid measure (documented Cronbach's alpha: 0.58–0.87).

Competitive Aggressiveness and Anger Scale (CAAS [25]): Athletes' levels of competitive aggressiveness and anger were measured with the CAAS. The questionnaire is composed of two 6-item subscales, one assessing "anger" (e.g., 'I feel bitter towards my opponent if I lose') and the other assessing "aggressiveness" (e.g., 'I use excessive force to gain an advantage'). Participants rated all items on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always).

Buss-Perry Aggression Questionnaire - Short Form (BPAQ-SF [44]): Athletes' trait aggression was measured with the BPAQ-SF. It is an adapted short version of the original Buss-Perry Aggression Questionnaire [45] validated by Ref. [44]. This questionnaire consists of 12 items measuring four aggression-related dimensions: "physical aggression" (3 items; e.g., 'Given enough provocation, I may hit another person'), "verbal aggression" (3 items; e.g., 'I can't help getting into arguments when people disagree with me'), "hostility" (3 items; e.g., 'I flare up quickly but I get over it quickly'), and "anger" (3 items; e.g., 'Other people always seem to get the breaks'). Participants rated all items on a 5-point Likert scale ranging from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). The Italian version of the questionnaire [46] has been considered a reliable and valid measure (documented Cronbach's alpha: 0.53–0.85).

Self-reported past cheating behavior: Athletes past cheating behaviors during their sport activities over the previous six months were measured using 4 items referring to different sport-related situations (e.g., cheating during a competition). Participants rated all items on a 6-point Likert scale ranging from 0 (never) to 5 (almost always). The Italian version of the questionnaire [43] has been considered a reliable and valid measure (documented Cronbach's alpha: 0.92).

2.4. Translation of the CAAS

The CAAS was translated using a simplified approach based on published guidelines [47]. In the first step, the CAAS was translated into Italian by an official English–Italian translator and by two independent researchers, reaching agreement on a common version to ensure there were no colloquialisms, slang, or esoteric phrases that would make interpretation difficult. The shared form was then back-translated by another English–Italian translator. Assessment of conceptual and linguistic equivalence was made during the translation process from English into Italian and vice versa, and after test–retest reliability.

3. Data analysis

3.1. Structural validity and internal consistency

The two-factor structure of the CAAS was examined by conducting a confirmatory factor analysis (CFA) on the total sample using Mplus (version 7.0, Muthén & Muthén, Los Angeles, CA, USA). As the distribution of items data deviated significantly from normality (see Table 1), CFA was performed using the robust maximum likelihood (MLR) estimator to ensure that standard errors and tests of model fit were robust in relation to the non-normality of observations. A series of fit indices were examined to evaluate the model fit, including the Chi-square (χ^2), comparative fit index (CFI), Tucker–Lewis Index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The following criteria were indicative of acceptable model fit: CFI and TLI $\geq .90$, RMSEA $\leq .08$, SRMR $\leq .10$ [48]. Next, Cronbach’s alpha was calculated for the two indicators of the CAAS using SPSS version 28. In addition, a post-hoc power analysis was conducted with a semPower package in R [49] to determine the level of statistical power (i.e., Power = $1 - \beta$) achieved for the sample size used in the present study (N = 296), considering $\alpha = .05$ and the effect size = .5. A power level higher than 0.80 was considered adequate [50]. The post-hoc power analysis yielded adequate results (>0.90).

3.2. Construct validity and external correlates

To evaluate the construct validity of the CAAS, convergent and discriminant validity were evaluated. Convergent validity was assessed via bivariate correlations between variables that were theoretically expected to relate (i.e., “anger”, “physical aggressiveness”, and “verbal aggressiveness” dimensions of BPAQ). Discriminant validity was evaluated via bivariate correlations between measures that were theoretically expected to not relate (i.e., “keeping winning in proportion” dimension of AMDYSQ).

Convergent and discriminant validity were also evaluated by measuring the average variance extracted (AVE), composite reliability (CR), and squared correlations (SC) of the two CAAS dimensions. AVE values above 0.50 and CR values above 0.70, where AVE values are below CR values, demonstrate an acceptable level of convergent validity. Discriminant validity is instead evident when the AVE values of each dimension are greater than the SC between the two dimensions [51].

Afterwards, bivariate associations between CAAS dimensions and scores on measures of moral attitudes and self-reported cheating behavior were examined. All Pearson’s correlations were calculated using SPSS version 28.

3.3. Multivariate analyses of covariance (MANCOVA)

A MANCOVA was conducted using SPSS version 28 considering the two dimensions of the CAAS as dependent variables and athletes’ sex (male vs. female), competitive level (amateur vs. competitive), and type of sport (individual vs. team; contact vs no-contact) as independent variables. Finally, the age of the athletes was included as covariate.

Table 1

Descriptive statistics of the items of the Italian version of the Competitive Aggressiveness and Anger Scale (CAAS).

Items	M (SD)	Ske	Kur
Ang1. I become irritable if I am disadvantaged during a match <i>Divento irritabile se sono in svantaggio durante una partita</i>	2.49 (1.07)	.36	-.55
Ang2. I feel bitter towards my opponent if I lose <i>Mi sento amareggiato nei confronti del mio avversario se perdo</i>	2.28 (1.13)	.64	-.37
Ang3. I get mad when I lose points <i>Mi arrabbio quando perdo un punto</i>	2.84 (1.16)	.01	-.88
Ang4. I show my irritation when frustrated during a game <i>Mostro la mia irritazione quando sono frustrato durante una partita</i>	2.44 (1.06)	.46	-.46
Ang5. I find it difficult to control my temper during a match <i>Trovo difficile controllare il mio temperamento durante una partita</i>	2.18 (1.09)	.71	-.34
Ang6. Official’s mistakes make me angry <i>Gli errori arbitrali mi fanno arrabbiare</i>	3.05 (1.27)	.05	-1.07
Agg1. Violent behavior, directed towards an opponent, is acceptable <i>Dei comportamenti violenti rivolti ad un avversario sono accettabili</i>	1.37 (.86)	2.83	7.99
Agg2. It is acceptable to use illegal physical force to gain an advantage <i>È accettabile usare la forza in modo non corretto per guadagnare un vantaggio</i>	1.47 (.96)	2.24	4.42
Agg3. I taunt my opponents to make them lose concentration <i>Schernisco i miei avversari per fargli perdere la concentrazione</i>	1.59 (.87)	1.45	1.62
Agg4. I use excessive force to gain an advantage <i>Uso la forza in modo eccessivo per guadagnare un vantaggio</i>	1.59 (.97)	1.67	2.09
Agg5. I verbally insult opponents to distract them <i>Insulto verbalmente il mio avversario per distrarlo</i>	1.28 (.61)	2.49	6.92
Agg6. Opponents accept a certain degree of abuse <i>Gli avversari accettano un certo grado di maltrattamento</i>	1.43 (.82)	2.07	3.86

Note. N = 296; M: mean; SD: standard deviation; Ske: Skewness; Kur: Kurtosis; Ang: Anger; Agg: Aggressiveness. The items’ Italian translations are in italics.

4. Results

4.1. Confirmatory factor analysis and internal consistency

The results of the CFA indicate that the two-factor model provided a good fit to the data ($\chi^2 = 99.738$, $df = 52$, $CFI = .94$, $TLI = .93$, $RMSEA = .06$, $SRMR = .05$) after correlating the residuals of item 4 (i.e., “I show my irritation when frustrated during a game”) and 5 (i.e., “I find it difficult to control my temper during a match”), probably due to possible semantic overlap between the items’ wording. Fig. 1 shows the standardized factor loadings for the CFA. All items loaded significantly on their respective factors ranging from .43 to .75, and the correlations among factors were modest ($r = .42$), suggesting that these two factors reflected distinct constructs. Regarding the internal consistency of the CAAS, Cronbach’s alpha was adequate for both dimensions ($\alpha = .83$ – 0.76 ; see Table 2).

4.2. Construct validity and correlations with the other key variables of the study

Table 2 reported the internal consistency and bivariate correlations between the key variables of the study. In line with our hypotheses, both dimensions of the CAAS were related to all dimensions of the BPAQ and the correlations were greater between the target constructs. That is, the “anger” dimension of the CAAS was slightly more related to BPAQ “anger” dimension ($r = .41$) rather than the other BPAQ dimensions ($r = .23$ to 0.37). In the same way, the “aggressiveness” dimension of the CAAS was more related to “physical” ($r = .44$) and “verbal” ($r = .23$) aggressiveness dimensions of the BPAQ than with the other two BPAQ dimensions ($r = .20$; $r = .13$). Moreover, the two dimensions of CAAS were unrelated or negatively related with the positive dimension of AMDYSQ (i.e., “keeping winning in proportion”). In addition, the AVE values for the CAAS-Anger (0.446) and CAAS-Aggressiveness (0.368) dimensions were slightly below the cut-off criteria (i.e., 0.50), but CR values were higher than 0.70 (i.e., $CR = .827$ for CASS-Anger dimension and $CR = .77$ for CASS-Aggressiveness dimension). Thus, convergent validity can be considered adequate [51]. Finally, the AVE values for CAAS dimensions were greater than the SC between dimensions ($r = .341$), which demonstrated acceptable discriminant validity.

With respect to the AMDYSQ dimensions, the CAAS-Anger dimension resulted associated more with “acceptance of gamesmanship”

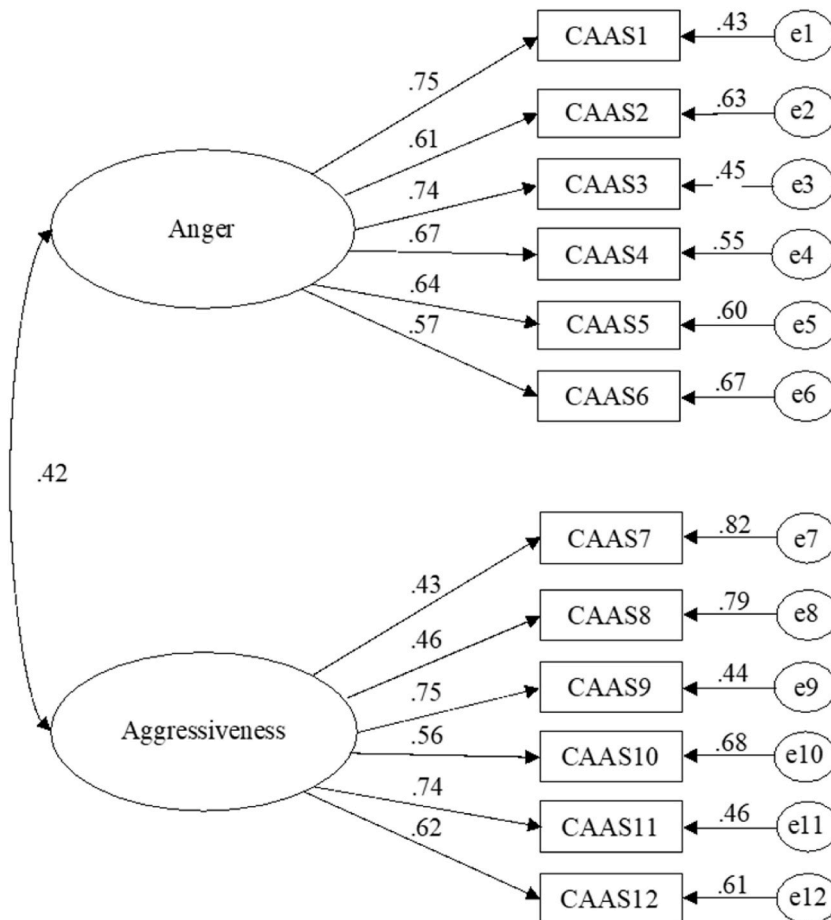


Fig. 1. Confirmatory Factor Analysis. Factor loadings, residual variances, and correlations between factors of the CAAS Italian translation. Factor loadings are expressed in standardized form.

Table 2
Internal consistency and bivariate correlations between CAAS, BPAQ, AMDYSQ, and cheating behavior scores.

	CAAS dimensions		α
	Anger (α = .83)	Aggressiveness (α = .76)	
<i>BPAQ Dimensions</i>			
Physical Aggressiveness	.229**	.440**	.80
Verbal Aggressiveness	.367**	.229**	.59
Anger	.408**	.199**	.67
Hostility	.328**	.128*	.75
<i>AMDYSQ dimensions</i>			
Acceptance of Cheating	.265**	.490**	.81
Acceptance of Gamesmanship	.411**	.501**	.88
Keeping Winning in Proportion	-.052	-.155**	.64
<i>Self-reported Cheating Behavior</i>	.199**	.370**	.85

Note. ** $p < .01$; * $p < .05$; α: Cronbach’s alpha; CAAS: Competitive Anger and Aggression scale; BPAQ: Buss-Perry Aggression Questionnaire; AMDYSQ: Attitudes to Moral Decisions in Youth Sport Questionnaire.

($r = .41$) than “acceptance of cheating” ($r = .27$). Conversely, the CAAS-Aggressiveness dimension resulted associated with “acceptance of cheating” ($r = .49$) and “gamesmanship” ($r = .50$) to the same extent. Lastly, the CAAS-Aggressiveness dimension was more strongly correlated to athletes’ self-reported cheating behaviors than the CAAS-Anger dimension.

4.3. Differences in CAAS across sex, competitive level, type of sport and sport contact

Results of the MANCOVA showed a multivariate statistically significant effect for sex (Wilks’ Lambda (2,279) = .950; $p < .001$; partial eta squared=.050) and for sport type (Wilks’ Lambda (2,279) = .978; $p = .044$; partial eta squared=.022), while the covariate age did not have a significant influence on these effects. Analyzing the univariate effects, it emerged a significant effect of sex only for the aggressiveness dimension of the CAAS ($F(1,280) = 12.917$; $p < .001$; partial eta squared=.044) and an effect of sport type for anger dimension of the CAAS ($F(1,280) = 4.884$; $p = .028$; partial eta squared=.017). Specifically, male athletes showed a statistically significant higher level of aggressiveness on CAAS than female (see Table 3), while athletes involved in team sports reported higher levels of anger on CAAS than athletes involved in individual sport (see Table 3).

In addition, univariate effect analysis showed two statistically significant interaction effects: a) between the sport contact and the competition level upon the CAAS aggressiveness dimension ($F(1,280) = 4.686$; $p = .031$; partial eta squared=.016), and b) between sport type and competition level upon the CAAS anger dimension ($F(1,280) = 4.031$; $p = .046$; partial eta squared=.014). More specifically, as reported in Fig. 2, when we considered the sport contact, the differences in aggressiveness emerged only for competitive athletes, with athletes practicing contact sports reporting higher levels of aggressiveness than athletes practicing non-contact sports. Conversely, no significant difference across sport type emerged for amateur athletes.

Finally, when we considered the sport type, the differences in anger emerged only for competitive athletes, with team sports

Table 3
Means and standard deviations of the scales and their sub-scales.

	Sex		Competitive level		Sport type		Sport Contact	
	Male (N = 160) M (SD)	Female (N = 136) M (SD)	Amateur (N = 111) M (SD)	Competitive (N = 185) M (SD)	Individual (N = 136) M (SD)	Team (N = 160) M (SD)	Contact (N = 132) M (SD)	No-contact (N = 164) M (SD)
<i>CAAS</i>								
Ang	15.35 (5.21)	15.18 (4.74)	14.89 (4.69)	15.50 (5.17)	14.24 (5.03)	16.15 (4.81)	15.81 (4.75)	14.84 (5.16)
Agg	9.49 (3.70)	7.84 (2.90)	8.13 (3.42)	9.10 (3.44)	7.92 (2.85)	9.43 (3.77)	9.58 (3.82)	8.05 (2.98)
<i>BPAQ</i>								
PA	5.18 (2.82)	4.20 (1.95)	4.55 (2.28)	4.84 (2.63)	4.62 (2.36)	4.83 (2.62)	4.97 (2.64)	4.54 (2.38)
VA	6.92 (2.30)	7.30 (2.41)	7.08 (2.40)	7.10 (2.34)	7.13 (2.35)	7.06 (2.37)	6.77 (2.35)	7.36 (2.34)
Anger	6.38 (2.43)	6.87 (2.64)	6.43 (2.50)	6.71 (2.56)	6.54 (2.43)	6.66 (2.63)	6.53 (2.56)	6.66 (2.53)
Hostility	7.53 (3.02)	8.18 (2.69)	7.75 (2.80)	7.88 (2.94)	7.88 (2.85)	7.78 (2.93)	7.41 (2.81)	8.16 (2.91)
<i>AMDYSQ</i>								
AC	1.42 (.58)	1.32 (.53)	1.38 (.50)	1.37 (.60)	1.27 (.46)	1.46 (.63)	1.38 (.54)	1.37 (.58)
AG	2.45 (.91)	1.97 (.95)	2.03 (.90)	2.35 (.97)	1.94 (.96)	2.48 (.88)	2.51 (.88)	2.00 (.95)
KWP	3.79 (.77)	3.80 (.83)	3.79 (.87)	3.80 (.75)	3.83 (.87)	3.77 (.73)	3.84 (.75)	3.76 (.83)
CB	.28 (.52)	.24 (.58)	.18 (.45)	.31 (.60)	.16 (.44)	.35 (.62)	.26 (.49)	.26 (.59)

Note. M: mean; SD: standard deviation; CAAS: Competitive Anger and Aggression scale; BPAQ: Buss-Perry Aggression Questionnaire; AMDYSQ: Attitudes to Moral Decisions in Youth Sport Questionnaire; Ang: CAAS-Anger; Agg: CAAS-Aggressiveness; PA: BPAQ-Physical Aggressiveness; VA: BPAQ-Verbal Aggressiveness; AC: AMDYSQ-Acceptance of Cheating; AG: AMDYSQ-Acceptance of Gamesmanship; KWP: AMDYSQ-Keeping Winning in Proportion; CB: Cheating Behavior.

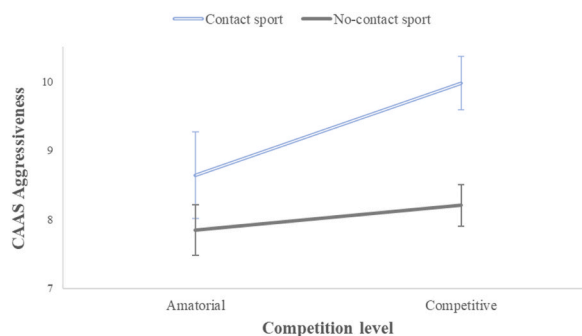


Fig. 2. Competition level and sport type for CAAS aggressiveness. Mean of CAAS aggressiveness dimension in amatorial and competitive athletes differentiating between contact and no-contact sport. Interaction between competition level and contact level significant at $p < .05$.

athletes reporting higher anger than individual sport athletes. Conversely, no differences across sport type emerged for amateur athletes (see Fig. 3).

5. Discussion

The purpose of this study was to translate and validate the Italian version of the CAAS [25], and to explore how aggression and moral attitudes are modulated by sex and sport factors, such as competitive level, sport contact, and sport type.

The two-factorial model of the Italian version of the CAAS provided a good fit of the data, adequate internal consistency for our sample, as well as its construct validity was supported via convergent and discriminant validity. This latter was examined with respect to the dimensions of the BPAQ and the “Keeping winning in proportion” dimension of the AMDYSQ. Italian athletes who scored higher on the CAAS dimension of “anger”, also scored higher on the BPAQ dimension of “anger”. Similarly, Italian athletes who scored higher on the CAAS dimension of “aggressiveness”, also scored higher on the BPAQ aggressiveness dimensions, especially in the dimension of “physical aggressiveness”. When the CAAS was examined with respect to the AMDYSQ dimension of prosocial attitude, the “anger” and “aggression” dimensions showed negative or no relation. Finally, additional evidence of convergent and discriminant validity of the CAAS emerged from the examination of the Fornell and Larcker criterion [51]. Taken together, the findings suggest that the Italian version of the CAAS has acceptable factorial validity and, therefore, it may be used as a valid measure of aggressiveness and anger in sport context.

According to the study hypotheses, the patterns of relations of CAAS dimensions with antisocial behaviors were examined. Findings showed that athletes’ anger and aggressiveness were positively related to their acceptance of cheating and gamesmanship. Both dimensions also showed positive relations with self-reported cheating behavior. These findings support previous studies, advancing the association between aggressive tendencies and antisocial behaviors (e.g. Refs. [21,52]).

Within this context, moral disengagement (i.e., performing antisocial actions, as cheating, without necessarily experiencing moral self-sanction) might lead to increased tolerance of aggressive and antisocial behaviors and perceived legitimacy of aggression in sport [32,53–55]. Indeed, previous data suggest that perceived legitimacy of aggressive behaviors increases as a function of the players’ experience only when the aggression has an instrumental objective (e.g., winning), whereas hostile behavior does not [56]. Similarly, previous studies have found that athletes’ moral disengagement was positively associated with self-reported antisocial behaviors, aggression, and their tolerance [19,35].

Furthermore, motivational factors seem to play a major role in athletes’ behavioral tendencies, as motivational climates created by coaches and teammates can promote prosocial and antisocial behaviors. Indeed, positive coach-athlete relationships, autonomous,

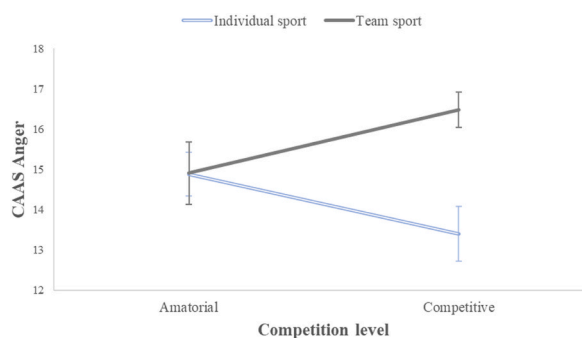


Fig. 3. Competition level and sport type for CAAS anger. Mean of CAAS anger dimension in amatorial and competitive athletes differentiating between individual and team sport. Interaction between competition level and sport type significant at $p < .05$.

supportive, and task-oriented motivational climates foster more prosocial tendencies and prevent moral disengagement [36–38], whereas ego motivational orientations might support antisocial behaviors [57]. Thus, perceived motivational climates and orientations are crucial determinants of moral disengagement in sport, potentially predicting aggressive and antisocial behaviors, and offering interesting and applied perspectives to deal with these types of behaviors.

Additionally, present data showed a statistically significant effect for sex and two interactions: the first between sport contact and competitive level for the measure of aggressiveness, and the other between sport type and competitive level for the measure of anger. Sex analysis showed that males were more aggressive than females, in line with previous results in which male athletes, regardless of sport type, sport contact, or competitive level, showed higher aggressiveness [21,58]. Sex differences in aggressiveness may be attributed to genetic components [8,59], as well as to gender socialization differences and social norms of morality, in which males are more oriented to legitimize aggressive behaviors [12]. However, instrumental aggression scores have been shown not to differ between sexes, indicating that females may engage in aggressive behaviors in selected situations [24].

Perhaps more interestingly, the present study highlights the influence of the competitive level. Indeed, as the competitive level rose (i.e., athletes playing at a competitive level versus an amateur level), sport aggressiveness increased for contact sport's athletes, and sport anger increased for team sport's athletes. These findings corroborate the association between aggressive tendencies and antisocial behaviors, contact level, and team sports [16,25,60]. In a recent article [29], it was argued that motivational aspects, such as ego orientations and controlled motivation, may be of special interest when predicting antisocial tendencies. Specifically, athletes who take part in competitions for extrinsic reasons, such as to obtain rewards, prizes, or win, tend to also engage in more antisocial behaviors towards both opponents and teammates (e.g. Ref. [38]). Therefore, as competition level rises, extrinsic motivations may increase in quality and quantity, potentially promoting aggressive behaviors, cheating, or gamesmanship.

However, athletic identity may also explain, at least partly, these interactions. Higher competitive levels lead to stronger athletic identities [61], and stronger athletic identities have been linked to higher levels of aggressiveness [17]. [62] suggested that obsessive passions (i.e., feeling pressured to engage in an activity, while also experiencing conflict, and investing an extensive amount of time and energy into it [63]) are internalized into the athletes' identities as contingencies of self-worth. Thus, aggressive and antisocial behaviors may be seen as valid solutions to contrast potential threats to one's sense of self and competence. Consequently, passionate athletes were more likely to act aggressively when their sense of competence and identity was being threatened to defend or restore their threatened identity [62,64]. These findings suggest that the study of aggressive and antisocial tendencies in sport should also consider the athletic identity, because the way in which people approach sport competition has important implications on how they experience sport, and, more importantly, on how they will behave and, consequently, perform.

This study presents few limitations. The first limitation is the convenience sampling method used to collect data, which limit the generalizability of the results, also mined by the lack of detailed information about participants' specific competitive levels, such as the division or ranking within their sport, and team sports. Given the exponential growth of competition levels (for an example of competitive elite classification [65]), this lack of specificity merits further attention. Further, it is well known that team sports differ in terms of field dynamics, contact levels, playing surfaces, or team sizes, and missing this information might lead to results misinterpretation. Future research may address this limitation by considering additional sport characteristics, such as the specific level of competition (i.e., sport division or ranking), and the specific type of team sport played (i.e., soccer or rugby). The second limitation is the cross-sectional nature of the study that does not allow for causal conclusions and directionality of underlying relations. Further longitudinal research is needed to examine the development and potential changes in aggressive and antisocial tendencies in sports. The third limitation is the use of self-report measures, which are subject to inherent biases (e.g., social desirability [66]), leading to underestimate aggressiveness, antisocial tendencies, and cheating behaviors. Nevertheless, anonymity was implemented in data collection to minimize the effect of social desirability. Future research should also investigate motivational climate fostered by parents, coaches, and other contextual variables (i.e., team dynamics, peer influences, organizational culture), due to its influence on moral disengagement tendencies and consequent antisocial behaviors. For example, the complexity of group dynamics is exacerbated in team sports, and it plays a significant role in the athletes' performances and related outcomes [67]. Additional exploration of how contextual factors may moderate athletes' motivations and behaviors in sport performance may provide substantial insights at both theoretical and applied levels. Increasing available knowledge on the factors promoting prosocial attitudes, while also considering how they contribute to hindering cheating and gamesmanship, will help athletes to express their aggressive tendencies instrumentally and in more appropriate contexts. Additionally, as different team sports allow for different levels of physicality and intensity of contact (e.g., basketball vs. rugby), it would be rather interesting to dig deeper into this context and test whether the variation in the level and intensity of contact allowed within a specific sport has further implications on their athletes' aggressive and antisocial behaviors. Finally, the present study should be replicated using both a bigger samples and other sports settings or cultures to strengthen the generalizability of our results.

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Luca Bovolon: Writing - review & editing, Writing - original draft, Investigation, Formal analysis. **Luca Mallia:** Writing - review & editing, Writing - original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Alessandra De Maria:** Writing - review & editing, Writing - original draft, Formal analysis. **Maurizio Bertollo:** Writing - review & editing, Writing - original draft,

Supervision, Methodology, Formal analysis. **Marika Berchicci**: Writing - review & editing, Writing - original draft, Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e23321>.

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