

Investigating the Protective Factors for Perceived Stress Among NCAA Student-Athletes: An Examination of Social Support, Coping Skills, and Mental Toughness

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Guided by Lazarus and Folkman's transactional theory of stress and coping, this study aimed to investigate the individual and combined effects of age, gender, social support, coping skills, and mental toughness on perceived stress among NCAA student-athletes. Participants were 107 college student-athletes aged from 18 and 24 years. The majority of participants were recruited from Division I universities within the American Athletic Conference. Hierarchical multiple regression was employed to assess the incremental variance accounted for by each predictor set. Results showed that higher levels of social support and coping skills were significantly associated with lower levels of perceived stress among college athletes. However, the effect of social support and coping skills on stress dissipated when mental toughness was entered into the model. The final regression model identified mental toughness as the strongest predictor of perceived stress, accounting for 41.7% of the variance in perceived stress scores. The findings suggest that enhancing mental toughness may be an effective strategy for reducing perceived stress among college student-athletes. Furthermore, these results may inform coaches, instructors, athletic departments, and universities in developing targeted and effective intervention programs aimed at improving college student-athletes' mental health.

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Introduction

Literature Review

Perceived stress is the feelings or thoughts individuals' experience regarding their stress levels and their perceived ability to manage such stress (Liu et al., 2021; Varghese et al., 2015). Compared to typical college students, student-athletes face additional stressors such as time management (Wilson & Pritchard, 2005; Young et al., 2022), coping with injuries (Lu et al., 2012; Mayol et al., 2024), and the pressure to succeed in their sport (Lu et al., 2012; Young et al., 2022). More specifically, student-athletes experience three unique sources of perceived stress. The first source stems from their athletic commitments, as college student-athletes are expected to represent their institutions in sports competitions throughout their academic careers while balancing demanding training schedules, team practices, and academic responsibilities (Gayles & Hu, 2009; Humphrey et al., 2000). The second source of perceived stress is associated with scholarships (Humphrey et al., 2000). Some college student-athletes secure full or partial athletic scholarships based on their sports performance and abilities. They are recruited by universities to enhance their sports teams, and the annual renewal of their scholarships hinges on maintaining a certain level of athletic and academic performance. The third source of perceived stress arises from the dual career demands placed on student-athletes (Brown et al., 2020; Heird & Steinfeldt, 2013). Balancing academic and athletic standards is essential for maintaining scholarships and ensuring graduation. This necessitates juggling intense practice sessions, competitions, and travel commitments with academic responsibilities, including exams, assignments, and maintaining a designated Grade Point Average (GPA) level. Given that perceived stress has adverse effects on both physical health (Cohen et al., 1993; McGregor et al., 2008) and mental health (Catabay et al., 2019; Khodami et al., 2022; Slimmen et al., 2022), failure to effectively address sources of stress can adversely affect the well-being of student-athletes which may also ultimately lead to a decline in their sports performance. To prevent negative consequences and proactively enhance college student-athletes' well-being, it is crucial for researchers to identify the underlying buffers and coping skills associated with perceived stress, as well as understand how these protective factors individually and collectively help reduce their stress levels.

Theoretical Framework

Over the past five decades, the Transactional Theory of Stress and Coping (TTSC), has played a pivotal role in advancing research on stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984). Within the TTSC framework, stress is depicted as a transaction between an individual and their environment that is appraised by individuals as taxing or exceeding their resources and threatening their well-being. The TTSC model includes four key constructs: (a) personal and environmental stressor factors, (b) cognitive appraisal, (c) coping strategies, and (d) stress

outcomes (Schuster et al., 2003). According to Lazarus & Folkman (1984), cognitive appraisal plays a crucial role because it determines how an individual interprets a situation or stressor, deciding whether it's seen as stressful, manageable, or irrelevant. Cognitive appraisal consists of primary and secondary appraisals. In the primary appraisal, individuals evaluate a situation or stressor to determine whether it represents a threat, challenge, or is irrelevant. If the situation is perceived as benign-positive or irrelevant, no further appraisal is needed. However, if the individual perceives the situation as a threat, they engage in a secondary appraisal to assess their available resources and coping options for managing both internal and external stressors (Lazarus & Folkman, 1984; Schuster et al., 2003). The available resources mainly include social resources and psychological resources. Once a situation has been appraised as stressful, individuals engage in coping, which encompasses the cognitive and behavioral efforts used to manage stressful demands and serves as a mediator between stress appraisal and adaptation (Lazarus & Folkman, 1984).

Within the TTSC model, mental toughness, social support, and coping efforts appear to be key protective factors in reducing the adverse effects of stress on an individual's mental health. Specifically, mental toughness plays a central role in primary appraisal by influencing how individuals evaluate stressors (Crawford et al., 2021; Levy et al., 2012). As an internal resource, mental toughness refers to the essential quality that enables individuals to flourish in challenging circumstances (Weinberg, 2010). Athletes with high levels of mental toughness tend to appraise stressors as "challenging" instead of "threatening", which leads them to use more adaptive self-regulation strategies compared to those with lower mental toughness (Levy et al., 2012; Mahoney et al., 2014). Additionally, when a situation is perceived as a challenge rather than a threat, athletes are also more likely to engage in task-oriented coping strategies (Kaiseler et al., 2009; Nicholls et al., 2012).

Social support refers to the resources offered to an individual by another person or a group (Cohen & Syme, 1985). The roles of social support can be fulfilled by family, friends, and significant others when individual encounters external stressors from their environment (Thoits, 1995). If an event is appraised as stressful, perceived social support acts as a buffer, mitigating the negative effects of stressors on mental health and physical well-being by providing both tangible aid and emotional comfort, especially when stressors become more intense or persistent (Glanz & Schwartz, 2008). Empirical evidence has confirmed that individuals with stronger social support networks are associated with lower risk for a variety of health concerns, including but not limited to stress, anxiety, depression, loneliness, low self-efficacy, and physical health (Aziz et al., 2023; Dambi et al., 2018; Lee et al., 2020; Lilympaki et al., 2016; Özer et al., 2021; Zhang et al., 2022). For student-athletes, A stronger coach-athlete relationship has been linked to lower depression levels and higher quality of life (Powers et al., 2020). Additionally, greater social support from teammates has been associated with lower levels of depression (Hagiwara et al., 2017).

Coping skills also serve as a key internal resource that helps individuals reduce or tolerate stressful situations and regulate their emotional responses. Multiple stud-

ies have shown that student-athletes' coping skills not only have the potential to improve their sports performance, but also contribute to effectively managing daily stressors and enhancing overall well-being (Estanol et al., 2013; Gardner & Moore, 2004; Hanton et al., 2015; Smith et al., 1995). Additionally, empirical evidence has revealed that college student-athletes with higher levels of coping skills tend to experience significantly lower levels of perceived stress (Surujlal et al., 2013). Over the long term, effective coping is associated with improved psychological well-being, social functioning, and physical health (Biggs et al., 2017).

To date, the existing literature has shown that the TTSC model has been widely applied in sports settings (e.g., Crawford et al., 2021; Fogaça, 2019; Kim & Ahn, 2025; Leis et al., 2022). However, limited studies in sports psychology literature grounded in the TTSC model have examined the effect of mental toughness on an athlete's perceptions of their own stress (Crawford et al., 2021). Moreover, few studies using the TTSC model have simultaneously investigated the individual and combined influences of social support, mental toughness, and coping skills on perceived stress, particularly among National Collegiate Athletic Association (NCAA) student-athletes. This gap is significant because it leaves the relative importance of these protective factors unclear. By examining these factors concurrently, this study seeks to clarify their unique and overlapping effects, which will help determine the hierarchy and interplay of these resources in the stress process. Such an understanding is crucial for developing more targeted and efficient interventions. Accordingly, the purpose of this study was to examine the individual and combined effects of social support, mental toughness, and coping skills, along with personal factors such as age and gender, on perceived stress levels among NCAA student-athletes.

Method

Participants

Participants in this study were 107 athletes aged between 18 and 24 years. Most participants were recruited from Division I universities within the American Athletic Conference (AAC) in the United States with only five college student-athletes coming from Division III institutions. The sample consisted of college student-athletes from a diverse range of sports, including track and field, golf, cross-country, basketball, softball, soccer, baseball, football, volleyball, bowling, cheerleading, diving, lacrosse, and sailing. A summary of the participants' demographics is provided in Table 1.

Procedures and Data Collection

Data collection was conducted from October 2024 through May 2025. After obtaining approval from the university's institutional review board, we contacted university athletic department directors through the AAC office and secured permission from both the directors and the participants. The questionnaire was administered through The Qualtrics Online Survey Platform (www.qualtrics.com). The survey consisted of demographic questions (e.g., gender, GPA, age, classification,

Table 1*Sociodemographic characteristics of participants (N = 107)*

Characteristic	N	%	M (SD)
Age(years)			20.13 (1.55)
GPA			3.58 (0.41)
Gender			
Male	25	23.40%	
Female	82	76.60%	
Division level			
Division I	102	95.30%	
Division III	5	4.70%	
Classification			
Freshman	30	28.00%	
Sophomore	22	20.60%	
Junior	29	27.10%	
Senior	20	18.70%	
Graduate	6	5.60%	
Athletic scholarship			
Full scholarship	43	40.20%	
Partial scholarship	40	37.40%	
No scholarship	24	22.40%	
Race			
Caucasian	58	54.20%	
African-American	8	7.50%	
Hispanic-American	17	15.90%	
Asian-American	4	4.70%	
Other	19	17.80%	

Division level, athletic scholarship, and race) and four assessment scales: perceived stress, social support, mental toughness, and coping skills. To ensure the accuracy of the participants' responses, student-athletes were assured that their responses would be confidential and that their participation was voluntary. Additionally, participants were informed that the data would be used for research purposes only. The completion of the questionnaire typically took the student-athletes between 7 and 12 minutes. Lastly, after completing the survey, participants were eligible to be entered into a raffle for a chance to win a \$25 Amazon electronic gift card. Gift cards were sent electronically to their registered email at the end of the study.

Perceived Stress Scale

The 10-item perceived stress scale (PSS) was employed to evaluate the frequency of individuals' perceived stress experiences over the past month (Cohen & Williamson, 1988). Participants rated the frequency of stress experiences on a 5-point Likert scale (1 = never, 2 = almost never, 3 = sometimes, 4 = fairly often, and 5 = very often). The scale comprises six negatively worded items (e.g., "In the last month, how often have you felt nervous and stressed?") and four positively phrased items (e.g., "In the last month, how often have you felt that things were going your way?"). The total PSS score was calculated by reversing the scores of the four positively phrased items and then summing the scores for all 10 items. Thus, individual scores on the PSS ranged from 10 to 50, with higher scores denoting higher degrees of perceived stress. The PSS internal consistency reliability for this study was .86.

Mental Toughness Scale

We employed the 8-item Mental Toughness Inventory (MTI) to assess mental toughness of the student-athletes (Gucciardi et al., 2015). This scale is unidimensional, with items such as, "I can effectively apply skills or knowledge when faced with challenges." Items were rated on a 5-point Likert scale from 1 (not true of me) to 5 (very true of me). Scores ranged from 8 to 40, with higher scores indicating higher levels of mental toughness. The internal consistency reliability for the MTI in the present study was .79.

Social Support Scale

The Multidimensional Scale of Perceived Social Support (MSPSS) was used to assess college student-athletes' social support (Zimet et al., 1988). The MSPSS consists of three domains: family (e.g., "My family is willing to help me make decisions."), friends (e.g., "My friends really try to help me."), and a significant other (e.g., "There is a special person in my life who cares about my feelings.") with four items per subscale. Participants responded to options ranging from 1 (not true of me) to 5 (very true of me). For each source of social support, the score was obtained by summing the scores across all four items of that source category. Higher values on each of the subscales indicate higher levels of social support. The total perceived social score ranged from 12 to 60. The internal consistency reliability for the MSPSS was .86 in this study.

Coping Skills Scale

The Athletic Coping Skills Inventory-28 (ACSI-28) was adapted to assess athletes' coping skills (Smith et al., 1995). This scale includes seven dimensions: coping with adversity (e.g., "I remain positive and enthusiastic during competition, no matter how badly things are going."), coachability (e.g., "When a coach or manager tells me how to correct a mistake I've made, I tend to take it personally and feel upset."), concentration (e.g., "When I'm playing sports, I can focus my attention and block out distractions."), confidence and achievement motivation (e.g., "I get the most out of my talent and skill."), goal setting and mental preparation (e.g., "On a daily or weekly basis, I set very specific goals for myself that guide what I do."), peaking under pressure (e.g., "I tend to play better under pressure because I think more clearly."), and freedom from worry (e.g., "I worry quite a bit about what others think of my performance."). Each subscale consists of four items. Student-athletes self-rated their skills using a 5-point Likert scale (1 = never, 2 = almost never, 3 = sometimes, 4 = fairly often, and 5 = very often). The composite score ranged from 28 to 140, with higher scores indicating a greater ability to cope with sport-related stressors. The internal consistency reliability for the ACSI-28 in the present study was .87.

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics (Version 29). Descriptive statistics were calculated to summarize the sample's basic characteristics for the following variables: perceived stress scores, total social support scores, scores for each of the three social support subscales (family, friends, and significant others), mental toughness scores, total coping skills scores, and scores for each of the seven coping skill subscales: coping with adversity, coachability, concentration, confidence and achievement motivation, goal setting and mental preparation, peaking under pressure, and freedom from worry. Bivariate correlation analysis was employed to examine the individual relationship between perceived stress and each of the predictors such as social support, mental toughness, coping skills, including their subscales. Finally, a hierarchical multiple regression was utilized to investigate the individual and combined influence of five predictors: age, gender (0 = male; 1 = female), social support, mental toughness, and coping skills on college athletes' perceived stress levels. Four blocks were entered to measure the incremental variance accounted for by each predictor set. The change in R^2 (ΔR^2) was examined to determine the unique contribution of each predictor set beyond the variance accounted for by the preceding blocks. To better assess both the unique and potential overlapping effects of the predictors, variables were entered into multiple regression analysis in order of their relationship strength with perceived stress, ranging from weakest to strongest, as determined by the initial correlation analyses. Specifically, the four blocks were entered in the following order: (1) personal stress factors (age, gender); (2) social support; (3) coping skills; and (4) mental toughness.

To estimate the required sample size for our hierarchical multiple regression analysis, we conducted a power analysis using G*Power. Based on the linear multiple regression with four blocks, fixed model, and R^2 increase, G*Power analysis

indicated that a sample of 68 athletes was required to detect a conventional medium effect size ($f^2 = .15$) with 80% power at a significance level of .05. Our sample size also met a commonly accepted guideline of having at least 10 participants for each predictor variable when conducting a multiple regression analysis. Finally, to ensure the accuracy of the data analysis, the listwise deletion method was employed to handle missing data.

Results

Descriptive statistics for all study variables were presented in Table 2. On average, female athletes reported higher scores for perceived stress and social support, while male athletes scored higher in mental toughness and coping skills. Correlation analyses showed that except coachability, higher score in social support (including its three subscales: family, friends, and significant others), mental toughness, and coping skills (along with its six subscales: coping with adversity, concentration, confidence and achievement motivation, goal setting and mental preparation, peaking under pressure, and freedom from worry) were significantly associated with lower scores of perceived stress (see Table 3). Notably, social support ($r = -.349$) and coping skills ($r = .428$) demonstrated medium effect sizes on perceived stress, whereas mental toughness showed the strongest bivariate correlation ($r = -.57$) with perceived stress, representing a large effect size according to Cohen's (1988, pp. 79-80) guidelines (i.e., $r = .10$ small effect size; $r = .30$, medium effect size; $r \geq .50$, large effect size).

Table 2
Descriptive Statistics for Variables Based on Gender

Variables	Male				Female			
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>No%</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>No%</i>
Perceived stress	25.32	6.25	25	23.36%	28.26	6.13	82	76.64%
Social support	49.95	11.69	21	22.58%	51.65	8.09	72	77.42%
Family	16.95	3.94	21	22.34%	17.59	3.21	73	77.66%
Friend	16.76	4.52	21	22.58%	16.74	3.14	72	77.42%
Person	16.24	5.11	21	22.34%	17.19	3.55	73	77.66%
Mental toughness	33.24	5.03	21	22.83%	31.62	4.93	71	77.17%
Coping skills	102.94	14.79	18	21.95%	95.92	11.12	64	78.05%
Goal setting*	14.75	3.39	20	22.99%	14.46	2.99	67	77.01%
Confidence*	15.95	2.37	20	23.26%	15.24	2.21	66	76.74%
Coachability	15.10	3.01	20	23.26%	15.52	2.62	66	76.74%
Concentration	15.11	2.78	18	21.43%	14.26	2.16	66	78.57%
Coping*	13.85	3.48	20	22.99%	13.51	2.18	67	77.01%
Peaking*	14.30	4.22	20	23.26%	13.23	2.62	66	76.74%
Freedom*	12.05	3.47	20	22.99%	9.51	3.55	67	77.01%

Note. Goal setting* = goal setting/mental preparation; Confidence* = confidence and achievement; Coping* = coping with adversity; Peaking* = peaking under pressure. Freedom* = freedom from worry.

Table 3
Correlation Coefficients

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Perceived stress	1.000													
2. Social support	-.349**	1.000												
3. Family	-.290**	.817**	1.000											
4. Friend	-.323**	.864**	.623**	1.000										
5. Person	-.270**	.826**	.473**	.561**	1.000									
6. Mental toughness	-.561**	.453**	.367**	.387**	.383**	1.000								
7. Total coping skills	-.428**	.359**	.297**	.345**	.273*	.725**	1.000							
8. Goal setting/mental preparation	-.230*	.389**	.326**	.301**	.366**	.409**	.605**	1.000						
9. Confidence and achievement	-.308**	.461**	.407**	.427**	.355**	.628**	.788**	.558**	1.000					
10. Coachability	-.172	.228*	.343**	.211	.069	.406**	.453**	.075	.275*	1.000				
11. Concentration	-.348**	.383**	.336**	.337**	.308**	.675**	.812**	.525**	.655**	.271*	1.000			
12. Coping with adversity	-.443**	.410**	.354**	.335**	.348**	.621**	.802**	.486**	.611**	.282**	.697**	1.000		
13. Peaking under pressure	-.267*	.236*	.163	.230*	.196	.454**	.736**	.313**	.599**	.287**	.627**	.545**	1.000	
14. Freedom from worry	-.212*	-.159	-.241*	-.067	-.112	.229*	.372**	-.121	.062	.044	.079	.150	.026	1.000

Note. **. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed).

Table 4. Hierarchical regression models with varying predictor entry orders

Models with predictors		<i>b</i>	<i>SE</i>	<i>Beta</i>	<i>Sig.</i>	<i>sr</i>	95.0% <i>CI</i> for <i>b</i>		<i>R</i> ²	ΔR^2
							<i>Lower</i>	<i>Upper</i>		
1	(Constant)	9.381	9.804		.342		-10.141	28.904	.109	.109**
	Age	.454	.455	.107	.322	.107	-.453	1.361		
	Gender	4.971	1.690	.317	.004	.316	1.605	8.336		
2	(Constant)	26.890	10.295		.011		6.386	47.395	.241	.133**
	Age	.240	.427	.057	.575	.056	-.610	1.090		
	Gender	5.320	1.573	.339	.001	.338	2.188	8.452		
	Social support	-.268	.073	-.368	.000	-.364	-.414	-.121		
3	(Constant)	38.805	10.711		.001		17.468	60.142	.315	.073**
	Age	.327	.410	.077	.427	.076	-.489	1.143		
	Gender	4.042	1.571	.258	.012	.246	.913	7.171		
	Social support	-.180	.077	-.248	.022	-.224	-.333	-.027		
	Coping skills	-.163	.058	-.305	.006	-.271	-.278	-.048		
4	(Constant)	45.142	10.098		.000		25.021	65.263	.417	.102**
	Age	.144	.384	.034	.708	.033	-.620	.909		
	Gender	3.646	1.462	.232	.015	.221	.732	6.561		
	Social support	-.119	.073	-.163	.110	-.144	-.265	.027		
	Coping skills	.006	.071	.011	.936	.007	-.136	.148		
	Mental toughness	-.671	.186	-.485	.001	-.320	-1.042	-.300		
1	(Constant)	9.381	9.804		.342		-10.141	28.904	.109	.109**
	Age	.454	.455	.107	.322	.107	-.453	1.361		
	Gender	4.971	1.690	.317	.004	.316	1.605	8.336		
2	(Constant)	41.815	9.749		.000		22.399	61.232	.396	.287**
	Age	.211	.379	.050	.579	.050	-.544	.967		
	Gender	3.248	1.429	.207	.026	.203	.402	6.094		
	Mental toughness	-.761	.126	-.550	.000	-.536	-1.013	-.509		
3	(Constant)	45.285	9.874		.000		25.615	64.955	.417	.021
	Age	.149	.377	.035	.694	.035	-.603	.900		
	Gender	3.627	1.433	.231	.013	.223	.773	6.481		
	Mental toughness	-.661	.139	-.478	.000	-.419	-.939	-.384		
4	Social support	-.118	.072	-.162	.106	-.144	-.262	.026		
	(Constant)	45.142	10.098		.000		25.021	65.263	.417	.000
	Age	.144	.384	.034	.708	.033	-.620	.909		
	Gender	3.646	1.462	.232	.015	.221	.732	6.561		
	Mental toughness	-.671	.186	-.485	.001	-.320	-1.042	-.300		
	Social support	-.119	.073	-.163	.110	-.144	-.265	.027		
	Coping skills	.006	.071	.011	.936	.007	-.136	.148		

Note. $p < .01$. ΔR^2 is significant at the .01 level. *sr* = semi-partial correlation coefficient.

In the hierarchical multiple regression analysis, age and gender were entered in Step 1 (Model 1), which significantly accounted for 10.9% of the total variance in perceived stress ($F(2, 77) = 4.701, p = .012$). Age ($b = .454, \beta = .107, p = .322$) did not significantly contribute to explaining the variance, while gender was a significant predictor of stress scores with a medium effect size ($b = 4.971, \beta = .317, p = .004$), suggesting that after controlling for age, female athletes reported perceived stress scores approximately 4.971 points higher than their male counterparts.

In Step 2 (Model 2), social support was added, increasing the explained variance to 24.1% ($F_{(3, 76)} = 8.060, p < .001$). Age remained a non-significant predictor ($b = .240, \beta = .057, p = .575$), while gender continued to significantly predict perceived stress ($b = 5.320, \beta = .339, p = .001$). Social support contributed significantly to the model, demonstrating a medium effect size ($b = -.268, \beta = -.368, p < .001$) and accounting for an additional 13.3% of the variance ($\Delta R^2 = .133$). Specifically, each one-point increase in social support was associated with a .268-point decrease in perceived stress, holding age and gender.

In Step 3 (Model 3), coping skills were entered, further increasing the explained variance to 31.5% ($F_{(4, 75)} = 8.609, p < .001$). Coping skills significantly contributed to the prediction of perceived stress with a medium effect size ($b = -.163, \beta = -.305, p = .006$) and explained an additional 7.3% of the variance ($\Delta R^2 = .073$). Again, age remained a non-significant predictor ($b = .327, \beta = .077, p = .427$), while both gender ($b = 4.042, \beta = .258, p = .012$) and social support ($b = -.180, \beta = -.248, p = .022$) continued to be significant predictors. These results suggest that when controlling for age, gender, and social support, an increase of one-point in coping skills corresponded to a .163-point decrease in perceived stress.

Finally, in Step 4 (Model 4), adding mental toughness increased the total explained variance in perceived stress to 41.7% ($\Delta R^2 = .102, F_{(5, 74)} = 10.592, p < .001$), resulting in the best-fitting model for predicting perceived stress. After controlling for the effects of age ($b = .144, \beta = .034, p = .708$), gender ($b = 3.646, \beta = .232, p = .015$), social support ($b = -.119, \beta = -.163, p = .110$), and coping skills ($b = .006, \beta = .011, p = .936$), mental toughness made a significant and unique contribution to perceived stress, showing a nearly large effect size ($b = -.671, \beta = -.485, p < .001$) and accounting for an additional 10.2% of the variance ($\Delta R^2 = .102$). Notably, while gender was a significant predictor, the effects of both social support and coping skills became non-significant when mental toughness was included and emerged as the strongest contributor to stress reduction in the model, suggesting potential overlap among these predictors in their influence on perceived stress. However, all Variance Inflation Factor (VIF) values (1.045 – 2.296) were below 10, and all tolerance values (.436 – .957) exceeded .10, indicating no evidence of multicollinearity based on Ho's (2014) guidelines (i.e., $VIF \geq 10$ or tolerance $\leq .10$ suggests multicollinearity).

To confirm the overlapping effects of mental toughness in relation to social support and coping skills, we conducted a second hierarchical multiple regression. Predictors were entered in the following four sequential blocks: (1) personal stress fac-

tors (age, gender), (2) mental toughness, (3) social support, and (4) coping skills. As shown in Table 4, gender and mental toughness consistently emerged as significant predictors across the models, while social support and coping skills did not when mental toughness was entered into the model prior to them. These results aligned with our initial speculation. Additionally, among all predictors, mental toughness exhibited the largest semi-partial correlation (sr) values in both hierarchical regression analyses, further indicating that it played the most substantial individual role in buffering perceived stress.

Discussion

Informed by Lazarus and Folkman's transactional theory of stress and coping, the current study examined the individual and combined effects of age, gender, social support, coping skills, and mental toughness on perceived stress levels among college student-athletes. Our data showed that age did not have a significant impact on perceived stress across all four regression models. In contrast, gender consistently emerged as a significant predictor. Consistent with previous studies (Bureau, 2016; Lassiter et al., 2022; Wu et al., 2025), female athletes in our sample reported higher stress levels than male athletes.

Our correlation analyses revealed that all three types of social support (family, friend, and significant others), mental toughness, and six of the seven coping skill subscales (coping with adversity, concentration, confidence and achievement motivation, goal setting and mental preparation, peaking under pressure, and freedom from worry), with the exception of coachability, were significantly and negatively related to perceived stress. This suggests that when considered individually, each of these factors played a significant role in buffering perceived stress among college student-athletes.

Aligning with our correlation analyses and previous studies (Fogaca, 2019; Hefner & Eisenberg, 2009), the hierarchical multiple regression confirmed that social support significantly reduced perceived stress levels. Additionally, our study showed that higher levels of coping skills were significantly associated with lower levels of perceived stress in the third step of the model, which is consistent with the findings reported by Surujlal et al. (2013), further supporting the important roles of social and psychological resources within the TTSC model. However, both social support and coping skills were no longer significant predictors of stress when mental toughness was included and emerged as the strongest contributor to stress reduction in the model. This finding highlights the central role of mental toughness in the TTSC's primary appraisal stage. As a key internal resource, mental toughness influences athletes to appraise stressors as challenges rather than threats. Such positive appraisals promote the use of more adaptive self-regulation strategies compared to those with lower levels of mental toughness.

Additionally, the results from the hierarchical multiple regression indicated a potential overlap among these variables in their influence on perceived stress levels,

suggesting that mental toughness may play a more prominent role than social support and coping skills in reducing stress levels among student-athletes. One possible explanation is that social support and coping skills may be partially embedded within the broader construct of mental toughness. Rather than being entirely separate constructs, they may contribute to the development of mental toughness, which in turn more directly impacts stress. Our study aligns with the findings of Pandian et al. (2022), who found that mental toughness and coping skills are deeply and positively correlated. This conceptual overlap could explain why the predictive power of social support and coping skills diminishes when mental toughness is accounted for in the model. Given the significance and important roles of social support, coping skills, and mental toughness within the TTSC model, future research is warranted to further explore their impacts of interrelationships and conceptual overlaps within this theoretical framework on perceived stress across different populations.

Our findings suggest two implications for future research. First, primary appraisals (e.g., mental toughness) may hold greater importance than secondary appraisals in reducing stress levels, as it serves as an initial filter in how stressors are evaluated. Second, internal resources (e.g., coping skills and mental toughness) may be more influential than external resources (social support) in managing stress because internal resources are relatively stable, controllable, and personally owned, whereas external resources are often temporary, uncontrollable, and dependent on others. To confirm these two implications, further research in this area is warranted.

Practical Recommendations

Our study points to several practical recommendations for reducing perceived stress among college student-athletes. First, our results highlight the role of mental toughness and social support in buffering perceived stress among college student-athletes. Mentally tough athletes can push through adversity and stay composed, enabling them to excel even in high-stress situations (Gucciardi, 2014). Importantly, mental toughness can be developed through both direct and indirect methods. Research has identified several direct methods through which athletes acquire mental toughness. For example, athletes can enhance mental toughness through Psychological Skills Training (PST). PST programs typically involve psycho-educational sessions focused on a set of skills, including motor imagery, attention control, arousal regulation, self-talk, and goal setting. Research by Gould et al. (2002) examining the psychological characteristics of Olympic athletes found that Olympic champions, compared to less successful athletes, are more likely to utilize these psychological strategies, which are often taught by their coaching staff. It is therefore essential for coaches to intentionally integrate mental skills training into regular practice. Techniques such as visualization, goal-setting routines, and pre-competition plans can help student-athletes develop the mental fortitude to navigate challenges and perform optimally (e.g., Land et al., 2021; Vella-Fondacaro & Romano-Smith, 2023). Notably, these training techniques require minimal financial resources while offering substantial benefits. Moreover, they provide a dual benefit, as these psychological strategies are highly transferable and can be effectively applied to manage stressors

beyond the competitive environment, such as academic pressures and personal challenges (Gould & Carson, 2008).

In addition to direct methods, an athlete's family support system appears critical in indirectly developing the mindset and resilience needed for mental toughness. For example, Gould et al. (2002) found that the family environment contributed to the psychological development of Olympic champions through several mechanisms, including: emphasizing improvement over winning, instilling a belief in the child's ability to succeed, and valuing hard work, persistence, and high personal standards. Additionally, Gould and colleagues noted that coaches also indirectly supported psychological development through emphasizing hard work, discipline, and having fun. Moreover, they fostered deep trust and respect from their athletes through encouragement and support. These findings are consistent with those of the current study, emphasizing the role that social support plays in supporting college athletes' ability to manage perceived stress.

Our findings also highlight the critical role of coping skills in managing perceived stress. Importantly, a substantial body of research has demonstrated that mental toughness and coping skills are not independent constructs but are deeply and positively correlated (Pandian et al., 2022). Mentally tough athletes are not individuals who are immune to stress; rather, they are individuals who consistently manage stress more effectively through the deployment of superior coping strategies (Beckford et al., 2016). In fact, a study by Romanová (2021) has found that an athlete's existing coping skills are a significant predictor of their overall level of mental toughness. To strengthen athletes' coping skills for managing perceived stress, coaches are uniquely positioned to teach and model problem-focused coping strategies. They can influence their athletes' coping skills in several ways. For instance, coaches can help athletes anticipate and plan for adversity by creating contingency plans for competition and training demands. They can also facilitate reflection on prior experiences with stress, helping athletes learn from those events to improve their confidence and develop more effective coping strategies. Additionally, coaches can purposefully implement stress into practice to simulate the pressures of competition. The core idea of this approach is to expose athletes to manageable doses of stress in a controlled environment, which builds resilience by allowing them to learn from mistakes in practice rather than in high-stakes competition. Importantly, this coping skills training is both sustainable and cost-effective, as it can be implemented within regular training sessions without requiring additional resources or specialized personnel.

Lastly, our findings indicate that female athletes experience higher levels of perceived stress compared to their male counterparts, a result that emphasizes the significance of the team's motivational climate. Motivational climate is critical, as an athlete's motivation level influences not only their effort but also their capacity to cope with adversity. This is particularly salient given research suggesting that female athletes are often more motivated by social connectedness and a sense of belonging compared to their male counterpart (Sirard et al., 2006). Consequently, teams and coaches who intentionally cultivate a strong sense of togetherness can enhance the motivation of female athletes and bolster their resilience against perceived stress.

This approach is further supported by evidence that team cohesion has a more pronounced effect on performance in female teams than in male teams (Carron et al., 2002). Practical strategies to foster this positive climate include developing a shared team vision, engaging in structured team-building activities, cultivating a strong group identity, preventing the formation of social cliques, and strengthening social support networks (Weinberg & Gould, 2024). On the other hand, although male athletes reported lower levels of perceived stress and tended to rely less on social support for emotional reasons (Crocker & Graham, 1995), we encourage them to actively engage with social support resources to further strengthen their resilience, even if social factors may play a less central role in their motivation compared to female athletes.

Limitations

This study had four limitations. First, this study employed a cross-sectional survey design. All variables were assessed through self-report measures, which may have introduced response bias and social desirability effects. Additionally, although our data indicated that mental toughness was the strongest predictor of perceived stress, we cannot discern the directionality of cause-effect relationship between mental toughness and perceived stress. To determine whether enhancing mental toughness causally reduces stress, future studies should employ longitudinal or experimental research designs. Second, the predominance of female participants and the high proportion of athletes from Division I may limit the generalizability of the findings to student-athlete populations across other NCAA divisions. Future studies should aim to recruit larger and more diverse samples, including a greater number of male athletes Division II and III athletes. Third, although no direct evidence showed that the raffle incentive introduced biased responses, it remains possible that athletes motivated by incentives differ in certain characteristics from those who were not, potentially affecting the generalizability of the findings. Therefore, future research examining and controlling for this potential bias is warranted. Finally, the limited sample size in the current study permitted only a broad examination of social support and coping skills, restricting the ability to analyze specific subtypes of these variables within the regression model. Future research should pursue a more nuanced analysis of how different forms of social support and coping skills influence perceived stress. Specifically, researchers should explore whether specific types of social support are more effective in alleviating stress, whether particular coping skills provide greater benefits, and whether there are potential racial differences in perceived stress.

Conclusion

The design of the current study was guided by the TTSC model. Individually, gender, social support, mental toughness, and coping skills each showed a significant relationship with and impact on perceived stress among college athletes. Collectively, mental toughness was the most influential predictor for perceived stress among these variables. Although social support and coping skills significantly influenced the levels of perceived stress, these two variables were no longer significant pre-

ditors of stress once mental toughness was included in the regression model. The findings not only underscore the importance of mental toughness in buffering college student-athletes' perceived stress, but also provides a direction for broadening the current nomological network in perceived stress research within the TTSC model. Findings suggest that reducing college student-athletes' stress by improving mental toughness may be an effective way to ameliorate perceived stress in student-athletes. Moreover, the findings from this study may be used to guide coaches, instructors, athletic department, and universities in creating specific and effective intervention programs for improving NCAA student-athletes' mental well-being and athletic performance.

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