JTIKOR
(Jurnal Terapan Ilmu Keolahragaan)
e-ISSN: 2549-6360 | homepage: ejournal.upi.edu/index.php/JTIKOR/index
email: jtikor@upi.edu | DOI: 10.17509/jtikor.v11i1

Original Arcticle JTIKOR 11(1): 42-49 (May 2026) | DOI: 10.17509/jtikor.v11i1.95589

The Absence of Specific Instruments to Measure Hand-Eye Coordination in Petanque

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Article Info

Article History
Submitted: January 7, 2026
Accepted: May 30, 2026
Published: May 31, 2026

Article Access

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Abstract

Hand–eye coordination is a crucial motor component that strongly influences the performance of petanque athletes, particularly in executing shooting and pointing techniques that demand high levels of accuracy. Although numerous studies have examined the relationship between hand–eye coordination and performance outcomes, the measurement instruments used in previous research remain general in nature and do not reflect the specific movement characteristics of petanque. This literature review aims to examine existing studies on hand–eye coordination assessment in petanque and to identify the absence of specialized instruments that align with the technical requirements of the sport. The review was conducted by analyzing relevant publications from the past eight years. The synthesis of findings indicates that most studies rely on generic tests, such as ball throw-and-catch tasks, which fail to capture the unique visual–motor demands of petanque. These findings highlight the need for developing more sensitive, valid, and sport-specific instruments tailored to the technical aspects of petanque throwing performance.

Keywords: hand–eye coordination, petanque, measurement instrument, throwing accuracy

Introduction

Petanque is a sport that is increasingly popular in various countries, including Indonesia, as a sport that offers unique technical and strategic challenges. Although the game is simple, involving throwing metal balls at a target, the performance of petanque athletes relies heavily on fine motor skills. One crucial aspect is hand-eye coordination, the ability to process visual stimuli and translate them into precise hand movements (Bayu & Jayadi, 2024). Without good coordination, petanque throws struggle to achieve accuracy and consistency, two crucial factors for competitive performance (Rabani & Nurhidayat Nurhidayat, 2021).

Petanque is a precision sport played by throwing metal balls (boules) as close as possible to a small ball called a cochonnet. This sport is categorized as a sport of accuracy because it demands precise aiming, movement control, and mastery of throwing technique (Rahmat & Irfandi, 2022). In practice, petanque is not just about throwing balls, but also a sport that combines game strategy, field reading skills, and the ability to adapt throwing techniques to ground conditions.

Several studies have shown that petanque has very specific movement characteristics. In shooting, for example, athletes must be able to execute throws at specific angles to accurately hit the opponent's ball, thus requiring effective integration of visual observation and motor control (Widodo & Hafidz, 2018). Particularly in competitive competitions, many novice athletes struggle to establish the correct shooting angle. Variations in throwing angles from trial to trial indicate that petanque requires consistent postural stability and eye-hand coordination to ensure the throw does not miss the target (Kasmad et al., 2025). This characteristic distinguishes petanque from other throwing sports such as softball or handball, as it emphasizes precision over power.

Apart from the technical aspects, petanque is also understood as a sport that requires physical and mental readiness. Research on the nutritional education of petanque athletes indicates that concentration and physical condition influence the quality of throw execution (Munawar et al., 2025). Thus, petanque can be viewed as a sport that integrates fine motor skills, body stability, concentration, and game strategy simultaneously.

In the sports literature, hand-eye coordination has been extensively studied for its influence on various precision motor skills. However, research specifically focused on petanque remains relatively limited. Several studies have adapted common instruments such as the tennis ball throw-catch test, the pointing game test, and standard coordination tests to measure the abilities of petanque athletes (Bayu Laksana et al., 2017). Although these instruments provide initial indications, they are not designed to take into account the technical characteristics of metal ball throwing as in the sport of petanque, such as ball speed, weight of the metal ball, angle of throw, and distance to the target.

This study demonstrated a strong correlation between hand-eye coordination and shooting performance in petanque (Navis et al., 2025), who found that hand-eye coordination and concentration were significantly correlated with petanque shooting ability. In addition, (Permadi & Nurhidayat, 2021) reported a positive relationship between eye-hand coordination and pointing game ability in petanque-interested students at Muhammadiyah University of Surakarta (UMS). Other studies also confirm the contribution of other biomotor factors such as wrist flexibility and balance to the accuracy of shot-on-the-iron throws (Nurfatoni & Hanief, 2020).

However, these findings also reveal a significant weakness: the absence of a measurement instrument specifically for the unique hand-eye coordination patterns in petanque. Most studies still use generic tests (such as tennis ball throwing and catching) that may be insensitive to the technical nuances of petanque, such as variations in throw angle, ball release speed, and distance between the ball and the target. A systematic review by (Helmi et al., 2024), highlighted this gap. Although eye-hand coordination has been analyzed in various petanque studies, the designs and methods varied and have not yet led to consistency or standardized instruments.

Therefore, this issue clearly demonstrates that the issue is further complicated by the fact that arm muscle strength and balance have also been shown to contribute to shooting ability. For example, research at Sriwijaya University demonstrated a significant relationship between hand-eye coordination, arm muscle strength, and balance on petanque throwing accuracy (Safitri et al., 2024). Conversely, Amalia et al., 2023 found that hand-eye coordination and arm strength influence shooting at specific stations in petanque. Research in Surakarta also confirmed the contribution of balance, along with eye-hand coordination, to the shooting abilities of petanque students (Permadi & Nurhidayat, 2021). All these findings underscore that while other factors are important, eye-hand coordination still plays a central role.

This review makes it clear that the instrument approach used is inadequate. Due to the lack of specific measurement tools tailored to the characteristics of petanque, athlete performance evaluations may not be fully valid and reliable. This

creates a research gap, highlighting the urgent need to develop sensitive, specific, and valid eye-hand coordination measurement instruments in the context of petanque.

Based on this gap, the primary research question that arises is: "How can we design an eye-hand coordination measurement instrument specific to petanque that can capture the technical nuances of athlete movements and more accurately predict pointing and shooting performance?" The hypothesis proposed is that "an instrument specifically designed for petanque will be more sensitive and have higher validity and reliability in measuring eye-hand coordination than generic tests such as tennis ball throwing and catching."

The novelty of this article lies in the development of a new instrument, previously unseen in the petanque literature, that takes into account the physical and technical characteristics of the petanque ball throw (e.g., ball mass, angle, distance), as well as the specific visual-motor

dynamics of the sport. The development of such a tool has the potential to significantly impact the development of petanque athletes, allowing both coaches and researchers to use more accurate data to diagnose abilities, monitor progress, and design more targeted training programs.

Methods

Research Design

This study used a systematic literature review approach to collect, critique, and synthesize the results of various recent studies on eye-hand coordination measurement instruments in petanque. This literature review was chosen because it comprehensively maps the development of research and practice in this specific field and identifies gaps in the field (Arifah & Widodo, 2022; Mulyana, 2023).

The search for sources for the reviewed articles was conducted through Sinta-accredited national and international journal databases and Google Scholar, focusing on articles published within the last eight years. The article selection process began with a screening process based on topic relevance, completeness of methodological data, and clarity of research reporting, as recommended by Lubis & Iskandar, (2020) and Susanto et al. (2021). The 10 selected articles were then analyzed in depth to identify methodological patterns, instrument models, and the need for measurement innovations relevant to the relevant context of petanque.

The literature review in this study also utilized a thematic analysis approach, where each finding from the selected articles was then grouped according to key categories, including data collection techniques, instrument validity, and practical application in the field. This method aligns with recommendations (Dwiastuti, 2022), which emphasize the importance of a critical synthesis process so that the literature review can produce new, applicable recommendations for scientific advancement.

With this method, the study is expected to provide a factual overview of the current state of eye-hand coordination measurement instruments in petanque and serve as a reference for future instrument development (Handayani et al., 2024).

Results

This section explains the results of a search and analysis of ten research articles relevant to the topic of measuring eye-hand coordination in petanque. Each piece of data presented is summarized from various scientific sources to provide a comprehensive and systematic overview of the methods used, sample characteristics, tested variables, and key findings of each study. The presentation of the results below is expected to help readers understand the development of research in this field and identify gaps that require further attention in the development of measurement instruments specifically for petanque.

Based on the review of ten articles (Table 1), a consistent pattern of findings emerges from various studies in the field of petanque. Nearly all studies agree that hand-eye coordination plays a crucial role in determining game performance, particularly for accuracy in shooting and pointing. Furthermore, most studies also reveal that arm muscle strength and flexibility are supporting factors that contribute to optimal eye-hand coordination in petanque.

However, upon closer examination, an interesting trend emerges: the measurement methods used in these studies generally rely on general tests, such as ball throwing and catching or conventional arm strength tests. To date, no standardized instrument has been developed specifically for the needs of petanque. This creates a gap between the need for accurate evaluation and the limitations of available measurement tools.

Furthermore, the sample characteristics in some studies are quite varied, ranging from college students and teenagers to petanque club members. Nevertheless, the final conclusion of each study still points to the importance of developing specialized measurement instruments to allow for more specific and objective assessment of player abilities.

Table 1
Literature Review Results of 10 Articles

No	Authors/Year	Journal Indexer	Method	Sample Characteristics	N	Measurement Variables	Research Findings
1	(Bue et al., 2023)	Sinta	Correlational descriptive	Physical Education and Health Students of UNISMUH Luwuk	15	Eye-hand coordination, arm muscle power, shooting ability	There is a very significant relationship between eye-hand coordination and arm muscle strength on shooting throwing ability.
2	(SN & Setiawan, 2020)	Sinta 5	Experiment	Extracurricular students of SMP 01 Jatibarang	30	Hand eye coordination exercises, arm muscle strength exercises, petanque ball throwing accuracy	Hand-eye coordination and arm muscle strength exercises improve throwing accuracy, with the most significant improvement in hand-eye coordination exercises.
3	(Hanief & Purnomo, 2019)	Sinta 2	Quantitative descriptive	Petanque athletes of Kediri City	15	Physical factors: height, arm length, arm muscle strength, flexibility, balance, eye-hand coordination	Eye-hand coordination is one of the six dominant physical factors determining petanque performance.
4	(Yulianingsih et al., 2025)	Sinta 3	Quantitative correlation	Neltas Petanque Club Athlete	13	Arm muscle strength, hand eye coordination, shooting ability	Arm muscle strength and hand-eye coordination have a significant correlation with shooting results in petanque athletes.
5	(Bayu & Jayadi, 2024)	Sinta 5	Quantitative correlation	Petanque Club UKM Students of Universitas	16	Eye-hand coordination, game pointing ability	Eye-hand coordination was significantly related to game

				Katolik Santo Agustinus Hippo			pointing ability, 65.2% of the variation was explained by eye-hand coordination.
6	(Rabani & Nurhidayat Nurhidayat, 2021)	Sinta 5	Quantitative correlation	UMS Sports Education Students	30	Eye-hand coordination, game pointing ability	There is a significant relationship between hand-eye coordination and pointing ability in petanque students
7	(Saputra & Alpen, 2024)		Quantitative correlation	atlet UKM petanque UIR	13	Eye-hand coordination exercises, arm muscle strength, accuracy	There is a relationship between eye-hand coordination in 7-meter shooting for UKM petanque UIR athletes with r-count > r table (0.700 > 0.553)
8	(Bayu Laksana et al., 2017)	Sinta 2	Quantitative descriptive	Central Java Petanque Athlete	-	Physical and biomotor factors, petanque performance	Biomotor and physical elements, eye-hand coordination greatly support petanque performance.
9	(Widodo & Hafidz, 2018)	Sinta 4	Quantitative correlation	FIK UNESA Students	-	Arm length, hand-eye coordination, concentration, shooting accuracy	Eye-hand coordination contributes to petanque shooting accuracy.
10	(Rasyono & Setiowati, 2021)	Sinta 5	Quantitative correlation	Jambi Petanque Athletes	-	Eye-hand coordination, flexibility, precision shooting results	Eye-hand coordination and flexibility are related to precision shooting results in petanque.

Thus, the findings of this literature review not only provide insight into the crucial role of hand-eye coordination in petanque, but also reinforce the urgency of developing more relevant measurement instruments tailored to the game's needs. It is hoped that the availability of appropriate measurement tools will aid the development and achievement of petanque players, both at the recreational and competitive levels.

Discussion

From the results of the research and analysis of several studies, it is clear that hand-eye coordination plays a key role in supporting success in petanque, particularly in the accuracy of throws and the execution of other basic techniques. Nearly all of the reviewed research positions this coordination aspect as a crucial foundation for improving the performance of petanque players at various levels. It can be seen that hand-eye coordination variables not only impact motor skills but also support the concentration and confidence required during competition.

Interestingly, the pattern emerging from various studies indicates that previous research has relied heavily on general measurement instruments, such as ball throwing and catching tests and other tests originally developed for different sports. This situation has implications for evaluation results that do not reflect the actual conditions of the specific abilities of petanque players. This highlights the urgency of developing instruments that better align with the technical characteristics and needs of this game, so that the training and selection process can be more effective and objective.

In addition to the findings regarding the instruments, the discussion of these articles also shows that the characteristics of the samples are quite diverse, encompassing groups of schoolchildren, university students, and even regional sports communities. This diverse sample demonstrates the growing need for accurate measurement tools, especially for developing talent from an early age or providing ongoing coaching to aspiring players.

A major limitation found in the reviewed literature is the lack of measurement instruments specifically designed for petanque. This gap is a crucial reason why efforts to develop measurement tools must receive immediate and serious attention from researchers and practitioners. On the other hand, the majority of studies agree that eye-hand coordination can be an important predictor of performance in petanque, provided the measurement tool is valid, sensitive, and tested in the context.

Thus, this discussion serves as a reminder that despite the considerable research on eye-hand coordination, efforts to develop relevant measurement tools are still essential. It is hoped that the development of these measurement tools will assist coaches, trainers, and academics in more accurately assessing and mapping player abilities and developing targeted training programs.

Conclusions

From all the studies conducted, it has become increasingly clear that efforts to measure hand-eye coordination in petanque still face significant challenges, particularly in the availability of measuring instruments specifically designed for the game. The series of studies reviewed have all emphasized the importance of hand-eye coordination in supporting player performance, both in training and on the competition stage.

However, the current measurement methods still utilize test equipment typically used in other sports, namely the baseball throw-and-catch instrument. This situation presents a challenge, especially when coaches, trainers, and researchers seek objective measurement results tailored to the specific needs of petanque.

In short, these findings emphasize that there is significant room for innovation, particularly in developing more relevant measurement instruments. If such instruments are successfully implemented, the development and development of petanque talent in Indonesia can be more focused and effective. It is hoped that future research will be able to address this gap, enabling petanque players to develop optimally according to their individual potential.

Acknowledgment

I express my deepest gratitude and thanks to all those who have helped and supported me throughout the process of compiling this work. Without their help and support, this paper would not have been completed successfully. May all your kindness be richly rewarded. Thank you from the bottom of my heart.

I sincerely declare that there are no conflicts of interest in this research that could influence the results or interpretation of the research process. All research steps were conducted objectively, honestly, and transparently, without any pressure or personal or group interests that could potentially affect the validity of the data. Therefore, I am committed to maintaining scientific integrity and openness in communicating the results of this research.

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