

Psychometric validation and implementation of a Psychological Skills Training (PST) module for rugby coaches in Malaysia

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Abstract

Background: Rugby, is a high-intensity contact sport, that places high physical and mental demands on athletes. The benefits of psychological skills training (PST) are well recognised, but Malaysia lacks a grassroots and developmental training infrastructure that integrates PST. This study aimed to develop a PST module for Malaysian rugby coaches and evaluate its primary usability and psychometric parameters. **Methods:** The study utilised a quantitative cross-sectional approach and purposive sampling to collect data from 109 rugby coaches in schools, communities, and teams at the state level. A 30-item questionnaire was created to assess three different constructs of usability: perceived usefulness, user satisfaction, and ease of implementation. Content and visual validation was performed by panels of experts, while reliability and structural validity were assessed using Cronbach's alpha, KMO, EFA, and CFA. **Results:** The instrument attained excellent internal reliability ($\alpha = 0.878$), with the subscales Satisfaction (0.762) and Ease of Use (0.687) achieving acceptable thresholds. Valid sampling adequacy was established (KMO = 0.722). A six-factor EFA solution cumulatively explained 46.4% of variance, with item loadings from 0.600 to 0.770. CFA corroborated the instrument's structural validity, confirming the psychological skill domains were distinct yet interrelated. **Conclusions:** The PST module captures the fundamental aspects of mental training goals, self-talk, imagery, breathing, and concentration, making it both statistically reliable and conceptually robust. Mentally, the module is reliable and assists coaches by offering an organized yet simple and research-based method to incorporate psychological preparation into training. It has theoretical implications by situating PST within Malaysian rugby, as well as practical implications for coaching and athlete development. Additional research is needed on the PST module's longitudinal effects, cross-cultural adaptations, and digital accessibility.

Keyword: Sport psychology assessment, Exploratory factor analysis, Confirmatory factor analysis, Instrument reliability and validity, Usability evaluation

Introduction

Rugby is considered one of the most physically demanding contact sports due to the high collision intensity, tactics, and endurance required alongside equally important psychological factors (Vaajala et al., 2025). Sustained psychological control alongside emotional regulation, self-confidence management, and adaptability to stress during dynamic, often chaotic game scenarios is a constant requirement (Brođani et al., 2023; Carson et al., 2023). In Malaysia, rugby is developing at school, university, and national levels. However, there is often an imbalance between the focus on physical and technical training and the psychological preparation of athletes (Gryphon et al., 2024; Mellalieu et al., 2023). Recent studies have focused on mental attributes, and found that attention control, emotion regulation, self-confidence, and resilience are necessary to achieve and maintain peak performance in competitive sport (Huang, 2023; McAuliffe et al., 2022).

Performance in competitive sport is not solely down to talent, but can also be achieved through systematic, structured interventions. Psychological skills training (PST) is an established method that utilises goal setting, imagery, self-talk, and relaxation to cultivate and focus on specific attributes (Edwards & David Edwards, 2012; Park & Jeon, 2023). There is evidence that PST improves not only athletic performance but also psychological well-being, making it an integral part of the developmental approach for athletes (Wang et al., 2025). Despite the extensive evidence supporting the use of PST, it is little utilised in rugby coaching, particularly at the grassroots and developmental levels. Often, coaches do not have a certificate in sport psychology and therefore use disjointed and informal techniques, that end in preparation (Grobelaar, 2018; Nazarudin et al., 2025). In addition, none of the existing psychological skills training (PST) resources are applicable to rugby in Malaysia. Previous local research has focussed on the use of psychological techniques in Malaysian rugby players (Ismail et al., 2018). These studies were purely descriptive in nature and did not result in the development of coherent, reliable, or validated modules for coaches. Even though there is international

literature that recognises the importance of PST in rugby (Grobbelaar, 2018). These models have not been newly conceptualised for Malaysia. The lack of such resources prevents coaches from integrating psychological preparation into their routines in a systematic and evidence-based manner. To address this gap, the present study aimed to develop and validate a contextually relevant PST module for rugby coaches in Malaysia. The study assessed three key dimensions of usability: perceived value, user satisfaction, and ease of implementation. A 30-item questionnaire was created for these three dimensions and data was collected from 109 rugby coaches at different levels of competition.

In addition to ease of use, expert psychometric validation was also conducted through content and face validation, internal consistency assessment (Cronbach, 1951), and exploratory and confirmatory factor analyses (EFA and CFA) for structural validity. This research aims to provide a responsive, evidence-based, and tailored instrument for rugby coaching in Malaysia through the systematic evaluation of the practical utility of the module and its psychometric rigour. It is anticipated that the utilisation of the results will advance comprehensive athlete development models, improve the focus on mental training in rugby, and add to the literature on applied sport psychology in dynamic collision sports (Gryphon et al., 2024; Mellalieu et al., 2023).

Material & methods

In this study, a quantitative and cross-sectional approach was used to determine the reliability and practical relevance of a newly developed psychological skills training (PST) module for rugby coaches. In the field of sport psychology, cross-sectional surveys are often used to evaluate educational interventions based on perceptions and other psychometric characteristics (Cotterill et al., 2022; Dohme et al., 2019). The study focused on three specific constructs: perceived usefulness, user satisfaction, and ease of implementation in relation to usability within a structured and psychometrically guided questionnaire (Davis, 1989; Robert F. DeVellis, 2017).

Participants

A purposive sample was drawn to select 109 rugby coaches across Malaysia who are working as coaches at school, community, or national level. Each of the selected coaches had at least one year of experience and was familiar with basic psychological concepts (Kassim et al., 2022). To avoid bias, coaches without certification or relevant knowledge were excluded. Participants completed the instrument after attending structured pre-meeting workshops aimed at creating a common understanding of the content and scope of the PST module. The workshops provided extensive, friendly interactions with and between participants and facilitators. The sample size was in line with the recommended range of 100 to 300 participants for testing internal consistency with Cronbach's alpha in relation to the analysis (Bonett, 2002; Bujang et al., 2018; Yalçın et al., 2019).

Instrumentation

The questionnaire for the primary instrument was developed to capture a coach's perspective on the PST module and the measurement of perception. The questionnaire was modified and developed based on the literature on the psychological and developmental framework for adolescent athletes and the assessment of psychological skills (Dohme et al., 2019; McCarthy et al., 2010). The structure of the questionnaire comprised Section A, Usefulness (10 items), which explored the usefulness of the module in terms of its impact on performance and coaching practise, as well as its effectiveness in improving a coach's performance. Section B, User Satisfaction (10 items), assessed users' experience of interacting with the module in terms of enjoyment, perceived value, and likelihood to recommend the module to others, while Section C: Each item was based on a 4-point Likert scale with response options: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree. This structure enabled participants to clearly express their agreement or disagreement. In order to achieve both clarity of content and conceptual agreement, the instrument was validated by three experts in sports psychology and rugby coaching from an academic institution.

Results

The instrument in question showed internal consistency reliability with a Cronbach's alpha of 0.878, indicating that the 30 items actually measured the intended constructs (5.9). When analysed by construct, the alpha values were all in the acceptable to good range: section A usefulness (0.827), section B satisfaction (0.762), and section C ease of use (0.687) (Table 1). With these results, and in contrast to the information provided above on newly developed instruments, the score of 0.60 is considered acceptable when relevance theory and practicality are advanced (Hair, 2019; Nunnally & Bernstein, 1995). These results suggest that the module is organised, reliable and suitable for assessing psychological skills training for rugby coaches.

Table 1: Summary of Reliability Analysis (Cronbach's Alpha)

Construct / Section	Cronbach's Alpha	Number of Items
Section B: Usefulness	0.827	10
Section C: Satisfaction	0.762	10
Section D: Ease of Use	0.687	10
Overall Scale (B + C + D)	0.878	30

To check the adequacy of the data set for the factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was tested. The overall KMO value (Table 2) was 0.722, above the generally accepted criterion of 0.70, which is favourable for exploratory factor analysis (EFA) (Gie Yong & Pearce, 2013; Hair, 2019). At the level of specific measurement, KMO scores ranged from 0.504 to 0.873, with the majority of items being at least acceptable or better. Outstanding items such as D1 (0.873), B1 (0.860), and C9 (0.820) showed high individual sample adequacy, underpinning their representative role in the scale. Some other items, such as C2 (0.504), C5 (0.553), and D8 (0.573), had adequacy scores below the minimum threshold. These sample values were retained due to their conceptual importance as well as their practical significance in relation to coaching and training psychology. Taken together, the results allow the EFA to be used to a sufficient extent and at the same time confirm that the instrument has the structural elements required for subsequent refinement and validation. There is a sufficient basis for subsequent improvement and use in relation to psychological skills training for rugby coaches.

Table 2: Kaiser-Meyer-Olkin measure of sampling adequacy:

Code	Questionnaire Items	Value
B1	The PST module helps me become more effective.	0.860
B2	The PST module is useful to me.	0.819
B3	The PST module makes it easier for me to learn about psychological skills training.	0.724
B4	The PST module helps me improve my psychological skills.	0.746
B5	The PST module meets my needs as a coach.	0.686
B6	The goal-setting activity component is useful to me.	0.791
B7	The self-talk activity component is useful to me.	0.711
B8	The imagery training component is useful to me.	0.672
B9	The breathing control training component is useful to me.	0.630
B10	The concentration training component is useful to me.	0.818
C1	The PST module functions as I expected.	0.794
C2	The PST module makes me feel satisfied.	0.504
C3	I feel the need to own the PST module.	0.680
C4	I am satisfied using the PST module.	0.641
C5	I would recommend the PST module to others.	0.553
C6	The goal-setting activity component is satisfying to me.	0.682
C7	The self-talk activity component is satisfying to me.	0.635
C8	The breathing control activity component is satisfying to me.	0.725
C9	The concentration training component is satisfying to me.	0.820
C10	The imagery training component is satisfying to me.	0.721
D1	The PST module is easy to understand overall.	0.873
D2	The PST module is simple to use overall.	0.785
D3	The PST module is user-friendly.	0.767
D4	The PST module is easy to adapt in practice.	0.619
D5	I can learn to use the PST module quickly.	0.591
D6	The goal-setting activity component is easy to implement.	0.700
D7	The self-talk activity component is easy to implement.	0.657
D8	The breathing control activity component is easy to implement.	0.573
D9	The concentration training component is easy to implement.	0.780
D10	The imagery training component is easy to implement.	0.652
	KMO	0.722

An exploratory factor analysis (EFA) was conducted for the PST module assessment instrument using principal axis factorisation. The results of the factor extraction are summarised in Table 3 and visualised in Figure 1. According to Kaiser's criterion (eigenvalue > 1), a total of six factors were retained. These components had eigenvalues between 6.607 and 1.142 and accounted for a total of 46.40% of the variance. In particular,

factor 1 accounted for the largest proportion of variance (22.02%), followed by factor 2 (6.62%), factor 3 (5.04%), factor 4 (4.63%), factor 5 (4.28%), and factor 6 (3.81%), confirming that the instrument captures several relevant constructs of psychological skills training.

Table 3: Total Variance Explained by Extracted Factors

	F1	F2	F3	F4	F5	F6
Eigenvalue	6.607	1.985	1.512	1.389	1.284	1.142
Variability (%)	22.023	6.616	5.041	4.631	4.281	3.808
Cumulative %	22.023	28.639	33.680	38.311	42.592	46.400

Figure 1 also contains the scree plot, which confirms the six-factor solution, whereby a clear kink can be seen after the sixth component, which indicates that the remaining factors have little to no additional value. The combination of the eigenvalue approach and the graphical scree test justifies the retention of the model with six factors. Overall, these results empirically confirm the hypothesis of the multidimensionality of the instrument and provide a solid basis for further validation procedures such as factor rotation and confirmatory analysis.

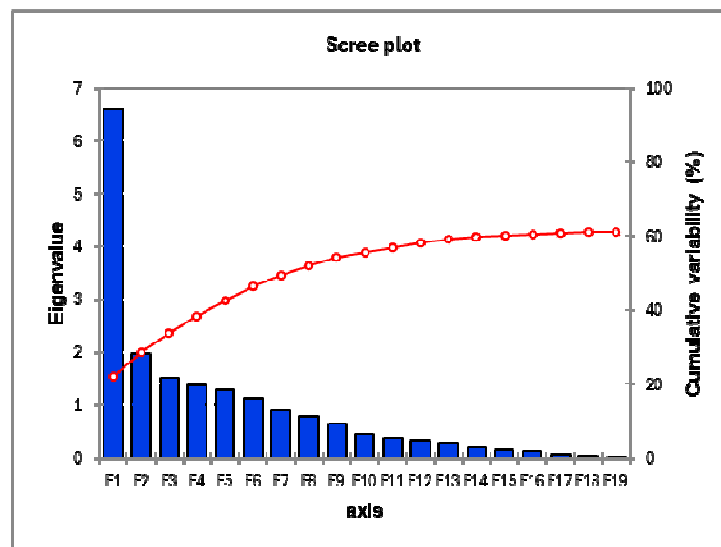


Figure 1 : Scree Plot Showing Eigenvalue Distribution by Factor

The structure was further interpreted using EFA with orthogonal varimax rotation, as shown in Table 4, which illustrates the percentage of variance accounted for by each of the six factors considered after post-rotation. The sum of the percentage of variance accounted for by the factors identified in the analysis shows that the components obtained from the factor structure account for the majority of the variance. In the order of factor loadings, D1 accounted for the largest proportion with 10.88%, followed by D5 with 9.57% and D2 with 8.41%. The remaining components were D3 (5.45%), D4 (5.70%) and D6 (6.39%). These six factors capture a total of 46.4% of the total variance, which is still reasonable enough to be considered optimal for the region bounding these thresholds, considering new instruments of multidimensional nature applied in practise (Hair, 2019).

Table 4: Percentage of variance after Varimax rotation:

	D1	D2	D3	D4	D5	D6
Variability (%)	10.878	8.405	5.454	5.702	9.572	6.389
Cumulative %	10.878	19.283	24.737	30.439	40.011	46.400

The rotated factor matrix was used to determine the relationship between the items and the associated constructs (Table 5). Provided that the loading criterion was at least equal to or greater than 0.60, 13 items were selected based on their loading among six factors, that comprised the various characteristics of the Psychological Skills Training (PST) module. These factors included: Factor 1, Perceived usefulness (B1, B6, B7, B10; loadings: 0.606 to 0.727), Factor 2, User satisfaction (C1, C6, C7; loadings: 0.609 to 0.770), Factor 3, Understanding and clarity (C2, 0.614), and Module structure (B8, 0.768) as Factor 4. B2 and D2 were included in Factor 5 Critical reflection with loadings of 0.636 and 0.600, respectively. Finally, B3 and B5 were included

in Factor 6, Ease of Use, with loadings of 0.651 and 0.600 respectively. To summarise, the values of the item loadings are between 0.600 and 0.770, which indicates a significant item-factor correlation, that confirms the construct validity of the instrument for the subsequent confirmatory analysis.

Table 5: Factor pattern after Varimax rotation

	D1	D2	D3	D4	D5	D6
B1	0.606	0.172	0.022	0.150	0.313	0.315
B2	0.201	0.210	-0.029	0.197	0.636	0.189
B3	0.363	0.078	-0.103	-0.004	0.113	0.651
B4	0.274	0.144	0.056	0.238	0.029	0.536
B5	0.099	0.000	0.306	0.070	-0.013	0.600
B6	0.705	0.198	0.009	-0.030	-0.011	0.229
B7	0.689	0.018	0.179	0.284	0.047	0.021
B8	0.292	0.025	0.059	0.768	0.020	0.055
B9	0.291	0.019	-0.078	0.472	0.380	0.060
B10	0.727	0.056	-0.003	0.167	0.152	0.137
C1	0.261	0.609	0.051	-0.003	0.214	0.176
C2	0.320	-0.022	0.614	0.132	-0.071	0.053
C3	0.588	0.044	0.263	0.027	0.306	-0.040
C4	0.222	0.172	0.111	-0.339	0.447	-0.199
C5	0.284	0.106	0.024	-0.213	0.587	-0.236
C6	0.073	0.739	-0.089	-0.019	0.242	0.027
C7	0.061	0.770	0.124	0.065	-0.058	0.007
C8	-0.027	0.182	-0.026	0.227	0.447	-0.091
C9	0.398	0.326	0.141	0.053	0.424	0.119
C10	0.040	0.368	0.115	0.438	0.407	0.080
D1	0.164	0.195	0.056	0.140	0.430	0.306
D2	0.113	0.010	0.040	0.141	0.600	0.283
D3	0.000	0.083	0.247	-0.030	0.324	0.136
D4	0.115	0.094	0.599	-0.065	-0.019	0.023
D5	0.035	0.023	0.440	-0.202	0.260	0.236
D6	0.137	0.408	0.198	0.064	0.125	0.166
D7	0.127	0.400	0.020	0.158	0.092	0.082
D8	-0.212	0.136	0.233	0.165	0.266	0.165
D9	0.109	0.303	0.155	-0.084	0.181	0.403
D10	-0.078	0.239	0.481	0.297	0.205	0.020

Table 4 provides the statistical justification, while Table 5 shows the conceptual context of the instrument. This two-stage investigation supports the argument in favour of a multi-layered but coherent structure within the PST module. Given the unambiguous item loadings, clear separation of factors, and consistency between concepts, the model has already been subjected to confirmatory factor analysis (CFA) within the six-factor framework. The results of the CFA underpin the structural suitability and confirm the six-factor solution. They prove that the proposed dimensions are suitable for empirical and theoretical testing in the coaching context.

Discussion

This study confirms the reliability, design, and usability of the Psychological Skills Training (PST) module developed for Malaysian rugby coaches. The instrument showed excellent internal consistency with an aggregate Cronbach's alpha of 0.878, which is well above the criterion of 0.70 for psychological instruments (Nunnally & Bernstein, 1995). This supports the emerging psychometric research that emphasises high reliability even in newly developed instruments for practical use (Hair, 2019; Taber, 2018).

At the sub-construct level, the three primary domains – usefulness ($\alpha = 0.827$), satisfaction ($\alpha = 0.762$), and ease of use ($\alpha = 0.687$) – all fulfil the acceptable reliability standard. Despite the comparatively low alpha value for ease of use, it exceeds the minimum standard recommended for exploratory research in real-world settings (DeVellis, 2017). Taken together, these results suggest that the module, not only fulfils the measurement standards, but is also rated by trainers as useful, satisfactory and easy to implement in practical training sessions.

The data set was considered suitable for conducting a dimensional analysis, as the Kaiser-Meyer-Olkin (KMO) yielded a result of 0.722. This value is above the frequently cited cut-off value of 0.70 (Field, 2018), making the sample suitable for factor analysis. Several cases performed exceptionally well in terms of individual sample adequacy (e.g., D1 = 0.873, B1 = 0.860, C9 = 0.820), which reinforces their favourability from a psychometric perspective. Some items with KMO values below the ideal value (e.g., C2, C5, D8) were retained for earlier phases for conceptual reasons, but prior to model refinement.

The exploratory factor analysis (EFA) yielded a 6-factor solution that explained 46.4% of the total variance. This can be considered acceptable for multidimensional measurement in applied psychology (Osborne, 2014; Worthington & Whittaker, 2006). The factors extracted align quite well with existing primary psychological training domains, which include goal setting, self-talk, imagery, and elements of breath control, which are recognised as integral to mental preparation in sport (Birrer & Morgan, 2010; Weinberg & Gould, 2019).

The factor analysis yielded 6 final factors, but, only 13 items with factor loadings ≥ 0.60 were retained for the development of the instrument. The remaining items were deleted, which is in line with best practise in scale development that advocates the removal of non-loading items to improve structural clarity and measurement accuracy (Boateng, 2018; Clark & Watson, 2019). It must be emphasised that these items were not removed from the operationalised version of the module as they are important for coach education. Their removal only relates to the classification measurement model in order to maintain the theoretical framework and strengthen the analysis.

A CFA was then conducted to test the six-factor model developed in the EFA. The results of the CFA confirmed the structure and theories used in the module. The validation of this model confirms its structural soundness, suggesting that the PST module serves as a valid and reliable resource for the assessment of psychological skills training in the context of rugby coaching. Furthermore, the presence of factors that are clearly separated from each other suggests that participants were indeed paying attention to and interacting with different psychological factors, confirming the usefulness and cognitive relevance of the content included in the module.

To summarise, this study provides strong empirical support for the psychometric properties of the psychological skills training module developed for Malaysian rugby coaches. It has bridged the gap between the theoretical psychological models and the practical coaching work. This trained framework goes beyond simply enhancing the psychological skills of athletes; it also equips coaches mentally to apply sports psychology at the top level in a competitive context. This marks a significant shift in the evolution of coaching approaches that integrate mental conditioning towards a multidisciplinary framework to support athlete development in the Malaysian rugby context.

Conclusions

The findings gathered in this study confirm the reliability, validity, and practicality of the Psychological Skills Training (PST) module tailored for Malaysian rugby coaches. The instrument demonstrated excellent internal consistency of 0.878, adequate sample adequacy with a KMO value of 0.722, and a clear six-factor structure as determined by both exploratory and confirmatory factor analyses. These results confirm that the PST module is not only statistically valid, but also conceptually sound, and captures important psychological elements such as goal setting, self-talk, imagery, breath control, and concentration. The study also contributes from the perspective of the applied sport psychology literature by further developing an existing PST framework into a sport and context-specific coaching tool. It supports the notion that the PST is not a generic resource but one that benefits from cultural and sport-specific adaptation, by presenting evidence from a rugby context in South East Asia.

The practical perspective that the PST module offers rugby coaches integrates the application of psychological skills into daily training with ease and organisation. This is particularly beneficial at grassroots and developmental levels, where there is little access to sports psychology. When coaches are equipped with accessible mental skills techniques, they can apply psychological practise and theory. This ultimately improves coach education and athlete performance preparation. The findings highlight the value of PST in coach education, national rugby development programmes and integrated athlete support within multidisciplinary teams. Sports federations could incorporate the module into official training programmes, institutionalising psychological preparation within physical and tactical training.

Future studies would benefit from a longitudinal examination of the effects of the module on the athlete's resilience, confidence, and overall performance. Further validation in different sports and cultures

would improve generalisability, while digitalisation, e.g. in the form of a mobile app, would increase accessibility. The PST module has been rigorously validated as a psychometric instrument and also serves as a functional educational tool. The incorporation of the module into rugby coaching signifies a progressive development in the comprehensive Malaysian athlete coaching paradigm, establishing a model with potential international influence on the practise of sports psychology.

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