Body language and words: a multimodal analysis of elite athletes' communication
Lenguaje corporal y palabras: un análisis multimodal de la comunicación de los deportistas de élite

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Abstract

Introduction: Competitive sports, especially elite badminton, are rich in complex communication interactions. Beyond technical and physical skills, communication dynamics play a crucial role in the outcome of a match. This study analyzes multimodal communication, namely the interaction of various communication modes such as verbal language, facial expressions, and body movements in a badminton match.

Objective: To examine multimodal communication in an elite badminton match.

Method: This qualitative study with a multimodal approach explores the meaning of the interaction of linguistic and kinesic cues at crucial moments in the men's doubles final of the 2024 PON in Indonesia. An in-depth case study analysis reveals the contribution of speech, intonation, facial expressions, and body movements to communication dynamics in competitive sports. Data were taken from a 2024 Youtube video recording (59:40 minutes, 5:40:10-6:39:50). Systematic multimodal analysis went through three stages: (1) synchronization of linguistic and kinesic transcripts with the video, (2) development of a cue coding framework, and (3) thematic analysis of main themes.

Results: Nonverbal communication (facial expressions, body movements) is more dominant than verbal, reflecting the complexity of athlete interaction. Nonverbal functions to convey emotions, build team spirit, and set strategies. Differences in communication patterns between teams affect team performance and dynamics.

Conclusion: Analysis of nonverbal communication is important for understanding athlete performance and team interaction. This study contributes to the development of multimodal linguistic theory and practice in athlete training, improving the understanding of team dynamics, and developing effective game strategies.

Keywords

Multimodal communication; badminton; verbal cues; non-verbal cues; team dynamics.

Resumen

Introducción: Los deportes competitivos, especialmente el bádminton de élite, son ricos en interacciones de comunicación complejas. Más allá de las habilidades técnicas y físicas, la dinámica de la comunicación juega un papel crucial en el resultado de un partido. Este estudio analiza la comunicación multimodal, es decir, la interacción de varios modos de comunicación como el lenguaje verbal, las expresiones faciales y los movimientos corporales en un partido de bádminton.

Objetivo: Examinar la comunicación multimodal en un partido de bádminton de élite.

Método: Este estudio cualitativo con un enfoque multimodal explora el significado de la interacción de las señales lingüísticas y kinésicas en momentos cruciales de la final de dobles masculinos de la PON 2024 en Indonesia. Un análisis de estudio de caso en profundidad revela la contribución del habla, la entonación, las expresiones faciales y los movimientos corporales a la dinámica de la comunicación en los deportes competitivos. Los datos se tomaron de una grabación de video de Youtube de 2024 (59:40 minutos, 5:40:10-6:39:50). El análisis multimodal sistemático pasó por tres etapas: (1) sincronización de las transcripciones lingüísticas y kinésicas con el video, (2) desarrollo de un marco de codificación de señales y (3) análisis temático de los temas principales.

Resultados: La comunicación no verbal (expresiones faciales, movimientos corporales) es más dominante que la verbal, lo que refleja la complejidad de la interacción de los atletas. Las funciones no verbales transmiten emociones, crean espíritu de equipo y establecen estrategias. Las diferencias en los patrones de comunicación entre equipos afectan el rendimiento y la dinámica del equipo.

Conclusión: El análisis de la comunicación no verbal es importante para comprender el rendimiento de los atletas y la interacción del equipo. Este estudio contribuye al desarrollo de la teoría y la práctica lingüística multimodal en el entrenamiento de los atletas, mejorando la comprensión de la dinámica del equipo y desarrollando estrategias de juego efectivas.

Palabras clave

Comunicación multimodal; bádminton; señales verbales; señales no verbales; dinámica de equipo.

Introduction

Multimodal linguistics is an approach to the study of language that goes beyond the boundaries of written texts (Pacheco-Costa & Guzmán-Simón, 2020; Wanselin et al, 2022). This approach recognizes that language does not only consist of written or spoken words, but also involves various other semiotic modes such as images, sounds, body movements, and space (Raharjo et al, 2020). Unlike traditional linguistic approaches that often focus on the analysis of grammatical and semantic structures, multimodal linguistics pays broader attention to how meaning is produced and interpreted through a combination of various semiotic modes (Hart & Marmol Queralto, 2021; Pacheco-Costa & Guzmán-Simón, 2020). Thus, multimodal linguistics is a means to understand communication phenomena more comprehensively and deeply.

In the context of sports, communication is not limited to the exchange of words. Non-verbal cues such as facial expressions, body gestures, and voice intonation play a crucial role in conveying meaning and influencing athlete behavior (Wang & Ruiz, 2021). These non-verbal cues can often reveal emotions, intentions, and strategies that are not explicitly expressed through verbal language (Thrien & Furley, 2021). Therefore, to fully understand the dynamics of communication in sports, an analysis involving both verbal and non-verbal aspects is needed.

Although there are a number of studies that have examined communication in sport, most of these studies still focus on the verbal aspects (Kim & Park, 2020). Research using a multimodal approach to analyze the complex interactions between verbal and non-verbal cues in a sport context is still relatively limited. This indicates a research gap that needs to be filled. Thus, research that adopts a multimodal linguistic approach can make a significant contribution to enriching the understanding of communication in sport and opening up new perspectives in the analysis of athlete performance (Izquierdo & Anguera, 2021; Lavega-Burgués et al, 2020; Cossich et al, 2023).

Research on communication in the context of sport has been the focus of academic attention in recent decades (Rogstad, 2022; Escamilla-Fajardo et al, 2021; Shoxrux, 2023; Orunbayev, 2023; Cranmer et al, 2021; Nazri et al, 2024; Getnet et al, 2025). Previous studies have successfully revealed the important role of verbal communication in influencing athlete performance, team dynamics, and playing experience (Kim & Park, 2020; Ashford et al, 2021; Vaughan et al, 2021; Heelis et al, 2020; Gu & Xue, 2022). However, most of these studies tend to focus on the analysis of verbal communication alone (Mason et al, 2020), ignoring the non-verbal dimensions which are also very significant in human interaction.

To understand the dynamics of communication in sport more comprehensively, an approach that goes beyond mere verbal analysis is needed (Labuschagne, 2017). Socio-semiotics offers a powerful theoretical framework for examining how meaning is constructed and negotiated through various modes of communication, both verbal and non-verbal, in a particular social context. Socio-semiotics does not only see signs as individual entities, but also as part of a wider system related to social, cultural and power practices (Jiao, 2022). In the context of sport, socio-semiotics can help us understand how athletes and coaches use language, gestures, facial expressions and other visual elements to interact, convey information, build strategies and assert team identity (Mensah & Nyong, 2022). In sport, communication does not only occur between individuals, but also involves interactions between teams, coaches and even spectators (Frew et al., 2024). Socio-semiotics allows us to analyze how meaning is produced and interpreted in this complex context (Leone, 2024). For example, we can examine how athletes' body language conveys their emotions and intentions, how coaches' gestures are used to give tactical instructions, or how shared symbols such as team colors and brand logos build identity and loyalty. Using a socio-semiotic approach, we can uncover the hidden meanings embedded in sporting interactions and understand how social and cultural factors influence the way athletes and coaches communicate (Semotiuk, 2023).

The fundamental difference between verbal and non-verbal communication lies in the medium used to convey the message (Muratova et al., 2021). Verbal communication, whether through spoken or written language, offers structure and precision in conveying information. Coaches can explain team strategies in detail, give complex tactical instructions, or convey rousing motivation through words. However, verbal communication has limitations in conveying emotions and intentions spontaneously (Ifan-

tidou, 2021). This is where non-verbal communication plays a vital role (Dragomir et al, 2021). Body language, facial expressions, and gestures can convey the emotions of athletes and coaches more honestly and directly (Ryou et al, 2023). For example, a sharp gaze can convey determination, while a calm hand gesture can convey confidence. In the dynamic and high-pressure context of sport, non-verbal communication often becomes a universal language that transcends the limitations of words (Kourtesis, 2024). The combination of effective verbal and non-verbal communication allows athletes and coaches to build deep understanding, strengthen teamwork, and achieve peak performance.

A multimodal approach that integrates analysis of various communication modes such as verbal, visual, and auditory, offers a more comprehensive perspective in understanding the complexity of communication in sports. Existing studies often only analyze one or two communication modes (Ryba et al, 2022), or focus on a particular type of sport (Torres-Ronda et al, 2022; Chersulich Tomino et al, 2020), such as soccer or basketball. In addition, many studies are less in-depth in analyzing nonverbal cues (Krol et al, 2024), so that the potential meaning contained in them has not been fully revealed.

Badminton, as one of the most popular racquets sports, offers a representative context and complexity for multimodal research. Compared to other sports, badminton has unique characteristics that make it particularly suitable for this type of analysis. First, badminton involves a complex combination of speed, power, and precision of movement. The interaction between players in conveying instructions and strategies often happens in a matter of seconds, so non-verbal communication becomes very important. Secondly, the intensity of emotions in badminton matches is very high, especially at crucial moments. Players' facial expressions, body gestures and voice intonation can provide important clues about the pressure, confidence or strategy being pursued. Third, badminton has fast and changing game dynamics. Adapting tactics and strategies often requires effective communication between players, both verbally and non-verbally. The combination of these factors makes badminton an ideal context for multimodal research, the analysis of verbal and non-verbal cues can provide deep insights into the dynamics of communication in sport and how it affects athlete performance.

However, it is important to remember that communication in sport is not only limited to words. Nonverbal communication also plays a crucial role in the interaction between athletes and coaches (Gandhi et al., 2023; Serafini & Reid, 2023; Lim et al., 2022). Previous studies that have only focused on one or two modes of communication (Tamminen et al., 2022; Buenemann & Schweizer, 2021; Furley & Roth, 2021), or on specific sports (Chung & Jeong, 2023; Ben Chikha et al., 2023), have not been able to fully uncover the complexity of communication interactions in sport. Moreover, the lack of attention to nonverbal cues in these studies leaves an important gap in the understanding of how nonverbal communication contributes to athlete performance and match outcomes. Therefore, multimodal research that integrates the analysis of different modes of communication, including nonverbal cues, is urgently needed to provide a more comprehensive and in-depth picture of communication dynamics in sport. This research will fill this gap by exploring the important role of nonverbal communication in the context of competitive sport, as well as how the interaction between different modes of communication can influence athlete performance and match outcomes.

This study fills the gap in the literature by offering an in-depth multimodal analysis of communication in badminton. Focusing on the men's doubles final match of the 2024 PON badminton, this study reveals how the combination of verbal and nonverbal cues contributes to the dynamics of athlete interaction and influences match outcomes. Some specific contributions expected from this study include, first, providing a more comprehensive understanding of communication in sports by integrating analysis of various communication modes. Second, identifying communication patterns that are specific to multimodal communication patterns that are typical in badminton, especially during crucial moments of the match. Third, revealing the hidden meanings contained behind nonverbal cues, which are often difficult to express explicitly through verbal language. The findings of this study are expected to provide practical implications for coaches, athletes, and other researchers interested in this field, such as the development of more effective training programs and optimal communication strategies.

This research is expected to provide significant contributions to the development of science, especially in the field of multimodal linguistics and sports psychology. By adopting a multimodal approach, this research will enrich the understanding of the complexity of human communication, especially in the context of highly dynamic sports. The findings generated from this research have the potential to fill the gap in the existing literature related to the interaction between verbal and non-verbal cues in

competitive sports. In addition, this research can also provide a strong empirical foundation for the development of multimodal linguistics and sports psychology theories.

The results of this study have broad practical implications, especially for coaches, athletes, and other researchers interested in this field. For coaches, this study can provide valuable insights into how to optimize communication with athletes, both through words and non-verbal cues. By understanding effective communication patterns, coaches can design more personalized and effective training programs. For athletes, this study can help them increase their self-awareness of how their communication affects their performance and relationships with teammates. Meanwhile, for other researchers, this study can be a starting point for conducting further, more in-depth research in the same field. Based on the previous explanation, the research questions are obtained, namely, first, how does the combination of verbal and non-verbal cues affect the dynamics of interaction in elite badminton matches? Second, what multimodal communication patterns are typical in crucial moments of the match? Third, what is the role of non-verbal communication in influencing athlete performance and match results?

Theoretical Framework

This study is based on the framework of multimodal linguistic theory, which offers a comprehensive perspective on the human communication process (NST et al, 2024; Farhan et al, 2024). The multimodal approach emphasizes that meaning is not only constructed through spoken or written language, but also through various other semiotic modes, such as images, sounds, gestures, and space (Hodge & Ferrara, 2022). Thus, multimodal analysis has the potential to explore deeper layers of meaning in a communication event.

One of the multimodal linguistic theories relevant to this study is social semiotic theory. This theory, developed by Gunther Kress and Theo van Leeuwen, views signs as social resources used to create meaning in a particular social context (Van Leeuwen, 2021). In the context of sports, these signs can be words, body movements, facial expressions, and other visual attributes that work together to form meaning. Social semiotic theory is used to analyze how social and cultural meanings are constructed and transmitted through various semiotic modes in the context of sports matches.

In addition to social semiotic theory, multimodal discourse analysis is also a theoretical basis in this study. Multimodal discourse analysis focuses on how various semiotic modes are interrelated and interact to form meaning in texts or events (Twiner et al, 2021; Lindenberg, 2023; Eisenlauer & Karatza, 2020). In the context of sports competitions, multimodal discourse analysis is used to identify typical communication patterns, uncover hidden meanings behind interactions between athletes, and understand how social context influences the production and interpretation of meaning (Tseng, 2024; Caldwell, 2020). Thus, multimodal discourse analysis provides a powerful tool to reveal the complexity of communication in sports.

This study uses a multimodal linguistics approach to conduct an in-depth analysis of the complex interactions between various semiotic modes in communication. Key concepts in multimodal linguistics that are relevant to this study include modality, mode, multimodality, and multimodal discourse (Eisenlauer & Karatza, 2020; Ruiz-Madrid, 2021; Chen, 2020). Mode refers to the different semiotic resources used to create meaning, such as spoken language, writing, images, gestures, and sounds (Lindenberg, 2023; Tang et al, 2022). Mode refers to the concrete realization of the mode in a particular context. For example, spoken language can be realized as speech (Zhang et al, 2024; Lindenberg, 2023), while writing can be realized as written text (Smith et al, 2022; Gray, 2021). Multimodality refers to the use of a combination of different modes in a text or message to achieve a particular communicative purpose (Weninger, 2020). Finally, multimodal discourse refers to the analysis of how different modes interact with each other and create meaning in social and cultural contexts (Eisenlauer & Karatza, 2020; Twiner et al, 2021).

In the context of sport, multimodality becomes increasingly important because sport involves multiple complementary semiotic modes (Osisanwo & Alugbin, 2024). Athletes communicate not only through spoken language, but also through facial expressions, body movements, and even sports equipment. By analyzing multimodality in sport, it is possible to understand how athletes use different modes to convey emotions, strategies, and other information.

The concept of multimodal discourse can be used to look beyond the individual level and analyze how multimodal interactions create meaning in a broader social context (Wilmes & Siry, 2021). In a badminton match, for example, the interactions between players and coaches, players and opponents, and players and spectators form a complex multimodal discourse. Multimodal discourse analysis is used to understand how meaning is co-constructed in this social context.

Different modes have different functions in communication (Howard & Sedgewick, 2021). Spoken language, for example, is often used to convey information directly and explicitly. Meanwhile, body gestures can be used to communicate emotions or emphasize certain messages (Clough & Duff, 2020). By understanding the function of each mode, we can then analyze how the combination of different modes creates richer and more complex meanings.

Multimodality is also influenced by social and cultural contexts (Wang & Feng, 2021). The prevailing social and cultural norms within a sporting community can influence how athletes use semiotic modes (Sveinson et al, 2021; Elyamany, 2024). For example, in some sporting cultures, strong emotional expressions may be seen as a sign of weakness, while in other sporting cultures, strong emotional expressions may be seen as a sign of fighting spirit. By considering social and cultural contexts, we can discover and understand how multimodality varies across cultures and subcultures.

This study highlights the importance of multimodality in understanding the complexity of communication in sports. By analyzing the various semiotic modes used by athletes in badminton matches, such as spoken language, gestures, and facial expressions, the authors can reveal the deeper meaning of each interaction. The main purpose of this study is to identify typical multimodal communication patterns in badminton and understand how social and cultural factors influence the use of these semiotic modes. Through in-depth analysis, the authors can make significant contributions to the development of multimodal linguistic theory and sports psychology. In addition, the results of this study also have practical implications for coaches and athletes in improving their performance and communication.

Method

Research Design

This study adopts a multimodal and qualitative approach to explore the deep meaning of the complex interactions between linguistic and kinesic cues in crucial moments of a badminton match (Ruiz-Madrid, 2021). Through an in-depth case study analysis, it aims to reveal how the combination of speech, intonation, facial expressions, and body movements contribute to the dynamics of communication in a competitive sport context (Katz & Kedem-Yemini, 2021). Through qualitative analysis, it reveals the hidden meanings behind these interactions, and identifies typical communication patterns in moments that determine victory or defeat.

Research Data

This study applies a multimodal approach to deeply analyze the complex interactions between verbal and non-verbal cues in the final round of the men's doubles badminton final match of PON 2024. By focusing on the crucial moments at the end of the match, where pressure and strategic complexity are at their peak, this study reveals how elite athletes use a combination of language, intonation, facial expressions, and body movements to communicate effectively in a very decisive situation. The analysis was conducted through YouTube videos from IMSPORT TV's chanel with a video duration of 59:40, starting from 5:40:10 to 6:39:50.

YouTube, as the world's largest video sharing platform, offers representative potential as a rich and diverse source of research data, especially in the context of multimodal analysis. Some of the positive reasons why YouTube is an attractive option for researchers include firstly the wide availability of data, secondly natural and spontaneous data, thirdly the ease of access and use, fourthly the rich representation of context, fifthly the potential for longitudinal analysis, sixthly the efficient cost, seventhly the flexibility in analysis.

The selection of these crucial moments was based on the assumption that at these times, the pressure and complexity of the strategy is at its peak, making the communication between athletes very im-

portant and interesting to study. The video was watched and analyzed by three observers trained in multimodal analysis. Each observer independently observed three times to ensure the data collected was comprehensive and accurate.

Data Collection

Data collection in this study was carried out through video analysis of the men's doubles badminton match in the final round of PON 2024 uploaded on the YouTube platform from IMSPORT TV's chanel. The 59-minute 40-second video is focused on crucial moments at the end of the match, starting from minute 54:01 to 63:40 (the last 10 minutes). The selection of these crucial moments is based on the assumption that at these times, the pressure and complexity of the strategy reaches its peak, so communication between athletes becomes very important and interesting to study. The video was watched and analyzed by three observers trained in multimodal analysis. Each observer independently observed three times to ensure the data collected was comprehensive and accurate.

Validity and Reliability

To maintain data validity and reliability, this study used several strategies. First, the observers went through intensive training on the coding framework used, so that they had the same understanding of the categories and operational definitions of each cue observed. Second, the observations were conducted independently by each observer, and the results of the observations were then compared to identify potential differences in interpretation. Third, to measure inter-observer reliability, Cohen's Kappa coefficient was used. The Kappa value obtained will indicate the level of agreement between observers in coding.

Participants

The participants in this study were two pairs of men's doubles badminton athletes who competed in the final round of PON 2024. The specific identities of the athletes and coaches are not disclosed in this article to maintain privacy.

Data Analysis and Interpretation

The multimodal analysis was conducted using a systematic approach (Gandhi et al, 2023; Serafini & Reid, 2023). First, linguistic and kinesic transcripts were synchronized with match videos to identify temporal relationships between verbal and non-verbal cues. Second, a coding framework was developed to classify the various cues that emerged, both linguistic and kinesic. This classification included aspects such as type of utterance, tone of voice, volume, type of movement, intensity, and duration. Using this coding framework, researcher was able to identify recurring communication patterns. This coding was also carried out by several previous researchers, namely Pashangpour & Nejat, 2024; Luangrath et al., 2023. The framework for coding cues in badminton matches is that the unit of analysis in this framework is cues, which are defined as observable communication acts that have meaning in the context of badminton matches. Cues can be both verbal (speech) and non-verbal (body movements, facial expressions, etc.).

Verbal cues fall into 3 categories, the first being the type of speech that consists of tactical instructions, such as speech relating to game strategy, ball placement, or stroke technique, for example: "Play on the backhand!", 'Hit him with a smash!'. Speech types also consist of motivational ones: Utterances that aim to boost a player's morale and confidence, for example: "Come on, cheer up!", 'We can win!'. Another type of speech is feedback, which is speech that provides an evaluation of the player's performance. Example: "Your shot was good!", 'Your defense needs improvement.'. the last type of speech is non-tactical communication in the form of speech that is not directly related to strategy or performance, but plays a role in social interaction. Examples: "Sorry!", 'Thank you!'. Second, tone of voice which consists of high tone which is a high tone of voice that shows enthusiasm, excitement, or assertiveness, low tone which is a low tone of voice that shows calmness, seriousness, or disappointment, and changing tone which is a changing tone of voice that shows unstable emotions or uncertainty. Third, volume consists of loud volume, which is a loud voice volume that shows assertiveness, command, or strong emotions. Medium volume is a moderate volume of voice that indicates normal and controlled communication, and weak volume is a weak volume of voice that indicates hesitation, fatigue, or lack of confidence.

Non-verbal cues (kinesics), consist of first types of movements such as hand movements (instructional gestures, emotive gestures, interaction gestures), body movements (posture and displacement), and facial expressions (smiles, frowns, and eye gaze). Second, intensity consists of high (gestures or expressions performed strongly and full of energy.), medium (gestures or expressions performed with medium intensity.) and low (gestures or expressions performed weakly and lackluster). Third, duration consists of short (movement or expression that lasts for a short time.), medium (movement or expression that lasts for a medium time) and long (movement or expression that lasts for a long time).

The coding process in this study is divided into three parts first, cue identification, researchers observed the match video and identified every verbal and non-verbal cue that appeared. Second, coding is done with each identified cue coded based on predetermined categories and aspects. Third, time recording where the time of appearance of each cue (seconds and video frames) was recorded for temporal analysis. To ensure coding reliability, the research team will undergo training and inter-rater reliability testing. This aims to minimize bias and ensure consistency in data coding.

Third, a thematic analysis was conducted to uncover key themes underlying the interaction between linguistic and kinesic cues. The focus of this analysis included the influence of non-verbal communication on athlete performance as well as effective communication strategies used by coaches.

In the data interpretation stage, researcher do three stages. First step is temporal relationship syncronity. After synchronizing the transcript with the video, the researchers pay attention to moments where verbal and non-verbal cues occur simultaneously or sequentially and find out thether verbal cues precede or follow non-verbal cues. This sequence can indicate who initiate the interaction or reaction to a particular situation, and how fast the non-verbal response to verbal stimuli can be. During data interpretation, the difference between nonverbal and paraverbal communication lies in the medium used to convey the message. Nonverbal communication uses body, facial, and environmental cues, while paraverbal communication uses vocal elements that accompany spoken language.

A short response time can indicate high alignment between the two types of cues. Second stage is observation on communication patterns to find out which cues appear the most often. Frequently occurring cues may have a more important role in communication to see how different types of cues are combined. For example, are certain gestures always accompanied by a certain tone of voice? In what contexts do certain communication patterns emerge? For example, do certain communication patterns only emerge at critical moments in a match? The third step is examining the influence of non-verbal communication, such as how facial expressions, gestures, and body posture affect athlete performance. Is there a relationship between facial expressions and levels of confidence or anxiety? How do coaches use verbal and non-verbal language to provide instructions, motivation, or feedback? Are there differences in communication styles between successful and less successful coaches?

Results

This study focuses on the analysis of the role of the combination of verbal and non-verbal cues in the dynamics of interaction in elite badminton matches. The results obtained indicate that verbal and non-verbal cues complement each other and contribute to the overall experience of athletes during the match. The summary of data component quantity can be seen in table 1.

Table 1. Recapitulation of Verbal and Non-Verbal Transcript Results of Badminton Players in the Final Round of the Men's Doubles Final of PON XXI 2024

No.	Component		Amount of Data	
	Verbal	Non-verbal	Team A	Team B
1	Huuuuuh	-	1	-
2	*Ayo*!	-	-	1
3	Wooo!	-	-	1
4	Wow!	-	-	3
5	Argh!	-	-	2
6	*Semangat*!	-	-	1
7	-	Bowed head	1	-
8	-	Clenched fist	5	11
9	-	Clapping hands	8	17
10	-	Stare at the opposing team	11	9
11	-	Face down	3	2

12	-	Patting a teammate on the shoulder	2	3
13	-	Wiping the face	3	-
14	-	Smile	1	-
15	-	Sitting position	2	2
16	-	Tilted body	-	2
17	-	Lie down	-	2
18	-	Pointing towards the opponent	-	2
19	-	Prone	-	1
20	-	Patting the chest	-	1
21	-	Prostrate	-	1
22	-	Hug each other	-	1
		Number of Components Verbal Team A	1	
		Percentage Number of Components Verbal Team A	2.70%	
		Number of Components Non-Verbal Team A	36	
		Percentage Number of Components Non-Verbal Team A	97.2%	
		Number of Components Verbal Team B	8	
		Percentage Number of Components Verbal Team B	12.9%	
		Number of Components Non-Verbal Team B	54	
		Percentage Number of Components Non-Verbal Team B	87.1%	

Table 1 shows that non-verbal communication is more frequently used than verbal communication by both teams. This shows that in sports such as badminton, non-verbal communication plays a very important role. The types of non-verbal communication used are very diverse, ranging from facial expressions, body movements to visual contact. This shows the complexity of non-verbal communication in sports. Although both teams use similar types of communication, differences occur in the frequency of their use. For example, Team B claps more often than Team A. This difference may reflect differences in playing style, strategy, or personality of team members.

How does the combination of verbal and non-verbal cues influence the dynamics of interaction in elite badminton matches?

Based on Table 1. verbal and non-verbal components in elite badminton matches aims to understand how the combination of both types of cues affects the dynamics of interaction during the match (see figure 1). By comparing the two teams, it is possible to identify different communication patterns and their implications for performance and game strategy.

Figure 1. The comparison between verbal and non-verbal components between Team A and Team B.
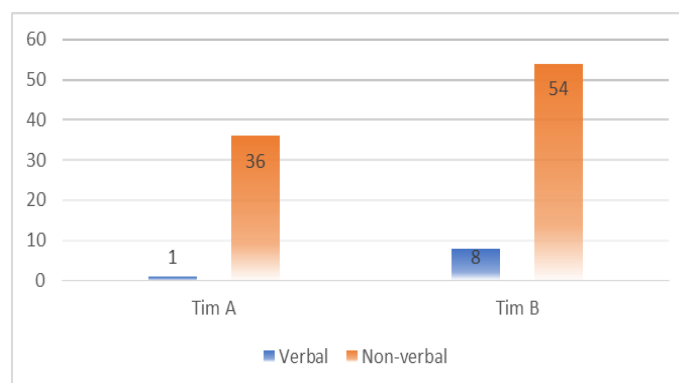
Based on the combination of verbal and non-verbal cues, Team A dominantly used non-verbal cues (36) compared to verbal (1) indicating that Team A communicates more through body language. The dominant non-verbal cue is clapping hands (8), indicating an effort to maintain team spirit and motivate oneself. On the other hand, Team B also uses more non-verbal cues (54) than verbal (8). However, the variation of non-verbal cues in Team B is more diverse, including lowering the head, clenching the fist, looking, and other body gestures. This indicates that Team B has a richer repertoire of non-verbal communication and may use it for various purposes, such as expressing emotions, coordinating play, and interacting with opponents (See table 2).

Based on the characteristics of gesture use in each team, Team A tends to use simple and repetitive non-verbal gestures, such as clapping hands. This suggests that their communication is more focused on the emotional and motivational aspects of the team. Team B uses a more complex combination of

verbal and non-verbal gestures. The greater use of verbal gestures suggests that they may communicate more explicitly, such as giving instructions or feedback to teammates. The wider variety of non-verbal gestures also suggests that they are more flexible in adapting their communication to different situations.

Table 2. Activities that require the use of technologies for which there was an increase in the self-perception of competence after the beginning of the pandemic

No	Team	Time	Screenshot	Component	
				Verbal	Non-verbal
1	A	5:54:17		Ugh!	Look forward while clenching the racket tightly
2	B	5:41:01		"Wow"	Clapping team mates
3	B	5:54:42		"*semangat*"	Clapping team mates
4	B	5:41:50		"Argh"	The body position is tilted to the side while jumping with the hands up to hit the shuttlecock.
5	B	5:42:51		"Wow"	Clenched fist with excited expression

6	B	5:43:52		"Wow"	Clenched fist with excited expression
7	B	5:42:50		"Argh"	The body position is tilted to the side while jumping with the hands up to hit the shuttlecock.
8	B	5:47:20		"Wow!"	Forward-focused gaze with the body leaning slightly forward
9	B	6:01:28		*"Ayo"*	Stare at each other with one player pointing to the opponent's area

Source: IMSPORT TV. (2024, 19 September). Final Bulutangkis PON 2024 Aceh-Sumut - (LIVE). (Video). Youtube.

Analysis of the verbal and non-verbal combinations in Table 2 shows a striking difference in characteristics between Team A and Team B. Team A tends to be more vocal in giving encouragement and direction to teammates. The use of positive words and high motivation is often heard among Team A players. In addition, their body movements also tend to be more expressive, such as jumping for joy when getting a point or giving an enthusiastic applause. In contrast, Team B appears calmer and more focused. Team B's verbal communication is more measured and specific, often in the form of technical instructions or error corrections. Team B's body movements are more controlled and efficient, indicating a high level of concentration.

The comparison between the two teams shows that different playing styles and communication can have a significant impact on team performance. Team A, with a more aggressive playing style and high fighting spirit, tends to be more effective in creating momentum and raising the spirits of the audience. On the other hand, Team B, with a calmer and more measured playing style, is more consistent in maintaining focus and avoiding mistakes. The right combination of verbal and nonverbal is one of the

successes in a badminton match, as it can affect player psychology, teamwork, and ultimately determine the final result of the match.

Based on the implications for performance and game strategy, Team A dominantly use non-verbal cues, reflecting a more intuitive and reactive style of play. Team A relies more on instinct and solid teamwork to achieve victory. Meanwhile, Team B uses a more complex combination of verbal and non-verbal cues. Based on the observations, it can be assumed that Team B showed some indicators that may relate to a more structured strategy and understanding of the opponent's tactics. However, further research is needed to confirm these findings.

Typical multimodal communication patterns in crucial moments of elite badminton matches?

Figure 1 provides an overview of how elite badminton players use various forms of communication, both verbal and non-verbal, especially at crucial moments of the match. The data shows that non-verbal communication is used more often than verbal communication. This indicates that in intense match situations, body expressions, gestures, and eye contact are often more effective in conveying messages and emotions than words. Players use a variety of non-verbal communication types, ranging from facial expressions (bowing, rubbing the face) to body movements (clapping, pointing). This variation shows the complexity of non-verbal communication in sport. Non-verbal communication in this context functions as, firstly, expressing emotions. This is indicated by expressions such as rubbing the face or lowering the head often indicating fatigue, frustration, or joy. Secondly, by managing interactions, indicated by eye contact, pointing, and other body movements used to manage interactions with opponents, referees, or teammates. Third, it is used to build team spirit, indicated by clapping and other supportive gestures serving to raise team spirit and celebrate success. Fourth, it is interpreted as sending tactical signals, with certain body movements can be tactical signals to teammates, such as pointing at the shuttlecock or signaling to make a certain attack. Fifth, as synchronous communication, that is verbal and non-verbal communication. For example, when a player shouts "*Semangat*!" while clenching his fists, these two forms of communication reinforce each other to show high fighting spirit. Sixth, the specific context such as the use of non-verbal communication is greatly influenced by the context of the match. For example, at critical moments such as match point, players tend to use more intense facial expressions and energetic body movements. Seventh, showing individuality, this is shown by each player having a unique non-verbal communication style, influenced by their personality, experience, and sports culture.

Typical multimodal communication patterns in crucial moments of elite badminton matches?

Based on Table 1, it can be seen that non-verbal communication plays a very significant role in elite badminton matches. The number of verbal components is very small and the non-verbal components dominate. This shows that first non-verbal communication is more dominant in match situations, this can be seen when the pressure and intensity of the match increases, athletes tend to express themselves more through body movements, faces, and postures than using words. Second non-verbal communication can provide richer information, such as body movements, facial expressions, and postures can convey various emotions, intentions, and strategies that are difficult to express through words. Third non-verbal communication can affect performance, seen with non-verbal cues such as patting the chest, clenching fists, or sharp gazes can increase an athlete's spirit and confidence, as well as intimidate the opponent.

Discussion

The results of this study refer to non-verbal communication data in elite badminton matches, revealing a significant dominance of non-verbal cues compared to verbal ones. This finding is in line with previous studies that emphasize the crucial role of body language in social interactions, especially in high-pressure situations such as sports competitions (Furley & Roth, 2021; Bijlstra et al, 2020). The dominance of non-verbal cues in badminton matches can be explained by the need to communicate quickly and efficiently in dynamic situations. In addition, non-verbal cues are often more difficult to fake than words, making them a more accurate indicator of an athlete's true emotions and intentions (Urakami

& Seaborn, 2023; Vishwakarma, 2023). Comparisons between athletes with different levels of experience also show varying patterns of non-verbal communication (Tamminen et al, 2022; Fritsch et al, 2022). Athletes with more experience tend to be more adept at using nonverbal cues to deceive opponents, build momentum, or control emotions. This suggests that nonverbal communication is not merely reactive, but also a deliberate strategy to achieve certain goals in the game.

Previous research has highlighted the important role of communication in sport, both verbal and non-verbal communication. Some important findings include the first regarding non-verbal communication as a universal language where research (McDermott, 2024; Lubert et al., 2024; Zhou et al., 2024) shows that body language, facial expressions, and voice intonation have a crucial role in social interactions, especially in high-pressure situations such as sports competitions. These non-verbal cues are often more honest and spontaneous than words, so they can provide more accurate information about athletes' emotions, intentions and strategies. Secondly regarding experience influencing communication proficiency is demonstrated by research (Tamminen et al., 2022; Fritsch et al., 2022) also found that athletes with different levels of experience exhibited varied non-verbal communication patterns. More experienced athletes tend to be more adept at using non-verbal cues to their advantage, such as deceiving opponents or building team momentum. Thirdly, leadership and communication styles from research (Ning, 2024; Almeida & Buzady, 2022; Kaur et al., 2024) on leadership styles show that leaders' communication styles can influence team dynamics and game strategies. Authoritarian leaders tend to be more dominant in non-verbal communication, while democratic leaders are more inclusive in verbal communication.

The comparison between Team A and Team B shows different communication patterns. Team A, with a more diverse dominance of non-verbal cues, appears to rely more on instinct and solid teamwork in making decisions. In contrast, Team B, which uses more verbal communication, tends to analyze situations more and make decisions together. This finding supports the theory (Hallo & Nguyen, 2021; Sutherland & Cartwright, 2022) about different leadership styles, where Team A may have a more authoritarian leader while Team B has a more democratic leader. These differences in leadership styles can affect team dynamics and game strategies. Team A with a more authoritarian leadership style is more suitable in situations that require quick responses and individual decisions, while Team B with a more democratic leadership style is more effective in complex situations and requires high collaboration.

The results of this study reveal that communication patterns in elite badminton matches have the richness and complexity of non-verbal communication in a competitive sport context. This finding is in line with previous studies (Zabala et al, 2021) which emphasize that body language plays a crucial role in conveying emotions, intentions, and information effectively. Based on the data, the results of the study show that in intense match situations, athletes tend to use more non-verbal cues to communicate, ranging from facial expressions to complex body movements. This variation in non-verbal communication not only reflects individual emotions, such as frustration or joy, but also serves as a tool to regulate social interactions, build team spirit, and convey tactical signals. These findings show the importance of context in the interpretation of non-verbal communication. For example, the use of intense facial expressions at critical moments of the match has a different meaning compared to normal times. In addition, each athlete's non-verbal communication style is also unique, reflecting the athlete's personality and experience. Furthermore, this study highlights the potential use of non-verbal communication analysis as a tool in athlete development. By understanding typical non-verbal communication patterns, coaches can provide more specific and effective feedback, and design training programs that are more suited to the needs of individual athletes. In addition, non-verbal communication analysis can also be used to identify potential conflicts or problems in team dynamics, so that preventive measures can be taken early.

Although this study provides insight into non-verbal communication in elite badminton matches, there are some limitations that need to be acknowledged. First, this study focuses on a single match, the men's doubles final of PON 2024. Although this match was chosen due to its intensity and high level of competition, the findings from one match may not be generalizable to all badminton matches. Future research with a more diverse sample of matches, including matches from different levels and different categories of players, will strengthen the external validity of these findings. Secondly, interpretation of non-verbal cues can be subjective. Although this study involved multiple observers to reduce bias, it

remains possible that the interpretation of non-verbal cues may be influenced by each observer's perspective and experience. The use of more quantitative methods to measure and classify non-verbal cues, such as gesture tracking technology or automated facial expression analysis, may reduce subjectivity in future research. Third, this study only focused on communication between players and coaches. Interactions with other parties, such as referees, spectators or even opponents, can also affect the communication dynamics in matches. Future research can consider these interactions to provide a more comprehensive picture of communication in badminton.

Fourth, cultural and social context can also play an important role in the interpretation of non-verbal communication. This study was conducted in Indonesia, and the findings may not apply to other cultural contexts. Cross-cultural research is needed to understand how cultural factors affect non-verbal communication in sports. Lastly, this study used YouTube video data, which has limitations in shooting quality and perspective. Some non-verbal cues may not be captured clearly, or the limited camera angle may affect interpretation. The use of video data recorded specifically for research, with better control over quality and perspective, may overcome these limitations.

Conclusions

Overall, this study provides a valuable contribution to the understanding of the role of non-verbal communication in elite badminton competition. The findings of this study suggest that non-verbal communication plays a very important role in influencing athlete performance and match outcomes. Understanding the complex and dynamic patterns of non-verbal communication may lead to the development of more effective interventions to enhance athlete performance and achieve higher sporting goals. Further research is needed to confirm and extend these findings, as well as to develop a more comprehensive model of the relationship between non-verbal communication, athlete performance, and match outcomes.

The implications of these findings are significant for the world of sport. First, coaches can use this data to design more effective training programs, focusing on developing athletes' non-verbal communication skills. Second, athletes can learn to pay more attention to their own and their opponents' body language, thereby improving their understanding of the game situation and making better decisions. Finally, this study opens up opportunities for further research, such as comparing non-verbal communication patterns between athletes from different cultures or analyzing the influence of technology on sports communication.

The findings of this study have significant implications for various disciplines, especially in the fields of sport psychology and nonverbal communication. First, the findings enhance our understanding of the dynamics of social interaction in competitive sport contexts. Second, this study provides data suggesting a relationship between nonverbal communication and athletic performance. The implications of these findings can be considered by coaches, athletes, and sport analysts in their efforts to improve performance. For example, coaches can use nonverbal communication analysis to identify patterns of strengths and weaknesses in athletes, and design more specific training programs to improve their nonverbal communication skills.

In addition, this study also opens up opportunities for further research in the same field. Some interesting research questions to study include: How do non-verbal communication patterns differ between different sports? Are there differences in non-verbal communication patterns between professional and amateur athletes? How can technology be used to analyze non-verbal communication more objectively and accurately? By answering these questions, we can gain a deeper understanding of the role of non-verbal communication in different sport contexts and develop more effective interventions to improve athlete performance.

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