



Direct and indirect effects of received social support on athletic mental energy: Testing burnout as a mediator among student-athletes

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Abstract

Background: Athletic mental energy is an important sport-specific psychological resource that supports athletes' motivation, focus, confidence, and readiness during training and competition. However, its social and psychological correlates remain underexamined in regional collegiate sport contexts in the Philippines.

Aims: This study examined the statistical associations among received social support, burnout, and athletic mental energy among collegiate student-athletes in Region XI, Philippines, and tested burnout as a possible indirect pathway between received social support and athletic mental energy.

Methods: A quantitative, non-experimental correlational design with mediation analysis was employed. Participants were 280 collegiate student-athletes selected through systematic random sampling. Data were gathered using the Athletes' Received Support Questionnaire, Athlete Burnout Questionnaire, and Athletic Mental Energy Scale. Mediation analysis was conducted using Hayes' PROCESS macro Model 4 in SPSS with 5,000 bootstrap resamples.

Result: Received social support was significantly and positively associated with athletic mental energy ($B = 0.123$, $p = .009$). Burnout was not significantly associated with athletic mental energy ($p = .061$), and the indirect pathway through burnout was not significant.

Conclusion: The findings suggest that received social support is directly associated with higher athletic mental energy among collegiate student-athletes, while burnout did not statistically explain this association. Strengthening responsive support systems may help sustain athletes' psychological readiness in collegiate sport settings.

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INTRODUCTION

Collegiate sport is often celebrated as a space for discipline, excellence, and character development (Hsieh et al., 2025), yet student-athletes are also expected to sustain performance while managing academic responsibilities, training demands, competition pressure, interpersonal expectations, and institutional obligations (Howard et al., 2026). This makes psychological readiness a central concern in sport participation, particularly because athletes are required not only to be physically prepared but also to be mentally available, emotionally regulated, and motivationally engaged. Recent literature has emphasized that collegiate athletes experience distinct psychological stressors linked to academic demands, training load, competition pressure, team dynamics, injury, and performance expectations, which may affect their mental health, daily functioning, and overall readiness for sport participation (Lopes Dos Santos et al., 2020; Young et al., 2023). A recent review on student-athletes also reinforces that psychological and emotional challenges in sport are shaped by multiple pressures surrounding training, academic life, interpersonal relationships, and competition demands (Mao, 2025). Athletic mental energy has therefore emerged as an important sport-specific psychological resource for understanding how athletes sustain readiness, focus, and emotional regulation during training and competition. Rather than referring only to general vitality or physical stamina, athletic mental energy captures an athlete's present psychological state through

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interrelated dimensions such as vigor, confidence, motivation, concentration, tirelessness, and calmness (Lu et al., 2018; Wu et al., 2024).

The importance of athletic mental energy becomes clearer when viewed against the realities of competitive sport. Athletic performance depends not only on physical preparation and technical competence, but also on the capacity to remain focused, composed, confident, and motivated under pressure. Recent work has extended the relevance of athletic mental energy by linking it to athletes' performance, well-being, and optimal psychological states, suggesting that mental energy may function as a positive psychological condition that supports athletes' ability to manage competitive demands (Singh et al., 2024; Yarayan et al., 2025). At the same time, evidence from mental fatigue research shows that diminished cognitive readiness can impair sport-specific physical execution, technical performance, and decision-making, particularly in tasks that require sustained attention and rapid tactical judgment (Gantois et al., 2020; Smith et al., 2016).

Given these demands, it is important to identify the social and psychological conditions that help sustain athletic mental energy among student-athletes. Received social support is a theoretically relevant antecedent because it reflects the actual supportive behaviors athletes obtain from significant others in their sport environment. Unlike general perceptions that support may be available when needed, received support concerns concrete supportive actions that athletes actually experience within their sport context. Recent validation work on the Athletes' Received Support Questionnaire (Freeman et al., 2014) further supports the usefulness of examining received support as a distinct sport-relevant construct, particularly because it captures support that athletes directly obtain rather than support they only believe to be available (Yilin et al., 2023). Athletes may therefore benefit not only from knowing that support exists but also from receiving encouragement, affirmation, advice, and practical assistance during demanding periods.

The Athletes' Received Support Questionnaire conceptualizes received support through emotional, esteem, informational, and tangible dimensions, providing a sport-specific basis for examining how support operates in athletic contexts (Freeman et al., 2014; Yilin et al., 2023). These dimensions are particularly relevant in collegiate sport because student-athletes may rely heavily on coaches, teammates, family members, peers, and institutional personnel as they manage simultaneous academic and athletic demands. Recent collegiate sport evidence also shows that coach-athlete relationships and social support are positively connected with sport-related psychological well-being, reinforcing the importance of examining support as a relational and contextual process rather than as a generic resource (Simons & Bird, 2023). In this sense, received support may be especially meaningful when it is responsive to the athlete's actual situation, such as emotional reassurance under pressure, informational guidance amid uncertainty, or tangible assistance in practical difficulties.

However, previous studies suggest that social support should not be treated as a uniform resource that automatically produces positive outcomes. Evidence indicates that support may show direct, stress-buffering, or inconsistent associations depending on the outcome being examined, the source of support, and the athlete's relationship with the support provider (Hartley & Coffee, 2019). More recent evidence also suggests that the protective value of support may depend on whether athletes identify with the group or person providing that support, showing that support is not only a resource but also a relational experience shaped by belonging and social connection (Murray et al., 2023). These findings justify examining received social support carefully, not as a guaranteed solution, but as a potentially meaningful social condition associated with athletes' psychological energy.

Burnout provides a plausible, though not automatic, explanatory pathway linking received social support to athletic mental energy. Athlete burnout is commonly understood as a sport-specific syndrome involving emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation, and the Athlete Burnout Questionnaire has been widely used to capture these dimensions in athletic populations (Raedeke & Smith, 2001). Reviews of athlete burnout indicate that it is associated with maladaptive sport experiences, reduced motivation, impaired well-being, and potential withdrawal from sport participation, making it a relevant psychological condition to consider when examining athletes' capacity to sustain mental energy (Gustafsson et al., 2017; Woods et al., 2025). Athletic mental energy has also been identified as a positive psychological strength that may buffer the stress-burnout relationship, suggesting that burnout and mental energy may be

connected but not necessarily in a simple linear pathway (Chiou et al., 2020). From a social-contextual perspective, supportive relationships may help reduce burnout by strengthening athletes' coping resources, sense of competence, and emotional security; however, existing evidence also shows that the relationship between social support and burnout is complex rather than automatic (Lu et al., 2016; Madigan et al., 2016; Pacewicz et al., 2019).

Despite these developments, important gaps remain in the literature. Existing studies have more commonly examined social support, burnout, or athlete well-being as separate areas of inquiry, while fewer have tested whether burnout explains the association between received support and athletic mental energy. This gap is especially important in regional and non-Western collegiate sport settings, where student-athletes may experience support, exhaustion, and psychological readiness within distinct cultural, institutional, and resource conditions. To address this gap, the present study aimed to examine the direct statistical association between received social support and athletic mental energy among collegiate student-athletes in Region XI, Philippines, and to test whether burnout functions as a possible mediating pathway in this relationship. The study contributes to sport psychology by extending athletic mental energy research through an integrated social-support and burnout framework. It also offers contextual contribution by generating evidence from a regional Philippine collegiate sport setting, and practical contribution by informing coaches, sports coordinators, and institutions on how responsive support systems may help sustain student-athletes' motivation, focus, confidence, and psychological readiness.

METHOD

Research Design

This study employed a quantitative, non-experimental correlational design with mediation analysis to examine the statistical associations among received social support, burnout, and athletic mental energy among collegiate student-athletes. This design was appropriate because the study aimed to determine whether variations in received social support were associated with variations in burnout and athletic mental energy without manipulating any study condition. Mediation analysis was used to estimate the direct statistical association between received social support and athletic mental energy, as well as the indirect pathway operating through burnout. Given the non-experimental and cross-sectional nature of the study, the terms direct effect, indirect effect, and total effect are used only in the statistical sense of the mediation model and are not interpreted as evidence of causality.

Participant

The participants were 280 collegiate student-athletes enrolled in State Universities and Colleges within the Davao Region (Region XI), Philippines. They were selected because they were actively managing both academic and athletic responsibilities, making them an appropriate population for examining the social support they received, burnout, and athletic mental energy. Participants were drawn from official rosters of eligible student-athletes obtained through coordination with the sports offices of the participating institutions. From a total population of 1,025 eligible tertiary-level student-athletes, 280 participants were selected through systematic random sampling. Eligible participants were those who were currently enrolled, actively training, eligible for intercollegiate competition, and had at least one year of continuous athletic participation. Student-athletes who were inactive, injured during the data collection period, or unwilling to provide informed consent were excluded.

The demographic profile of the participants is presented in Table 1. The sample comprised 280 collegiate student-athletes, with a higher proportion of male participants (57.9%) than female (42.1%). Most participants were in the 18–20 age group (44.3%), followed by those aged 21–23 years (38.6%), while 17.1% were 24 years or older. In terms of sports participation, slightly more than half (56.4%) were engaged in team sports, while 43.6% participated in individual sports. Regarding athletic experience, the largest proportion had three to four years of experience (43.2%), followed by those with one to two years (34.3%) and five years or more (22.5%). For the level of competition, most participants competed at the regional level (42.1%), followed by university or local competitions (36.4%) and national-level competitions (21.5%).

Table 1. Demographic Profile of the Participants (N = 280)

Variable	Category	n	%
Sex	Male	162	57.9
	Female	118	42.1
Age (years)	18–20	124	44.3
	21–23	108	38.6
	24 and above	48	17.1
Type of Sport	Individual Sports	122	43.6
	Team Sports	158	56.4
Years of Experience	1–2 years	96	34.3
	3–4 years	121	43.2
	5 years and above	63	22.5
Level of Competition	University/Local	102	36.4
	Regional	118	42.1
	National	60	21.5

Note: Percentages may not total 100% due to rounding.

Instruments

Data were collected using three standardized self-report instruments. Received social support was measured using the Athletes' Received Support Questionnaire developed by Freeman et al. (2014). The ARSQ assesses received support in sport through emotional, esteem, informational, and tangible support dimensions and was developed specifically to measure support actually received by athletes in sport contexts. Its original validation provided evidence for a four-dimensional structure and supported its use as either a multidimensional or aggregated measure of received support. Meanwhile, burnout was measured using the Athlete Burnout Questionnaire developed by Raedeke and Smith (2001), which assesses emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation. Athletic mental energy was measured using the Athletic Mental Energy Scale developed by Lu et al. (2018), which captures confidence, motivation, concentration, tirelessness, composure, and vigor.

Analysis Plan

Data were analyzed using SPSS. Regression-based mediation analysis was conducted using Hayes' PROCESS macro Model 4 with 5,000 bootstrap resamples. Received social support was specified as the independent variable, burnout as the mediator, and athletic mental energy as the outcome variable. The analysis estimated the direct statistical association between received social support and athletic mental energy, the indirect pathway through burnout, and the total statistical association. The indirect pathway was evaluated using 95% bootstrap confidence intervals, with mediation considered statistically significant when the confidence interval did not include zero. Given the non-experimental and cross-sectional design, the findings were interpreted as statistical associations rather than causal effects.

Ethical Considerations

The study was conducted in accordance with established ethical principles for research involving human participants. Before data collection, the necessary institutional permissions were secured from the participating State Universities and Colleges in Region XI. Participants were informed about the purpose of the study, the voluntary nature of their participation, their right to withdraw at any time, and the confidentiality of their responses. Informed consent was obtained before the administration of the survey. No personally identifiable information was collected, and all responses were coded, stored securely, and used solely for research purposes. The data collection process was coordinated with authorized institutional representatives to ensure that participation did not interfere with the students' academic or athletic responsibilities.

RESULTS AND DISCUSSION

Results

A regression-based mediation analysis was conducted to examine whether burnout statistically explained the association between received social support and athletic mental energy. Given the cross-sectional and non-experimental design, the estimates are interpreted as statistical associations rather than causal effects. As shown in Table 2, received social support was significantly and positively associated with athletic mental energy ($B = 0.123$, $SE = 0.047$, $t = 2.620$, $p = .009$, 95% CI [0.030, 0.215], $\text{Std. } \beta = .154$). Although the standardized coefficient indicates a modest association, the finding suggests that athletes who reported receiving more support also tended to report higher levels of psychological readiness, motivation, confidence, concentration, and sport-related mental energy. This pattern indicates that support may be more closely linked to the positive activation side of athlete functioning than to the mere absence of strain.

In contrast, burnout was not significantly associated with athletic mental energy ($B = 0.050$, $SE = 0.026$, $t = 1.882$, $p = .061$, 95% CI [-0.002, 0.102], $\text{Std. } \beta = .111$). The confidence interval narrowly crossed zero, which means that the association was statistically inconclusive and should not be interpreted as a reliable relationship. Received social support was also not significantly associated with burnout ($B = -0.077$, $SE = 0.105$, $t = -0.730$, $p = .466$, 95% CI [-0.285, 0.131], $\text{Std. } \beta = -.044$). This suggests that within the present sample, receiving support was not strongly associated with lower burnout symptoms. Taken together, the path estimates indicate that the meaningful pattern in the model was the direct link between support and mental energy. In contrast, the burnout-related paths were weak and not statistically supported.

Table 2. Regression Path Coefficients for the Mediation Model (Paths a, b, and c')

Path	B	SE	t	p	95% CI	Std. β
Received Social Support → Athletic Mental Energy	0.123	0.047	2.620	0.009	[0.030, 0.215]	0.154
Burnout → Athletic Mental Energy	0.050	0.026	1.882	0.061	[-0.002, 0.102]	0.111
Received Social Support → Burnout	-0.077	0.105	-0.730	0.466	[-0.285, 0.131]	-0.044

Note: β = unstandardized coefficient; $\text{Std. } \beta$ = standardized coefficient; SE = standard error; CI = confidence interval. Significant at $p < .05$.

The decomposition of effects presented in Table 3 further supports this interpretation. The direct effect of received social support on athletic mental energy remained significant after including burnout in the model ($B = 0.123$, $SE = 0.047$, $t = 2.620$, $p = .009$, 95% CI [0.030, 0.215], $\text{Std. } \beta = .154$). However, the indirect effect through burnout was not significant ($B = -0.004$, $SE = 0.006$, 95% CI [-0.020, 0.006], $\text{Std. } \beta = -.005$), because the bootstrap confidence interval included zero. This means that burnout did not statistically carry the association between received social support and athletic mental energy. In practical terms, the data suggest that supported athletes may feel more mentally energized, but this association did not appear to operate through reduced burnout in the tested model.

Table 3. Direct and Indirect Effects (ab) of Received Social Support on Athletic Mental Energy

Effect	B	SE	t	p	95% CI	Std. β
Direct Effect (Support → Mental Energy)	0.123	0.047	2.620	0.009	[0.030, 0.215]	0.154
Indirect Effect (Support → Burnout → Mental Energy)	-0.004	0.006	—	> .05	[-0.020, 0.006]	-0.005

Note: The indirect effect is non-significant as the confidence interval includes zero.

As shown in Table 4, the total effect of received social support on athletic mental energy was also significant ($B = 0.119$, $SE = 0.047$, $t = 2.529$, $p = .012$, 95% CI [0.026, 0.211], $\text{Std. } \beta = .149$). This confirms that received support had an overall positive association with athletic mental energy before separating the direct and indirect pathways. However, the total indirect effect remained non-significant ($B = -0.004$, $SE = 0.006$, 95% CI [-0.020, 0.006], $\text{Std. } \beta = -.005$), reinforcing that burnout did not explain the support-mental energy association. Overall, the findings suggest that received social support was linked to athletic mental energy primarily through a direct pathway. At the same time, burnout did not function as a meaningful mediator in this cross-sectional sample.

Table 4. Total Effects (c) of Received Social Support on Athletic Mental Energy

Effect	B	SE	t	p	95% CI	Std. β
Total Effect (Support → Mental Energy)	0.119	0.047	2.529	0.012	[0.026, 0.211]	0.149
Total Indirect Effect	-0.004	0.006	—	> .05	[-0.020, 0.006]	-0.005

Note: B = unstandardized effect estimate; SE = standard error; CI = confidence interval; Std. β = standardized effect estimate. The total effect represents the overall association between received social support and athletic mental energy before accounting for burnout. The total indirect effect was not statistically significant because the 95% bootstrap confidence interval included zero.

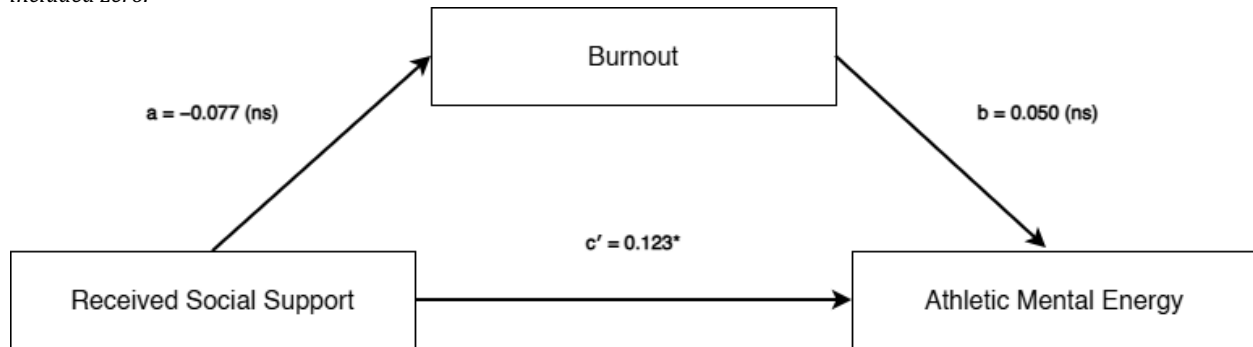


Figure 1. Mediation Model of Received Social Support, Burnout, and Athletic Mental Energy

Note. Values shown are unstandardized path coefficients. Path a represents the association between received social support and burnout; path b represents the association between burnout and athletic mental energy; and path c' represents the direct association between received social support and athletic mental energy after accounting for burnout. The indirect pathway through burnout was not statistically significant. ns = non-significant; $p < .05$.

Discussion

Theoretical Interpretation of the Findings

The findings suggest that received social support may be more strongly associated with the energizing side of athlete functioning than with burnout reduction in this sample. This interpretation is important because social support in sport is often discussed primarily as a protective or buffering resource against stress. However, the present model indicates that support may also operate as a direct psychological resource that strengthens athletes' readiness, confidence, motivation, focus, and composure. Emotional support may help athletes feel understood during demanding periods (Longakit et al., 2024), esteem support may reinforce their sense of competence, informational support may reduce uncertainty in training or competition (Huang & Li, 2025), and tangible support may lessen practical burdens that compete for attention and energy (Li et al., 2026). Recent evidence among collegiate athletes similarly shows that social support is linked with athlete well-being and burnout-related experiences, suggesting that support may shape positive functioning beyond the mere absence of distress (Gray et al., 2024). The relational context of support also matters because athletes may benefit more when support comes from groups or individuals with whom they meaningfully identify (Murray et al., 2023). From this perspective, social support may be better understood as a psychological activation resource rather than merely a protective mechanism. This is especially important in collegiate sports settings where student-athletes not only need protection from negative experiences but also need relational conditions that help them remain confident, focused, and motivated despite overlapping academic and athletic demands.

The non-significant mediating role of burnout also deserves careful interpretation. Rather than suggesting that burnout is unimportant, the finding may indicate that burnout does not function as a simple or immediate pathway between received support and athletic mental energy. Athlete burnout is multidimensional and may develop through long-term exposure to excessive demands, motivational disruption, organizational pressure, insufficient recovery, and strained relationships within sport. Longitudinal evidence supports the idea that burnout is temporally sensitive and may unfold across time rather than appear as an immediate response to support conditions (Glandorf et al., 2024). A recent scoping review of longitudinal athlete burnout studies also reinforces the need to treat burnout as a developing process rather than a fixed psychological state (Dišlere et al., 2025). In this sense, burnout may require more chronic, cumulative conditions before it becomes strongly linked to athletes' current mental energy. Student-athletes may still feel supported and psychologically energized even when some burnout-related symptoms are present, especially when

those symptoms are not severe enough to disrupt their immediate engagement in sport. This supports the idea that received support and burnout may represent partly distinct psychological processes within collegiate sport.

From a theoretical standpoint, the direct link between received social support and athletic mental energy may be explained by the immediate psychological value of support in athletes' daily sport experiences. When athletes receive encouragement, affirmation, guidance, or practical assistance, these forms of support may directly strengthen their sense of connection, competence, confidence, emotional stability, and willingness to continue investing effort in training and competition (Thomas et al., 2026; Liu et al., 2026; Chen et al., 2026; Dohme et al., 2019). In this way, social support does not need to operate only by reducing burnout; it may also function as an immediate energizing resource that helps athletes regulate emotions, interpret demands more positively, sustain attention, and remain mentally available for performance. The non-significant mediating role of burnout should therefore not be interpreted as evidence that burnout is unimportant. Instead, it may suggest that burnout develops gradually through repeated strain, insufficient recovery, and motivational disruption, whereas received social support may produce a more immediate positive effect on athletes' motivation, confidence, focus, and emotional composure.

Implications

The findings imply that collegiate sport programs should not frame support systems only as interventions for athletes who are already distressed or burned out. Support should also be treated as a proactive resource for sustaining mental readiness. Coaches, teammates, sports coordinators, and institutional personnel can strengthen athletic mental energy by ensuring that support is timely, relevant, and responsive to the athlete's actual situation. For example, athletes experiencing performance pressure may benefit from emotional reassurance and esteem-based feedback, while athletes facing tactical confusion may need informational support. Recent synthesis work on athletes' mental health supports this point, showing that social support is beneficial when embedded in meaningful and responsive sport relationships (Luo et al., 2025). This suggests that effective support is not merely about being encouraging; it requires matching the form of support to the athlete's specific psychological and performance-related needs. In regional collegiate sport contexts such as Region XI, this implication is particularly important. Student-athletes often manage academic demands, training expectations, competition responsibilities, and institutional limitations simultaneously. Support systems should therefore be integrated into coach education, athlete welfare programs, and institutional sport management. Recent work on elite athletes further suggests that strong support networks may help protect athletes from burnout when those networks are consistently accessible and psychologically meaningful (Saeed et al., 2025). The findings suggest that athlete support should be viewed not only as a matter of care but also as part of the psychological infrastructure that helps student-athletes remain motivated, focused, confident, and prepared for participation in sport.

Research Contributions

The study contributes to sport psychology by extending the discussion of athletic mental energy into a social-support and burnout framework. Athletic mental energy has been increasingly examined as a positive psychological condition in sport, but its relationship with received social support remains underdeveloped. By focusing on support actually received by athletes, the study adds nuance to the literature, especially because received support may operate differently from perceived support or support availability (Freeman & Rees, 2008; Hartley & Coffee, 2019). The findings, therefore, help clarify that actual supportive behaviors may be directly associated with athletes' psychological energy, even when they do not operate through burnout reduction. The study also contributes contextually by generating evidence from collegiate student-athletes in Region XI, Philippines. Much of the sport psychology literature remains shaped by Western, elite, or highly resourced sport contexts. By examining athletes in a regional setting in the Philippines, the study broadens the empirical base for research on athlete support, burnout, and mental energy. This is important because student-athletes in regional higher education settings may experience varying levels of support and psychological readiness across different institutional, cultural, and resource

contexts. The contribution of the study, therefore, lies not only in testing a mediation model but also in making regional athlete experiences more visible within broader sport psychology discourse.

Limitations

Several limitations should be considered when interpreting the findings. First, the study used a cross-sectional, non-experimental design; therefore, the mediation model should be interpreted as a statistical model rather than as evidence of causal pathways. Although the analysis estimated direct and indirect associations, it cannot establish whether support increases mental energy over time or whether mentally energized athletes are more likely to perceive and report support. Second, the use of self-report instruments may introduce common method bias, social desirability bias, or response style effects, especially because all variables were measured using the same survey format. Third, the study examined received social support, burnout, and athletic mental energy at an aggregated level. This may have limited the ability to detect more specific patterns among different types of support, sources of support, or dimensions of burnout. Emotional, esteem, informational, and tangible support may not influence athletes in the same way, just as exhaustion, reduced accomplishment, and sport devaluation may relate differently to mental energy. Finally, the sample was limited to collegiate student-athletes from State Universities and Colleges in Region XI, which supports contextual relevance but limits broad generalization to other regions, competitive levels, or sport systems.

Suggestions

Future studies may use longitudinal designs to examine whether received support predicts changes in athletic mental energy and burnout over the course of a season. This would provide stronger evidence on whether support functions as an immediate energizing resource, a delayed protective factor, or both. Researchers may also disaggregate support by type and source, such as coach support, teammate support, family support, and institutional support, to determine which forms of support are most strongly related to athletic mental energy. Similarly, future work may examine the separate dimensions of burnout to clarify whether exhaustion, reduced accomplishment, or sport devaluation plays a stronger role in athletes' psychological readiness. Further studies may also consider multilevel designs that account for team climate, coaching style, training load, academic pressure, and institutional resources. Such approaches would better reflect the ecological reality of student-athlete life, where psychological functioning is shaped not only by individual experiences but also by relational and institutional conditions. In the Philippine context, expanding the study to other regions and types of higher education institutions may help determine whether the support-mental energy pattern found in this study is consistent across different collegiate sport environments.

CONCLUSION

This study concludes that received social support is meaningfully associated with higher athletic mental energy among collegiate student-athletes, suggesting that supportive relationships in sport may help sustain athletes' motivation, focus, confidence, and psychological readiness. However, burnout did not statistically account for this association, suggesting that support may function more as a direct energizing resource than as a mechanism that improves mental energy by reducing burnout. These findings underscore the importance of strengthening responsive, athlete-centered support systems within collegiate sports programs, particularly in regional contexts where student-athletes manage overlapping academic, athletic, and institutional demands.

AUTHOR CONTRIBUTION STATEMENT

GJ led the conceptualization, study design, data collection, and primary analysis, and drafted the initial manuscript. IJ contributed to the refinement of the methodology, data interpretation, and critical revision of the manuscript. JL provided support in data analysis, manuscript review, and overall refinement of the final version. All authors read and approved the final manuscript.

AI DISCLOSURE STATEMENT

ChatGPT (OpenAI; version 5.5+) was used solely for editorial support in improving grammar, syntax, and overall readability of the manuscript. No AI tool was used to generate data, conduct

analysis, or make research conclusions. Final responsibility for the accuracy, integrity, and originality of the manuscript rests entirely with the authors.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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