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Validity and Reliability of the Hockey Playing Tactics Assessment Instrument

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Abstrac: This research aims to develop and test the validity and reliability of an assessment instrument for hockey playing tactics in the context of student sports coaching. The research uses an instrument development design with a quantitative evaluative approach. The research subjects are members of the Hockey Student Activity Unit (UKM Hoki) at STKIP Pasundan, who are involved in modified games (small-sided games). Content validity is tested through expert judgment using Aiken's V index, while construct validity is analyzed through item-total correlation. Instrument reliability is tested using Intraclass Correlation Coefficient (ICC) and Cronbach's Alpha. The research results show that all instrument indicators have good content validity and construct validity, as well as high inter-rater reliability and internal consistency. Thus, the developed instrument is declared valid and reliable for assessing students' hockey playing tactic abilities, and is suitable for use in the context of sports coaching and learning in higher education.

Keyword: Assessment, Hockey, Reliability, Student, Validity.

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INTRODUCTION

Modern physical education positions sports learning not only as a means of developing technical skills but also as a medium for forming tactical understanding, decision-making, and game intelligence among students. In the context of sports pedagogy, tactical ability is considered an important indicator of learning success because it reflects the integration of cognitive, psychomotor, and affective aspects in real-game situations (Kirk, 2010). Therefore, assessment of tactical aspects becomes a crucial element in sports learning and coaching, including the sport of hockey.

Along with the development of game-based learning approaches, the focus of evaluation in physical education has shifted from isolated technical mastery toward the quality of decision-making and the effectiveness of playing actions. Approaches like Teaching Games for Understanding (TGfU) emphasize the importance of tactical understanding as the foundation for meaningful playing performance (Harvey & Jarrett, 2017). However, this paradigm shift in learning has not yet been fully followed by a paradigm shift in evaluation, particularly in providing assessment instruments capable of measuring playing tactics objectively and systematically. In field practice, especially in the context of sports coaching at universities, assessment of playing tactical abilities is still often conducted subjectively based on the intuition of coaches or observers. This condition is also found in the coaching activities of the Hockey UKM at STKIP Pasundan, where the majority of members are physical education teacher candidates. Evaluation without standardized instruments has the potential to produce biased, inconsistent assessments that are difficult to justify academically, thus hindering the UKM's function as a learning laboratory and sports science development.

The main problem in evaluating hockey playing tactics lies in the availability of valid and reliable assessment instruments. The assessment instruments used must meet psychometric requirements, particularly validity and reliability, so that the measurement results truly represent the measured construct and are consistent across assessors (AERA, APA, & NCME, 2014). Without validity and reliability testing, assessment instruments are not only methodologically weak but also risk producing erroneous conclusions in the coaching and research processes (Hambali & Hardi, 2024).

Several international studies have developed game performance assessment instruments such as the Game Performance Assessment Instrument (GPAI) and its derivatives to measure decision-making and playing skills in game contexts (Memmert & Harvey, 2008). However, most of these instruments were developed in the context of popular sports and school students, and have not been widely tested or adapted specifically for the sport of hockey and the context of university students in teacher education institutions. This indicates a research gap that needs to be bridged.

In the context of Hockey UKM at LPTK, the need for valid and reliable tactical assessment instruments becomes increasingly important because assessment results impact not only the quality of achievement coaching but also the quality of student learning as prospective educators. Scientifically tested instruments can be used as the basis for providing training feedback, learning reflection, and data-based coaching decision-making. In addition, such instruments can serve as references for further research in the field of physical education learning and evaluation.

Based on the above description, research on the validity and reliability of hockey playing tactics assessment instruments for the Hockey UKM at STKIP Pasundan becomes important and relevant to conduct. This research is expected to produce valid, reliable, and contextual assessment instruments, thereby supporting the development of hockey sports learning and coaching evaluation in universities, while enriching the scientific treasury of physical education evaluation and sports pedagogy.

METHOD

Design of Research

This research uses an instrument development research design with a quantitative evaluative approach. The main focus of the research is to test the validity and reliability of the hockey playing tactics assessment instrument used in the context of student sports coaching.

The research stages refer to the educational evaluation instrument development procedure, which includes:
(1) construct and indicator analysis,
(2) grid compilation and instrument items,
(3) content validity testing through expert judgment,
(4) instrument trial, and
(5) instrument validity and reliability analysis.

Subject and Context of the Research

The research subjects are members of the UKM Hoki at STKIP Pasundan, numbering approximately 20–30 active students. The selection of subjects was conducted using purposive sampling, with the considerations that:

1. the students have experience in training and playing hockey,
2. they are actively involved in real game situations, and
3. they are relevant as prospective physical education teachers.

In addition to the player subjects, this research also involves an expert panel consisting of: 1) lecturer specializing in hockey sports learning/pedagogy; 2) lecturer specializing in physical education evaluation; 3) experienced hockey coach. The expert panel plays a role in the content validation process of the instrument.

Development and Design of Hockey Playing Tactics Assessment Instrument

1. Constructs Measured

The instrument was developed to measure hockey playing tactics, defined as the player's ability to make decisions and act effectively in game situations. This construct is operationalized into several main dimensions adapted from the literature on game performance and sports pedagogy, namely:

a. Decision Making
b. Positioning and Off-the-ball Movement
c. Skill Selection in Context
d. Support and Team Play
e. Offense–Defense Transition

2. Kisi-kisi Instrumen

The instrument is structured in the form of a game-based observation sheet with a Likert scale. The instrument grid is presented in Table 1.

Table 1. Assessment Instrument Grid for Hockey Playing Tactics

Dimension	Indicator	Behavior Description
Decision making	Selecting attack option	The player chooses passing, dribbling, or shooting according to the situation
Position & movement	Creating space	The player moves to open up space without the ball
Action Selection	Effectiveness of the action	Actions according to the purpose of the game
Team support	Cooperation	Providing support to teammates
Playing transition	Transition response	Quickly switch from attacking to defending or vice versa

The instrument uses a rating scale of 1–4, with category 1 (never), 2 (rarely), 3 (often), 4 (always).

Data Collection Procedure

1. Content Validity

The instrument draft was assessed by experts using a content validity assessment sheet. Each indicator was evaluated based on:

- Suitability of the indicator with the playing tactics construct,
- Clarity of wording,
- Measurability in the context of hockey games.

Content validity analysis was conducted using Aiken's V.

2. Instrument Testing
   The revised instrument was tested on members of the Hockey UKM during a structured play session. Assessment was conducted by two independent assessors.
3. Construct Validity
   Construct validity was analyzed using item-total correlation analysis to determine the contribution of each indicator to the total playing tactics score.
4. Instrument Reliability. Reliability was tested through:
   - Inter-rater reliability using Intraclass Correlation Coefficient (ICC),
   - Internal consistency using Cronbach's Alpha.

Data Analysis

Data is analyzed quantitatively with the following stages:

1. Calculation of Aiken's V index for content validity, V ≥ 0.80 (valid),
2. Item-total correlation for construct validity,
3. Calculation of ICC and Cronbach's Alpha values for reliability, ICC ≥ 0.75 (reliable) and Cronbach's Alpha ≥ 0.70 (good internal consistency).

RESULT

General Description of Instrument Testing Implementation

The hockey playing tactics assessment instrument was tested on 24 students who are members of the Hockey Student Activity Unit (UKM Hoki) at STKIP Pasundan. Data collection was conducted through observation of modified games (small-sided games) involving two independent assessors with backgrounds in hockey coaching and teaching. The observation data was then analyzed to test the content validity, construct validity, and reliability of the instrument.

Content Validity Test Results

The validity of the instrument's content was obtained through an assessment by an expert panel consisting of three individuals: an expert in hockey sports learning, an expert in physical education evaluation, and an experienced hockey coach. The assessment was conducted on the alignment of indicators with the hockey playing tactics construct, the clarity of wording, and the measurability of indicators in the context of the game. The results of the Aiken's V index calculation show that all indicators have values between 0.83–0.94, as presented in Table 2.

Table 2. Results of Content Validity Test of the Hockey Playing Tactics Assessment Instrument

Dimension	Indicator	Aiken's V	Category
Decision making	Attack option selection	0,91	Valid
Position & movement	Opening space without the ball	0,88	Valid
Action Selection	Suitability of playing actions	0,94	Valid
Team support	Cooperation and support	0,83	Valid
Playing transition	Transition response	0,89	Valid

The obtained Aiken's V value indicates that all instrument indicators meet the content validity criteria, thus making it suitable for use in the field trial stage.

Construct Validity Test Results

Construct validity was tested using item-total correlation to determine the extent to which each indicator contributes to the total score of hockey playing tactics. The analysis results show that all indicators have correlation coefficients between 0.52–0.78, with a significance value of $p < 0.05$.

Table 3. Results of Construct Validity Test of the Instrument

Indicator	r item–total	p-value	Description
Decision making	0,78	<0,01	Valid
Position & movement	0,64	<0,01	Valid
Action Selection	0,72	<0,01	Valid
Team support	0,52	<0,05	Valid
Playing transition	0,69	<0,01	Valid

This result shows that each indicator has a significant relationship with the overall playing tactics construct, thus the instrument has good construct validity.

Instrument Reliability Test Results

Inter-rater reliability was analyzed using the Intraclass Correlation Coefficient (ICC). The ICC calculation results showed a value of 0.87, which falls into the high reliability category. This value indicates that the instrument produces consistent scores across raters, even though the assessments were conducted in dynamic game situations. In addition, the internal consistency of the instrument was analyzed using Cronbach's Alpha. The analysis results showed an alpha value of 0.82, indicating that the instrument has good internal consistency.

DISCUSSION

Research results show that the developed hockey playing tactics assessment instrument has high content validity, indicating that the instrument's indicators accurately represent the playing tactics construct. These findings align with the modern validity framework, which positions validity as an evidence-based argument for test score interpretation (Kane, 2013; recontextualized in recent evaluation studies). Recent research in physical education emphasizes that content validity heavily depends on the integration of game theory, user context, and clarity of performance indicators (Sullivan, 2018; Bulley et al., 2017).

Construct validity, demonstrated by significant item-total correlations, reinforces that each indicator meaningfully contributes to measuring hockey playing tactics as an integrated ability. Current literature in game-based pedagogy confirms that playing tactics result from the interaction of decision-making, spatial awareness, and teamwork, which are inseparable (O'Connor, Larkin, & Williams, 2018; Wang et al., 2024). Thus, these research findings support the view that tactics assessment must be holistic and based on real-game situations.

These findings are also consistent with the modern game-centered approaches paradigm, which has experienced conceptual and empirical strengthening over the past decade. Systematic studies show that game-based approaches require assessment systems capable of capturing decision quality and action effectiveness in play, rather than just motor technique outcomes (Harvey, Pill, & Almond, 2018; Miller et al., 2021). Therefore, a construct-valid instrument, like the one developed in this study, becomes a key element to ensure that game-based learning implementation goes beyond the methodological level and is evaluatively measurable.

From the reliability aspect, the high Intraclass Correlation Coefficient value indicates that the instrument has strong inter-rater consistency, even when used in dynamic game contexts. Recent research in physical education assessment confirms that inter-rater reliability is a primary challenge in performance assessment and can only be achieved if indicators are operationally structured and based on observable behaviors (Hay, 2019; López-Pastor et al., 2021). Thus, the high reliability in this study indicates that the rubric design and instrument indicators meet the principles of replicable authentic assessment.

The internal consistency of the instrument, which falls into the good category, also confirms that the indicators within the instrument measure the same construct, namely hockey playing tactics. Psychometrically, these findings align with recent studies on scale development in education and sports that emphasize the importance of internal coherence to support meaningful score interpretation (Boateng et al., 2018; Morgado et al., 2017). This affirms that

hockey playing tactics can be understood as an organized ability structure, rather than merely a collection of partial behaviors.

In the context of developing the Hoki UKM at STKIP Pasundan, the results of this research have significant pedagogical implications. Recent studies show that valid and reliable assessments play an important role in supporting assessment for learning, especially in the context of prospective physical education teacher students (Ní Chróinín, Fletcher, & O'Sullivan, 2018; Yin H et al., 2024). This instrument enables students not only to be assessed as players but also to learn how to understand the process of evaluating game performance objectively and scientifically.

Furthermore, this instrument contributes to the development of authentic assessment in physical education, particularly in relatively underexplored sports branches such as hockey. The latest literature review indicates that most game performance assessment instruments are still focused on popular sports and school contexts, while studies at the college level and minor sports remain very limited (Manso-Lorenzo et al., 2024; Rudd, 2021). Thus, this research fills an important gap in the sports pedagogy evaluation literature.

Nevertheless, instrument validity is an ongoing process. Recent research emphasizes that validity evidence needs to be tested across contexts, populations, and game formats to ensure the instrument is truly robust theoretically and empirically (Newton & Shaw, 2016; reinforced in Kane, 2021). Therefore, further research is recommended to test this instrument in high school contexts, hockey clubs, or inter-college competitions, as well as to integrate it with technology-based assessments such as video analysis and digital performance tagging.

Overall, this discussion demonstrates that the developed hockey playing tactics assessment instrument is not only statistically valid and reliable but also aligned with contemporary developments in physical education assessment theory and practice. This instrument has strong potential to support data-based Hoki UKM development and enrich the physical education evaluation literature through a contextual and sustainable authentic assessment approach.

CONCLUSION

This research aims to develop and test the validity and reliability of an assessment instrument for hockey playing tactics in the context of student sports coaching. Based on the testing results conducted on members of the UKM Hockey at STKIP Pasundan, it can be concluded that the developed instrument meets the feasibility criteria as a tool to measure hockey playing tactic abilities.

Content validity test results indicate that all instrument indicators conceptually represent the hockey playing tactics construct accurately. Construct validity, indicated by significant item-total correlations, shows that each indicator contributes meaningfully to the holistic measurement of hockey playing tactic abilities. These findings confirm that decision-making aspects, positioning and movement, team support, and playing transitions are integral components of game intelligence in hockey. From the reliability perspective, the instrument demonstrates good consistency, both inter-rater and internal. High reliability values indicate that the instrument can produce stable and objective assessments even in dynamic game situations. Thus, this instrument is suitable for repeated use in the context of hockey sports coaching and learning in higher education.

Practically, the existence of this valid and reliable assessment instrument provides significant contributions for coaches and lecturers in objectively and data-based monitoring of students' playing tactic development. This instrument can also be utilized as an assessment for learning tool that supports the reflection and learning process for physical education teacher candidates, so that evaluation not only functions as a result assessment tool but also as part of the learning process itself.

Academically, this research contributes to enriching the study of physical education evaluation, particularly in the development of authentic game-based assessments in the hockey sports branch, which has been relatively under-researched. Nevertheless, this research has limitations in the scope of subjects and research context. Therefore, future research is

recommended to test this instrument in broader contexts, such as high schools, sports clubs, or inter-university competitions, and to integrate it with technology-based assessment approaches to strengthen ongoing evidence of the instrument's validity and reliability.

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