

Predicting Perceived Athletic Performance Through Self-Talk and Sport Confidence in University Footballers

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ABSTRACT

Self-talk and sport confidence are widely regarded as performance-relevant psychological skills, yet evidence from Southeast Asian university sport remains scarce. This cross-sectional correlational study examined the relationship between self-talk, sport confidence, and subjective performance among 30 male UiTM Perlis footballers (aged 18–24), selected purposively. Self-talk was assessed as naturally occurring/automatic self-talk using the Automatic Self-Talk Questionnaire for Sports (ASTQS) (Zourbanos et al., 2009) to distinguish it from structured self-talk interventions. Sport confidence was measured using the TSCI (Vealey, 1986), and subjective performance using the ASPS (Nahum, 2016). Data were analysed in SPSS 27 using reliability analysis, descriptive statistics, Spearman correlation, and regression. Naturally occurring self-talk was unrelated to confidence ($r = .15$, $p = .417$) or performance ($r = -.02$, $p = .923$), but confidence was strongly related to performance ($r = .66$, $p < .001$). Multiple regression showed self-talk became a significant negative predictor of performance once confidence was controlled ($\beta = -.30$, $p = .048$) a suppression effect despite no zero-order association. Sport confidence, rather than automatic self-talk itself, appears to be the main psychological factor linked to performance in this group. The practical implications for confidence-focused psychological skills training are discussed

1. INTRODUCTION

Sport psychology increasingly treats mental skills as indispensable to athletic preparation alongside physical and tactical training (Weinberg & Gould, 2019). Self-talk which is the instructional or motivational verbalisations athletes direct at themselves (Hardy, 2006; Theodorakis et al., 2000) shows a small-to-moderate overall performance benefit in meta-analyses (Hatzigeorgiadis et al., 2011). However, its precise operational pathway remains complex. Self-talk comprises instructional content (narrowing attention to

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task cues) and motivational content (regulating arousal and effort), with differential effects by task type: instructional self-talk typically benefits precision tasks, while motivational self-talk benefits strength and endurance tasks (Hatzigeorgiadis et al., 2011; Theodorakis et al., 2000). Football's fast, highly variable demands do not map cleanly onto either category (Tod et al., 2011), and self-talk's effects depend further on valence and automaticity.

In order to understand how self-talk impacts athletic execution, Bandura's (1997) self-efficacy theory and Vealey's (1986, 2001) sport-confidence framework provide an overarching cognitive-evaluative foundation. Within Bandura's framework, verbal persuasion serves as a primary source of efficacy expectations. Self-talk functions as an internal verbal persuasion mechanism that reinforces an athlete's perceived competence and mastery expectations, directly feeding into situational sport confidence (Vealey, 2001; Zourbanos et al., 2011). Higher sport confidence, in turn, enhances performance by optimizing effort expenditure, persistence under challenge, and task-relevant attentional focus (Sabri & Hamzah, 2025; Lochbaum et al., 2022).

However, this indirect, confidence-mediated pathway can compete with motor control mechanisms described by the constrained action hypothesis (Wulf et al., 2021). The constrained action hypothesis posits that consciously focusing on or verbalizing step-by-step movement mechanics disrupts automatically controlled motor processes in skilled performers, leading to motor degradation (Beilock & Carr, 2001). Furthermore, under high-pressure conditions, automatic self-talk can turn negative or ruminative, heightening somatic anxiety and consuming working memory (Fritsch et al., 2024; Van Raalte et al., 2015; Zinsser et al., 2010). Thus, while self-talk may theoretically build confidence via verbal persuasion, explicit or automatic self-talk verbalisations may simultaneously interfere with motor automaticity or trigger performance disruption.

Applied studies consistently demonstrate that self-talk interventions can raise confidence in football-school athletes and gymnasts (Santos-Rosa et al., 2022). Yet, meta-analytic evidence indicates that while confidence correlates moderately with performance ($r = .25$) (Lochbaum et al., 2022), direct self-talk and performance links remain mixed, as self-talk gains often fail to translate into objective performance improvements (Chang et al., 2012; Harbalis et al., 2008; Yang & Wang, 2023). Limited research appears to have examined self-talk, sport confidence, and subjective performance concurrently among Malaysian university football players (Olisola & Olaitan, 2021; Sabounchi & Sanatkaran, 2015), despite emerging local instrument-validation work in university sports. Whether self-talk's confidence-building potential (Hatzigeorgiadis et al., 2011; Zourbanos et al., 2011) translates into performance gains independent of a direct self-talk–performance effect remains unsettled, particularly within Southeast Asian collegiate sports that are traditionally under-represented in literature dominated by Western and elite samples (Tod et al., 2011). Therefore, this cross-sectional study examines how naturally occurring self-talk, sport confidence, and subjective performance interrelate among UiTM Perlis footballers.

2. METHODS

Sport confidence is conceptualised as a proximal determinant of subjective performance, with naturally occurring self-talk functioning as a potential antecedent that relates to performance directly or indirectly through confidence (Vealey, 2001; Zourbanos et al., 2011), as illustrated in Figure 1.

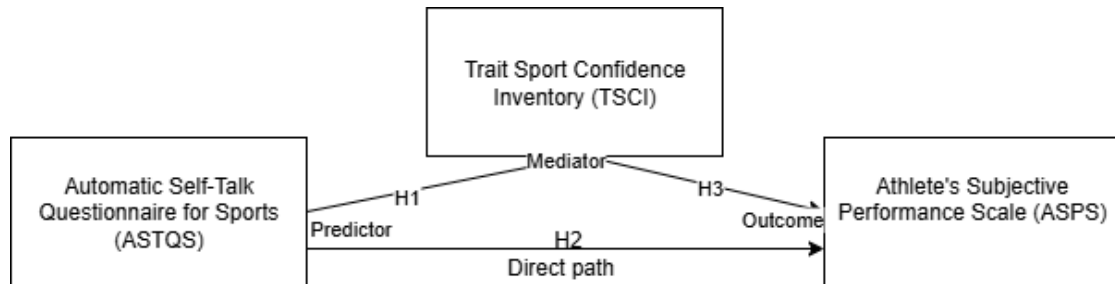


Fig.1. Conceptual framework linking naturally occurring self-talk, sport confidence, and subjective performance.

This study employed a quantitative, non-experimental correlational design utilizing data collected across two time points relative to a single competitive match to capture pre-performance cognitive states and post-performance evaluations (Field, 2018). While questionnaires were administered at two temporal intervals (pre-match and post-match), the analytical framework remains cross-sectional, as variables were evaluated to assess concurrent associations and predictive relationships without experimental manipulation.

The sample comprised ($N = 30$) male football players registered with the UiTM Perlis team for the 2026 competitive season (aged 18–24 years), selected via purposive sampling (Etikan et al., 2016). Inclusion criteria required active registration on the matchday and full completion of all pre and post-match survey.

Instruments

Automatic Self-Talk Questionnaire for Sports (ASTQS)

The Automatic Self-Talk Questionnaire for Sports (ASTQS), developed and validated by Zourbanos et al. (2009), was utilized to evaluate the multidimensional structure of athletes' organic, naturally occurring self-talk in competitive sport environments. Unlike intervention-focused questionnaires that assess structured verbal protocols (Hatzigeorgiadis et al., 2011), the ASTQS specifically captures the frequency of spontaneous cognitive statements that surface during competition (Zourbanos et al., 2009).

The instrument comprises 39 items structured across eight distinct subscales that map onto two higher-order dimensions which is positive self-talk, negative self-talk, and neutral self-talk (Zourbanos et al., 2009). The Positive Self-Talk dimension encompasses four subscales: Psych-up (regulating energy and drive), Confidence (reinforcing belief in execution capabilities), Instruction (directing task-relevant attentional cues), and Anxiety Control (regulating somatic and cognitive arousal) (Zourbanos et al., 2009; Theodorakis et al., 2000). The Negative and Neutral Self-Talk dimension comprises four subscales: Worry (cognitive

anxiety and self-doubt), Disengagement (desire to abandon effort), Somatic Fatigue (perception of physical exhaustion), and Irrelevant Thoughts (distractions unlinked to task execution) (Zourbanos et al., 2009; Van Raalte et al., 2015).

Each item is rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Very Often). Subscale scores are derived by calculating the mean of their respective items, with higher scores reflecting a greater frequency of specific self-talk statements during competition (Zourbanos et al., 2011). Psychometrically, the original validation studies demonstrated strong factorial validity with an eight-factor solution explaining over 50% of total variance and internal consistency values (α) ranging from .78 to .91 across subscales (Zourbanos et al., 2009). In the present study, internal consistency was evaluated separately across both collection points, yielding Cronbach's alpha values of $\alpha = .84$ for pre-match baseline self-talk and $\alpha = .88$ for post-match retrospective recall (Taber, 2018).

Data were screened for none missing values ($N = 30$), normality test was assessed via Shapiro–Wilk, with Spearman correlation used given non-normal post-match performance (Pallant, 2020). Cronbach's alpha assessed reliability ($\alpha \geq .70$) (Taber, 2018). Correlation tested H1–H3 (effect sizes per Cohen, 1988), simple and multiple regression evaluated self-talk's and confidence's predictive contribution to performance, checking linearity, homoscedasticity, and multicollinearity (VIF). Analyses used SPSS version 27, $\alpha = .05$.

Trait Sport-Confidence Inventory (TSCI)

To assess the athletes' underlying self-efficacy and belief in their athletic capabilities, the Trait Sport-Confidence Inventory (TSCI), developed by Vealey (1986), was administered. Grounded in Vealey's (1986, 2001) conceptualization of sport confidence and Bandura's (1997) self-efficacy framework, the instrument evaluates the degree of certainty athletes generally possess regarding their ability to achieve success in competitive sports.

TSCI is a 13-item unidimensional instrument that measures global trait sport confidence across critical competitive scenarios, such as executing essential physical skills under high-pressure conditions, making strategic decisions during gameplay, and maintaining focus when facing competitive adversity (Vealey, 1986, 2001). Participants evaluate each statement using a 9-point Likert scale ranging from 1 (Low Confidence) to 9 (High Confidence) (Vealey, 1986). A distinctive feature of the TSCI is its relative frame of reference: items require athletes to benchmark their personal confidence against the "most confident athlete you know" (Vealey, 1986).

Scoring for the TSCI involves calculating an overall sum (ranging from 13 to 117) or mean score across all 13 items, where higher values represent stronger trait sport confidence (Vealey, 1986; Lochbaum et al., 2022). The inventory possesses well-established psychometric properties, with original validation testing demonstrating high internal consistency ($\alpha = .93$) and strong test-retest reliability ($r = .83 - .86$) across diverse athletic populations (Vealey, 1986). For the current sample, the instrument demonstrated excellent internal reliability with a Cronbach's alpha of $\alpha = .91$.

Athlete Subjective Performance Scale (Asps)

Subjective athletic performance was evaluated using the Athlete Subjective Performance Scale (ASPS), developed by Nahum et al. (2016). Designed specifically for team sport environments, the ASPS addresses the limitations of objective statistical metrics (such as plus-minus indices or success rates) by providing a

psychometrically grounded self-appraisal of an athlete's execution and tactical contribution during a specific match context (Nahum et al., 2016).

The ASPS consists of six items that load onto a single global factor of subjective performance (Nahum et al., 2016). The scale captures three primary dimensions of match performance: General Performance Satisfaction (reflective self-appraisal of skill execution), Perceived Contribution to Team (fulfillment of tactical roles and team-oriented responsibilities), and Performance Under Adversity (maintaining effectiveness during high-pressure match moments (Nahum et al., 2016). Items are evaluated on a 10-point Likert scale ranging from 1 (Very Poor) to 10 (Excellent) (Nahum et al., 2016).

The composite performance score is derived by averaging the six item responses, with higher scores indicating higher self-rated match performance quality (Nahum et al., 2016). Psychometric evaluations of the ASPS indicate single-factor variance explanations between 72% and 83%, alongside high internal consistency ($\alpha = .90 - .96$) and test-retest reliability ($r = .80 - .86$) (Nahum et al., 2016). Furthermore, the instrument has demonstrated criterion validity through significant correlations with objective performance indicators ($r = .43 - .51$, $p < .001$) and coach ratings (Nahum et al., 2016). In this study, the ASPS showed high internal consistency with a Cronbach's alpha of $\alpha = .86$.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics (Version 28.0). Descriptive statistics including means, standard deviations, frequencies, and percentages were calculated to summarize participant demographic characteristics and baseline scores for social support and quality of life dimensions. Due to non-parametric distribution properties, the Mann-Whitney U test was conducted to evaluate gender differences across perceived social support and quality of life measures. Statistical significance for all analyses was established at a two-tailed threshold of $p < .05$.

3. RESULT AND DISCUSSION

The dataset ($N = 30$) contained no missing values or extreme univariate outliers. As detailed in Table 1, the sample comprised male collegiate footballers aged 18 to 24 years ($M = 20.63$, $SD = 1.47$), categorized across three age intervals (18 – 19 years: $N = 8$, 26.7%; 20 - 21 years: $N = 14$, 46.7%; 22 - 24 years: $N = 8$, 26.6%).

Scale reliability testing confirmed strong internal consistency across all administered batteries, exceeding the benchmark threshold of $\alpha = .70$, with ASTQS self-talk (pre - $\alpha = .80$, post - $\alpha = .79$), TSCI sport confidence (pre - $\alpha = .98$, post - $\alpha = .93$), and ASPS subjective performance (pre - $\alpha = .94$, post - $\alpha = .88$).

Table 1. Demographic Characteristics

Variable / Scale	n	%
Age Brackets (Years)		
18–19	8	26.7
20–21	14	46.7
22–24	8	26.6

Table 2. Reliability of instruments

Variable / Scale	Items	Cronbach's α	
Instruments (Pre / Post)		Pre	Post
ASTQS	14	.80	.79
TSCI	13	.98	.93
ASPS	6	.94	.88

Shapiro-Wilk tests indicated that pre-match naturally occurring self-talk ($W = .983, p = .902$), pre-match confidence ($W = .979, p = .796$), post-match confidence ($W = .957, p = .256$), and pre-match performance ($W = .960, p = .314$) met normal distribution parameters ($p > .05$). However, post-match subjective performance deviated significantly from normality ($W(30) = .925, p = .037$).

To maintain methodological consistency, non-parametric Spearman rank correlation coefficients (r_s) were used to evaluate bivariate associations (Pallant, 2020). Descriptively, both sport confidence and subjective performance were higher and exhibited less variability post-match compared to pre-match baseline states (see Table 3).

Table 3. Descriptive Statistics and Normality Diagnostics

Variable	Timepoint	M	SD	W	df	p
Self-Talk (ASTQS)	Pre	41.83	9.02	.983	30	.902
Sport Confidence (TSCI)	Pre	74.10	22.40	.979	30	.796
	Post	95.20	14.34	.957	30	.256
Subjective Performance (ASPS)	Pre	36.93	12.14	.960	30	.314
	Post	51.43	6.62	.925	30	.037

Note. N = 30. M = Mean; SD = Standard Deviation; W = Shapiro-Wilk test statistic.

Correlation Analysis

Bivariate associations were evaluated between pre-match naturally occurring self-talk, post-match sport confidence, and post-match subjective performance (Table 3). Pre-match self-talk showed no significant association with post-match sport confidence ($r_s(28) = .154, p = .417$) or post-match subjective performance ($r_s(28) = -.018, p = .923$). Conversely, post-match sport confidence demonstrated a strong,

positive correlation with subjective performance ($r_s(28) = .660, p < .001$), accounting for 43.6% shared variance ($r^2 = .436$).

Table 4. Spearman Rank Correlation Matrix Between Main Variables

Variable	1	2	3
1. Self-Talk (Pre-Match)	—		
2. Sport Confidence (Post-Match)	.154	—	
3. Subjective Performance (Post-Match)	-.018	.660**	—

Note. N = 30. Spearman r_s values reported. $p < .001$ (two-tailed).

Regression Analysis and Bootstrap Suppression

Linear regression models were evaluated to assess the joint and unique predictive contributions of naturally occurring self-talk and sport confidence to post-match performance. To address sample size boundaries ($N = 30$) and potential non-normality in performance scores, parameter estimates, standard errors, and 95% confidence intervals were generated using bias-corrected and accelerated (BCa) bootstrapping with 5,000 resamples (Field, 2018).

Prior to model interpretation, linear regression assumptions were verified. Standardized residuals for the multiple regression model met normal distribution criteria ($W = .967, p = .462$), and visual inspection of normal P-P plots confirmed linear alignment along the diagonal reference line. Furthermore, multicollinearity diagnostics revealed low Variance Inflation Factors ($VIF = 1.04$), well below the conservative threshold of 5.0, confirming the independence of the predictor variables.

Simple linear regression models indicated that pre-match self-talk alone did not significantly predict post-match subjective performance ($R^2 = .028, F(1, 28) = 0.82, B = -0.29, p_{boot} = .373$). Conversely, post-match sport confidence alone significantly predicted performance ($R^2 = .386, F(1, 28) = 17.62, B = 0.62, p_{boot} < .001$), accounting for 38.6% of performance variance. When entered simultaneously in the multiple regression model, the combined predictors accounted for 47.0% of total performance variance ($R^2 = .470, Adjusted R^2 = .431, F(2, 27) = 11.99, p < .001$). Within this joint model, sport confidence remained a robust positive predictor of performance ($\beta = .677, B = 0.68, Boot SE = 0.14, p_{boot} < .001, 95\% BCa CI = 0.39, 0.97$).

Crucially, after controlling for sport confidence, pre-match naturally occurring self-talk emerged as a statistically significant negative predictor of subjective performance ($\beta = -.295, B = -0.51, Boot SE = 0.24, p_{boot} = .048, 95\% BCa CI = -0.99, -0.03$). This has occurred due to self-talk exhibited no zero-order association with performance in bivariate correlation testing ($r_s = -.018$) but became a significant negative predictor in the presence of confidence, this statistical pattern reflects a classic suppression effect (Pandey

& Elliott, 2010). This indicates that when controlling for an athlete's level of sport confidence, higher frequencies of naturally occurring self-talk are associated with lower self-rated match performance. Full regression parameters and bootstrap estimates are summarized in Table 5.

Table 5. Simple and Multiple Linear Regression Models with BCa Bootstrapping Predicting Subjective Performance

Model / Predictor	R ²	B	Boot SE	β	t	pboot
Simple Models						
Self-Talk (Pre)	.028	-0.29	0.32	-.169	-0.91	.373
Confidence (Post)	.386	0.62	0.15	.621	4.20	< .001
Multiple Model	.470*					< .001
Constant	—	1.84	0.94	—	1.96	.061
Self-Talk (Pre)	—	-0.51	0.24	-.295	-2.07	.048
Confidence (Post)	—	0.68	0.14	.677	4.75	< .001

Note. N = 30. BCa = Bias-Corrected and Accelerated bootstrapping based on 5,000 resamples. Dependent Variable: Post-match Subjective Performance (ASPS).

3.2 Discussion

The primary objective of this study was to examine the predictive capacity of pre-match naturally occurring self-talk and sport confidence on perceived athletic performance among collegiate football players competing in a varsity context. By operationalizing performance through subjective self-appraisals, this investigation clarified how pre-competitive cognitive states predict self-rated match execution in open-skill team sports. Overall, the empirical findings identify sport confidence as the central positive predictor of perceived athletic performance, while revealing a statistically significant negative suppression effect for naturally occurring self-talk once sport confidence is controlled. A critical methodological boundary when interpreting these findings involves distinguishing between naturally occurring (automatic) self-talk and structured (deliberate) self-talk interventions (Zourbanos et al., 2021). The present study evaluated organic self-talk using the ASTQS, which captures spontaneous internal dialogue that surfaces naturally before and during match play.

In contrast, a substantial portion of the established literature including meta-analytic work and contemporary intervention trials demonstrating small-to-moderate performance benefits (Hatzigeorgiadis et al., 2011; Latinjak et al., 2023) evaluates structured interventions where athletes are systematically trained to recite pre-selected instructional or motivational cues. These two forms of self-talk differ fundamentally in intentionality, cognitive regulation, and functional mechanics (Fritsch et al., 2024;

Theodorakis et al., 2020). While structured interventions serve as intentional cognitive strategies to direct attention and manage physiological arousal, automatic self-talk in non-intervention settings often reflects an athlete's implicit affective state, competitive anxiety, or internal self-evaluations (Van Raalte et al., 2021). Consequently, positive outcomes documented in structured intervention studies (Santos-Rosa et al., 2022) cannot be directly generalized to spontaneous self-talk, which may lack functional structure and remain vulnerable to negative valence, self-doubt, or intrusive self-monitoring under match pressure (Fritsch et al.).

The empirical results strongly reinforce the theoretical frameworks of Bandura (1997) and Vealey (1986, 2023), positioning sport confidence as the primary proximal predictor of perceived athletic performance. Post-match sport confidence demonstrated a robust, positive correlation with perceived performance ($r_s = .660$, $p < .001$), explaining 38.6% of single-predictor variance and remaining the dominant positive predictor in the multiple regression model ($\beta = .677$, $B = 0.68$, $p_{boot} < .001$). These findings confirm recent contemporary sport psychology evidence indicating that an athlete's certainty in their execution capabilities directly drives self-rated match execution in high-demand, fast-paced collegiate team sports (Lochbaum et al., 2022). High sport confidence fosters adaptive behavioral persistence, efficient effort deployment under challenge, and resilient attentional focus during match play.

Conversely, the relationship between naturally occurring self-talk and perceived athletic performance proved far more complex. Although pre-match self-talk exhibited no zero-order association with performance ($r_s = -.018$, $p = .923$), it emerged as a statistically significant negative predictor once sport confidence was controlled in the multiple regression model ($\beta = -.295$, $B = -0.51$, $p_{boot} = .048$). This statistical pattern represents a classic suppression effect (Pandey & Elliott, 2010), indicating that when holding an athlete's confidence level constant, engaging in more frequent pre-match automatic self-talk is associated with lower perceived performance ratings. This negative predictive pathway is theoretically accounted for by the constrained action hypothesis (Wulf et al., 2021). Football execution relies heavily on implicit motor control, rapid decision-making, and fluid movement execution. When confident athletes engage in excessive pre-competitive verbalisation or internal self-guidance, they risk shifting motor control from automatic processing to explicit, step-by-step conscious monitoring (Beilock & Carr, 2021; Wulf et al., 2021). This conscious interference disrupts motor automaticity, increases internal self-focus, and impairs subjective performance execution during open-skill team play. Thus, while self-talk is often conceptualised as an efficacy-building mechanism, unguided automatic self-talk may simultaneously induce cognitive-motor disruption during match play.

Beyond individual psychological traits, alternative situational, contextual, and match dynamics must be recognized as influential drivers of athlete self-talk, confidence, and perceived performance self-evaluations. Match conditions with such as facing a high-stakes opponent, scoreline deficits, or tactical breakdowns and exert strong environmental influences on cognitive states (Van Raalte et al., 2021). High-pressure match scenarios can alter the content of automatic self-talk (shifting instructional cues toward worry or disengagement) while simultaneously suppressing situational confidence. Furthermore, positional demands for example defenders versus strikers and critical game events which is between scoring errors or missed tactical assignments inevitably shape post-match performance self-ratings, independent of baseline psychological profiles (Sabri & Hamzah, 2025).

From an applied sport psychology perspective, these findings indicate that practitioners working with collegiate football teams should prioritize targeted confidence-building protocols such as systematic mastery experiences, performance modeling, and structured efficacy reinforcement over general recommendations to increase unguided verbal self-talk. When self-talk strategies are implemented, they should be designed as structured, brief cue-word interventions practiced deliberately during training to avoid the conscious motor interference associated with spontaneous self-verbalisation during competition.

Several methodological limitations should be considered when interpreting these findings. First, the sample size ($N = 30$) was drawn from a single varsity football team roster, which limited statistical power for complex multi-variable modeling and constrained generalizability across different athletic populations and competitive tiers. Second, athletic performance was operationalized using a subjective self-report instrument (ASPS) rather than objective match-tracking indicators (e.g., pass completion rate, successful tackles, distance covered), introducing potential common method variance. Future research should combine longitudinal multi-match tracking with objective performance metrics alongside psychological inventories to further validate these structural relationships.

LIMITATIONS

Without a doubt, this study provides valuable insights into how pre-match self-talk and sport confidence predict perceived performance, several methodological constraints should be considered. First, the small sample size ($N = 30$) drawn from a single male varsity football team limits statistical power for multivariate modeling and restricts generalizability across female teams, elite cohorts, or individual sports. Future research should recruit larger, multi-team samples across diverse competitive levels to enhance statistical power and external validity.

Second, assessing athletic performance via a subjective self-report scale (ASPS) introduces potential common method bias and attributional errors influenced by match outcome. Future studies should incorporate objective metrics such as pass completion rates, tracking data, or coach evaluations alongside subjective scales to validate findings against physical execution. Third, evaluating a single competitive match leaves results vulnerable to game-specific dynamics (for example: opponent strength, and tactical roles). Implementing longitudinal multi-match designs paired with hierarchical linear modeling (HLM) will allow future researchers to separate stable psychological traits from game-to-game fluctuations.

Finally, examining self-talk as an overall composite score may aggregate distinct functional subscales (instructional vs. worry-based statements) that exert opposing effects on attentional focus and motor control. Future investigations should examine individual ASTQS subdimensions independently within structural models to clarify how specific self-talk functions interact with sport confidence during open-skill play.

4. CONCLUSION

This study evaluated the predictive roles of pre-match naturally occurring self-talk and sport confidence on perceived athletic performance among UiTM Perlis football players. The empirical evidence demonstrates that sport confidence, rather than automatic self-talk frequency, serves as the primary psychological correlate of perceived match performance. Although naturally occurring self-talk showed no zero-order association with performance or sport confidence, it emerged as a statistically significant negative predictor once sport confidence was controlled—reflecting a suppression effect consistent with motor automaticity disruption described by the constrained action hypothesis.

Given the sample size boundaries ($N = 30$), this suppression pattern should be treated as a tentative empirical baseline subject to confirmation in larger cohorts. Nevertheless, these findings highlight a critical applied insight that spontaneous, unstructured self-talk should not be assumed to function as an inherently performance-enhancing strategy during competition. Rather, the functional value of self-talk appears contingent upon its intentional structure, valence, and strategic application rather than its raw frequency. Consequently, psychological skills training programs for collegiate team-sport athletes may yield more consistent performance gains by prioritizing targeted confidence-building interventions, utilizing structured, brief cue-word self-talk protocols as a supportive tool rather than a standalone strategy. Importantly, the knowledge-mapping findings highlight an emerging consensus in the literature that PNE is optimally conceptualized when integrated within multimodal rehabilitation programs rather than

delivered as a standalone intervention. The strong thematic co-occurrence of psychological terms with strength training, neuromuscular re-education, and neurocognitively informed rehabilitation approaches appears to better address the complex interplay between physical capacity, perception, and behavior that characterizes post-ACLR recovery. These integrated strategies align with contemporary rehabilitation models that emphasize neuroplasticity, motor learning, and psychological readiness as key components of successful RTS.

Despite the growing interest in PNE, substantial gaps remain in the literature, particularly the lack of ACL-specific randomized controlled trials and standardized PNE protocols. Future research should prioritize long-term, well-designed studies that evaluate both psychological and RTS outcomes in recreational athletes, and examine how PNE can be optimally tailored and timed within rehabilitation pathways. Addressing these gaps will be essential for advancing evidence-based, psychologically informed ACLR rehabilitation and improving long-term sport participation and recovery outcomes.

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6. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

7. AUTHORS' CONTRIBUTION

All authors and co-authors have contributed, read, revised, and agreed to publish this manuscript.

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