

Publication status: This preprint has not been published elsewhere.

Tactical and technical indicators in wheelchair rugby: a preliminary analysis of elite Brazilian teams

Moisés Deicymar Candido Alves, Leonardo dos Santos Oliveira, Ana Lidia Pereira da Silva Rodrigues, Gilmário Ricarte Batista, Elaine Cappellazzo Souto

<https://doi.org/10.1590/SciELOPreprints.16744>

Submitted on: 2026-06-30

Posted on: 2026-10-07 (version 1)
(YYYY-MM-DD)

The moderation of this preprint received the endorsement of:

- **Ciro Winckler** (ORCID: <https://orcid.org/0000-0002-9595-8144>)

Tactical and technical indicators in wheelchair rugby: a preliminary analysis of elite Brazilian teams

Moisés Deicymar Candido Alves

Universidade Federal da Paraíba, João Pessoa-PB, Brazil

moises.alves@academico.ufpb.br

<https://orcid.org/0000-0002-8918-6045>

Leonardo dos Santos Oliveira

Universidade Federal da Paraíba, João Pessoa-PB, Brazil

leosoliveira@uol.com.br

<https://orcid.org/0000-0001-7485-105X>

Ana Lidia Pereira da Silva Rodrigues

Universidade Federal da Paraíba, João Pessoa-PB, Brazil

aninharodriguesufpb@gmail.com

<https://orcid.org/0009-0008-6615-1852>

Gilmário Ricarte Batista

Universidade Federal da Paraíba, João Pessoa-PB, Brazil

cajagr@gmail.com

<https://orcid.org/0000-0002-3294-8803>

Elaine Cappellazzo Souto

Laboratório de Estudo e Pesquisa em Atividade Física Adaptada para Pessoas com Deficiência (LEPAFA), Universidade Federal da Paraíba, João Pessoa-PB, Brazil

ecsouto@gmail.com

<https://orcid.org/0000-0001-6692-5311>

Abstract

Introduction: Although ample evidence demonstrates that tactical and technical indicators play a pivotal role in match analysis, a consensus on the most effective predictors of success in wheelchair rugby (WR) remains elusive.

Aim: To analyze potential tactical-technical indicators of points scored and match outcomes in WR among elite Brazilian teams.

Method: Notational analysis was conducted on the semifinals and finals matches of the “II Copa dos Campeões de Rugby em Cadeira de Rodas”, using the Lince 1.4 software. Tactical-technical performance indicators were evaluated by decision-making quality and overall game efficiencies and frequencies. Fisher's exact test evaluated the association between decision-making quality and score outcomes, while an independent t-test compared performance differences between winning and losing teams.

Results: Appropriate decision-making for pass, reception, and throw-in was statistically associated with a successful try outcome ($P < 0.05$). Regarding the performance parameter efficiencies between winning and losing teams, large and very large effects in favor of winning were identified for steals/interceptions ($d = 1.2$) and throw-ins ($d = 2.4$), respectively.

Conclusion: Strategic decision-making related to passing, receiving, and the throw-in seems to be essential for scoring tries. Moreover, throw-in efficiency and steals/interceptions emerged as possible performance indicators among elite Brazilian teams.

Keywords: Team sports, Para-athletes, Sports for persons with disabilities, Match analysis, Observational method

Indicadores tácticos y técnicos en rugby en silla de ruedas: un análisis preliminar de equipos brasileños de élite

Resumen

Introducción: No se ha llegado a un consenso sobre los predictores más efectivos del éxito en el rugby en silla de ruedas (RSR).

Objetivo: Este estudio analizó los posibles indicadores táctico-técnicos de los puntos anotados y los resultados de los partidos de RSR entre equipos brasileños de élite.

Método: Se realizó un análisis notacional de los partidos de semifinal y final de la "II Copa de Campeones de RSR" utilizando el software Lince 1.4. Los indicadores táctico-técnico se evaluaron mediante de la calidad de la toma de decisiones y la eficiencia y frecuencia general del juego.

Resultados: La toma de decisiones apropiada para pases, recepciones y saques mostró una asociación estadísticamente significativa con la anotación de un gol ($P < 0,05$). En cuanto a la eficiencia de los parámetros de rendimiento entre los equipos ganadores y perdedores, se identificaron efectos grandes y muy grandes a favor de los ganadores para robos/intercepciones ($d = 1,2$) y saques ($d = 2,4$), respectivamente.

Conclusión: La toma de decisiones estratégicas relacionadas con pases, recepciones y saques parece ser esencial para anotar goles. Además, la eficacia en los saques y en los robos/intercepciones surgieron como posibles indicadores de rendimiento significativo entre los equipos brasileños de élite.

Palabras clave: Deportes de equipo, Paratletas, Deportes para personas con discapacidad, Análisis del juego, Metodología observacional

Introduction

Wheelchair rugby (WR) is recognized as one of the world's most popular Paralympic team sports, and has attracted significant attention within the field of sports science. The result of a WR match is determined by the number of tries scored by the team (World Wheelchair Rugby, 2026). To this end, it is essential to consider the offensive (e.g., throw-in, passes and assist) and defensive actions (e.g., picks, blocks, steals/interceptions) that contribute to the scoring of tries. However, there is a complexity in analyzing these actions during the game (e.g., clear operational criteria, key performance indicators, cost-effectiveness) in order to provide parameters for success in the sport (Cullinane et al., 2024).

Most performance parameters in WR have focused on the athlete's physical, physiological and biomechanical profiles (Altmann et al., 2018; Bakatchina et al., 2024; O'Brien et al., 2025; Rhodes et al., 2017), whilst tactical and contextual game variables have received less attention (Mason et al., 2019; Molik et al., 2008; Morgulec-Adamowicz et al., 2010; Quinn et al., 2024). There is evidence that functional classification directly influences physical demands and performance during the game, and it is common to distinguish between low- and high-scoring athletes for performance analysis (Molik et al., 2008; Morgulec-Adamowicz et al., 2010; Rhodes et al., 2015). Nevertheless, there remains a paucity of studies devoted to the analysis of tactical-technical performance indicators in WR.

Match analysis, in general, can identify offensive patterns, defensive organization, decision-making and attacker-defender interactions that essentially complement technical and tactical preparation (Cullinane et al., 2024; Twist, 2023). Moreover, performance analysts collaborate closely with the coaching staff to provide insights on training sessions, match performance, and opponent behavior (Parmar et al., 2023). In this regard, an understanding of key performance indicators in WR may facilitate the technical training of the selected skills, as well as the adoption of new tactics to overcome opposition play, scoring more tries and winning matches (Quinn et al., 2024).

Despite their importance in conventional rugby (Ortega et al., 2009; Vaz et al., 2019), the influence of critical moments (e.g., set pieces and defensive transitions) on the outcomes of WR has yet to be thoroughly investigated. Furthermore, the continuous and dynamic nature of WR demands not only physical and technical excellence but also high-quality decision-making under defensive pressure (Orr & Malone, 2010; Twist, 2023). Whilst prior studies have established an association between functional classification and offensive efficiency (Molik et al., 2008; Morgulec-Adamowicz et al., 2010; Quinn et al., 2024), there remains a paucity of statistical modelling concerning the direct relationship between the quality of decision-making during these pivotal tactical-technical actions and the probability of scoring a try.

Extensive evidence demonstrates that tactical and technical indicators play a pivotal role in match analysis (Cullinane et al., 2024; Hughes & Bartlett, 2002), but a consensus on the most effective predictors of success in WR remains elusive. Additionally, Brazil is positioned among the world's leading WR teams (World Wheelchair Rugby, 2025), yet official competitions in Brazil remain under-researched. Therefore, the aim of this study is to analyze potential tactical-technical indicators of points scored and match outcomes in WR among elite Brazilian teams. The hypothesis is that offensive and defensive performance parameters are related to both successful tries and winning matches in this sport.

Method

This study employed the observational method (Anguera & Mendo, 2013). The observation is non-participant and direct, based on the filmed official competition matches. The typical behaviors exhibited by WR players have been examined within a real ecological framework, without the use of experimental manipulation. This approach enables the evaluation of tactical-technical performance in authentic competitive settings.

Sample

The data were derived from the on-court actions of four teams, comprising a total of 39 elite Brazilian WR athletes distributed across all functional classification categories: 0.5 (n= 8), 1.0 (n= 5), 1.5 (n= 3), 2.0 (n= 12), 2.5 (n= 4), 3.0 (n= 3), and 3.5 (n= 4). Among the participants, 10 were members of the Brazilian National Team, representing approximately 83% of the national squad. This composition underscores the representativeness of the sample and supports its characterization as reflecting the highest level of WR competition in Brazil. Consequently, the final sample of analyzed actions comprised 479 throw-ins, 864 receptions, 454 passes, 142 assists, 363 points scored (tries), and 39 steals/interceptions.

Data collections and analysis procedure

Notational analysis was conducted on the semifinals and finals matches (for the bronze and gold medals) of the “II Copa dos Campeões de Rugby em Cadeira de Rodas” (Brasília, Brazil, 2023), using the Lince 1.4 software (Gabin et al., 2012). Match videos were obtained from the official YouTube channel of the Brazilian Association Wheelchair Rugby (ABRC), and information regarding the athletes’ functional classification was collected from the official scoresheets available on the ABRC website.

The outcome and performance data for each team's match was recorded by a trained rater. Prior to data collection, the rater underwent a training protocol comprising three modules. Initially, an expert rater conducted a theoretical session (2h) on the utilization of manual video analysis software for the purposes of sports performance analysis. This included written operational definitions, photographic support and video examples related to the use of Lince 1.4 software. During the second module (2h), another expert rater demonstrated the practical applications of the software and its functions for notational analysis, during which the first quarter of an international WR match was analyzed under supervision. The third module (4h) involved analyzing the first quarter of a semi-final match from the “II Copa dos Campeões de Rugby em Cadeira de Rodas” for the first measure for the reliability analysis. To measure intra-rater reliability, 10% of each game's total actions were randomly reanalyzed (Tabachnick & Fidell, 2019), with an 8-week interval between analyses. The percentage agreement (PA) and Cohen's kappa (κ) values for each game action were acceptable (O'Donoghue, 2015): pass (PA= 81.8%, κ = 0.647), reception (PA= 86.4%, κ = 0.654), assist (PA= 95.5%, κ = 0.818), and throw-in (PA= 86.4%, κ = 0.704).

The game actions were recorded in accordance with the study by Molik et al. (2008), as shown in Table 1. Tactical-technical performance indicators were evaluated by decision-making quality and overall game efficiencies and frequencies. The decision-making processes involved in passing, receiving and throwing-in were categorized in order to gather independent gameplay components for each athlete. The decision-making criteria (i.e., the distinction between appropriate and inappropriate actions) were based on offensive and defensive principles, including ball progression, positional play, and ball possession. Furthermore, the establishment of these criteria was informed by insights from coaches and experts in the sport. Decision-making quality was defined as makes appropriate decisions about what to do with the ball during a game (appropriate decisions were coded 1 and inappropriate 0) (Memmert & Harvey, 2008). Thus, efficiency (E) was calculated as: $E = [(number\ of\ appropriate\ actions - number\ of\ inappropriate\ actions) \div (total\ of\ actions)] * 100$. Moreover, the match outcome was considered as win or loss in order to identify the performance parameters associated with winning. The total number of assists, steals and points scored (try) was also used for the analysis. The outcome of each offensive sequence was recorded as a successful try (point scored) or a failure. Therefore, five performance parameters relating to two groups were

selected: offence (pass efficiency, reception efficiency, throw-in efficiency, and number of assists) and defense (number of steals/interceptions).

Table 1. Operational definitions for the game actions.

Game action	Definition
Pass	A technical action in which a player intentionally passes the ball to a teammate. It is an offensive skill used to advance the ball or maintain possession. A pass was considered appropriate when the ball was thrown in a way that allowed a teammate to successfully receive it; it was considered inappropriate when the direction of the ball made it difficult or impossible for a teammate to receive it.
Reception	This is the action of successfully gaining control of the ball after receiving a pass from a teammate. It is a key metric for evaluating a player's ability to maintain offensive flow and secure possession under defensive pressure. A reception is considered appropriate when the player successfully catches the ball from a pass by another teammate; it was considered inappropriate when the player fails to catch the ball properly, whether due to a technical error or lack of coordination, potentially resulting in a loss of possession.
Throw-in	The specific action of restarting play by tossing the ball into the court from the sidelines or end lines after a stoppage. A throw-in was considered appropriate when the throw-in was executed and a teammate caught the ball; it was considered inappropriate when the player who took the throw-in missed the pass, which could have meant losing possession of the ball.
Assist	The last ball passed that creates a score.
Steal/Interception	A steal occurs when a defensive player intentionally gains possession of the ball. Otherwise, it occurs when an attacking player loses possession of the ball.
Point scored (try)	It occurs when a player crosses the opponent's try line while in possession of the ball.

Note: Adapted from Molik et al. (2008).

Data analysis

Data on categorical variables were reported using absolute (n) and relative (%) frequencies. For quantitative variables, mean and standard deviation (SD) were employed for descriptive analysis. The bootstrap method (k= 1000, with replacement) was applied to all analysis to estimate the 95% confidence interval (95%CI) (Carpenter & Bithell, 2000). Fisher's exact test was used to analyze the association between decision-making quality (appropriate vs. inappropriate) across game actions (passes, receptions, and throw-ins) and score outcomes (successful try vs. failure). The magnitude of these associations was quantified using the Odds Ratio (OR). OR were not calculated for variables presenting zero frequencies in contingency table cells, as this mathematically prevents the calculation. The independent *t* test was applied to verify differences between winners and losers teams. The magnitude of these differences was quantified using the Cohen's *d*, and interpreted as $d < 0.20$ trivial, $d = 0.20-0.59$ small, $d = 0.60-1.19$ moderate, $d = 1.20-1.99$ large, $d = 2.00-3.99$ very large and $d \geq 4.0$ almost perfect

(Hopkins et al., 2009). The analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS) program, version 27.0 (IBM Corp., Armonk, USA), and the statistical significance was set at $P < 0.05$.

Results

With the exception of the bronze medal match (a 4-point margin), the other matches were considered balanced (a 10-18-point margin). Tables 2 and 3 detail the association between the decision-making quality of game action (pass, reception, and throw-in) and the occurrence of a try (point scored) for winning and losing teams, respectively. For both groups, appropriate decision-making across all three game actions was statistically associated with a successful try outcome ($P < 0.05$).

Table 2. Making decision analysis for the winners WR teams.

Game action	Making-decision quality	Try (Success)	Try (Failure)	P-value	OR (95% CI) ^a
Pass	Appropriate	139 (100.0)	35 (71.4)	<0.001	-
	Inappropriate	0 (0.0)	14 (28.6)		
Reception	Appropriate	225 (100.0)	162 (95.9)	<0.001	-
	Inappropriate	0 (0.0)	7 (4.1)		
Throw-in	Appropriate	174 (99.4)	38 (90.5)	<0.001	18.3 (2.0 to 37.3)
	Inappropriate	1 (0.6)	4 (9.5)		

Note: Data reported by absolute (n) and relative (%) frequency. *P*-value for the Fisher's Exact Test. ^aConfidence interval based on bootstrap method.

In winning teams (Table 2), appropriate throw-ins were a relevant predictor of offensive success, increasing the odds of scoring a try by 18 times (95%CI: 2.0 to 37.3, $P < 0.001$) compared to inappropriate throw-ins. Particularly, 100% of the tries scored by winning teams were preceded by appropriate passes and receptions, which resulted in a significant association ($P < 0.05$) but prevented the calculation of OR due to the absence of inappropriate actions leading to a try.

For the losing teams (Table 3), an appropriate pass increased the odds of scoring a try by 10 times (95%CI: 4.1–26.1, $P < 0.001$). Similarly, an appropriate throw-in increased the odds by 13 times (95%CI: 2.9–58.7, $P < 0.001$), compared to an inappropriate decision. Reception quality also showed a significant positive association with scoring a try ($P = 0.002$) in the losing group.

Table 3. Making decision analysis for the losers WR teams.

Game action	Making-decision quality	Try (Success)	Try (Failure)	P-value	OR (95% CI) ^a
Pass	Appropriate	157 (96.3)	73 (71.6)	<0.001	10.4 (4.1 to 26.1)
	Inappropriate	6 (3.7)	29 (28.4)		
Reception	Appropriate	230 (100.0)	228 (95.0)	0.002	-
	Inappropriate	0 (0.0)	12 (5.0)		
Throw-in	Appropriate	160 (98.8)	86 (86.0)	<0.001	13.0 (2.9 to 58.7)

Inappropriate 2 (1.2) 14 (14.0)

Note: Data reported by absolute (n) and relative (%) frequencies. *P*-value for the Fisher's Exact Test. ^aConfidence interval based on bootstrap method.

Table 4 compares the overall performance parameter efficiencies between winning and losing teams. The analysis revealed no significant differences regarding pass efficiency, reception efficiency, the number of assists, or the number of steals/interceptions between the match outcomes ($P>0.05$). However, a large ES was observed for steals/interceptions ($d= 1.2$). Moreover, winning teams demonstrated a higher throw-in efficiency compared to losing teams, presenting a very large ES ($d= 2.4$, $P= 0.014$). The number of points scored (tries) did not show a statistically significant difference between winning and losing teams, although a large ES has been detected ($d= 1.7$).

Table 4. Performance parameter differences between winning and losing teams according to the match outcome.

Performance parameter	Loss	Win	<i>P</i> -value	ES (95% CI)
Pass efficiency	82.0 (36.1)	90.4 (19.1)	0.693	0.291 (−1.6 to 2.2)
Reception efficiency	94.7 (5.4)	96.7 (3.6)	0.556	0.436 (−1.5 to 2.4)
Throw-in efficiency	89.3 (3.2)	95.4 (1.5)	0.014	2.441 (−0.1 to 5.0)
Number of assists	20 (4)	15 (4)	0.136	−1.250 (−3.3 to 0.9)
Number of steals/interceptions	4 (1)	6 (2)	0.076	1.265 (−0.9 to 3.4)
Points scored (try)	40 (8)	51 (5)	0.051	1.649 (−0.6 to 3.9)

Note: Data reported by mean and SD. ES, effect size presented by Cohen's *d*. *P*-value for the *t* independent test.

Discussion

Research on rugby has centered on offensive efficiency through functional classification and lineup structure, yet there has been no statistical modelling of the relationship between performance parameters and game outcome. The present investigation analyzed potential tactical-technical indicators of points scored and match outcomes in WR among elite Brazilian teams. The hypothesis that offensive and defensive performance parameters are related to both successful tries and winning matches in this sport was partially supported. Our data indicated that strategic decision-making, throw-in efficiency and steals/interceptions seem to be important performance indicators among elite Brazilian teams.

The findings of the present study indicated that a well-executed throw-in increased the chance of a try for both winning and losing teams. Consequently, when players are under pressure to defend, they must make quick decisions that are accurate. In the context of standing rugby, set pieces are widely recognized as being indispensable for achieving optimal performance at the highest levels of competition (Ortega et al., 2009; Vaz et al., 2019). This highlights the importance of throw-ins as a potential deciding factor among elite Brazilian teams. However, further research is required to confirm this assertion.

Another interesting result was the positive correlation between effective passing and receiving skills and try-scoring opportunities across all teams analyzed. Moreover, losers and winners presented similar results for pass and reception. This finding suggests that the ability to execute passes and receive the ball competently is considered the standard of excellence in WR among elite Brazilian teams. In order to explain the excellent efficiency values observed

(>80%), it is highly probable that the teams studied will exhibit clear communication between teammates and an awareness of each other's abilities (Orr & Malone, 2010). In light of the fact that passes and receptions are associated with other offensive actions that can result in a try, these fundamental skills can be considered crucial for success in WR.

In terms of practical application, a large magnitude of effect for steals/interceptions indicates that they can play a decisive role in both defensive and offensive transitions. This underlines the importance of prioritizing steals/interceptions within training regimens. However, the efficiency of these actions varies according to the athlete's functional classification, with higher classes demonstrating superior performance in comparison to lower classes (Molik et al., 2008; Morgulec-Adamowicz et al., 2010). Moreover, a recent study observed that 'high-low' offensive team's lineup structure may generate fewer turnovers (due to steals/interceptions) than expected, thereby increasing the likelihood of possession resulting in a try (Quinn et al., 2024).

In WR, the team's success in scoring is contingent not only on the achievement of a try by a player, but also on the team's ability to execute a play (Orr & Malone, 2010). It is evident that, despite the necessity for greater teamwork in order to achieve successful assists, this skill can be a viable solution for winning matches. Interestingly, our study found an advantage for losing teams on the question of assists. One potential explanation for this might be related to functional classes. It is reasonable to speculate that teams with players occupying higher functional classes (e.g., 3.5) may employ these players in individual plays, while teams lacking such players require more collective plays, as evidenced by a greater number of assists.

Very few studies have conducted match analyses to identify key tactical-technical indicators in the context of WR (Mason et al., 2019; Molik et al., 2008; Morgulec-Adamowicz et al., 2010; Quinn et al., 2024; Rhodes et al., 2015). Our data, obtained from elite Brazilian teams, demonstrated that the primary performance parameters that differentiate winning and losing teams are throw-in efficiency and number of steals/interceptions. This information may assist coaches and athletes in designing more effective training sessions and providing elements to improve tactical-technical aspects (Cullinane et al., 2024; Hughes & Bartlett, 2002; Parmar et al., 2023). Furthermore, the clear identification of these variables enables the enhancement of structured observation instruments (scouts).

Despite the practical applicability of this study, it is important to acknowledge the limitations of the research. The investigation examined specific matches (semi-finals and finals), which constitutes an inherent restriction due to the reduced sample size, yet it represents the highest level of competition. This limitation also affected the possibility of relating the specific role of low-pointers and high-pointers in the execution of these success variables (Mason et al., 2019), as well as the offensive lineup structures (Molik et al., 2008; Morgulec-Adamowicz et al., 2010; Quinn et al., 2024). Due to logistical constraints, a single rater was assigned to perform match analysis. Therefore, the incorporation of additional raters, a wider array of actions, and rugby players with diverse training levels and backgrounds is fundamental to ascertain the replicability of the findings.

Conclusion

Strategic decision-making related to passing, receiving, and the throw-in seems to be essential for scoring tries. Moreover, throw-in efficiency and steals/interceptions emerged as possible performance indicators among elite Brazilian teams. These findings may offer preliminary insights into the tactical-technical indicators linked to success in WR.

Data availability

All relevant data is in the article. For further information, contact the corresponding author.

References

- Altmann, V. C., Groen, B. E., Hart, A. L., Vanlandewijck, Y. C., & Keijsers, N. L. W. (2018). Classifying trunk strength impairment according to the activity limitation caused in wheelchair rugby performance. *Scandinavian Journal of Medicine & Science in Sports (John Wiley & Sons, Inc.)*, 28(2), 649–657. <https://doi.org/10.1111/sms.12921>
- Anguera, M. T., & Mendo, A. H. (2013). Observational methodology in Sport Sciences. *E-Balonmano.com: Revista de Ciencias del Deporte*, 9(3), 135–160.
- Bakatchina, S., Weissland, T., Astier, M., Pradon, D., & Faupin, A. (2024). Performance, asymmetry and biomechanical parameters in wheelchair rugby players [Article]. *Sports Biomechanics*, 23(7), 884–897. <https://doi.org/10.1080/14763141.2021.1898670>
- Carpenter, J., & Bithell, J. (2000). Bootstrap confidence intervals: when, which, what? A practical guide for medical statisticians. *Statistics in Medicine*, 19(9), 1141–1164. [https://doi.org/10.1002/\(SICI\)1097-0258\(20000515\)19:9<1141::AID-SIM479>3.0.CO;2-F](https://doi.org/10.1002/(SICI)1097-0258(20000515)19:9<1141::AID-SIM479>3.0.CO;2-F)
- Cullinane, A., Davies, G., & O'Donoghue, P. (2024). *An introduction to performance analysis of sport* (2nd ed.). Taylor & Francis. <https://doi.org/10.4324/9781003375463>
- Gabin, B., Camerino, O., Anguera, M. T., & Castañer, M. (2012). Lince: Multiplatform sport analysis software. *Procedia - Social and Behavioral Sciences*, 46, 4692–4694. <https://doi.org/10.1016/j.sbspro.2012.06.320>
- Hopkins, W. G., Batterham, A. M., Marshall, S. W., & Hanin, J. (2009). Progressive statistics. *Sportscience*, 13.
- Hughes, M. D., & Bartlett, R. M. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences*, 20(10), 739–754. <https://doi.org/10.1080/026404102320675602>
- Mason, B. S., Altmann, V. C., & Goosey-Tolfrey, V. L. (2019). Understanding the impact of trunk and arm impairments on wheelchair rugby performance during competition [Article]. *International Journal of Sports Physiology and Performance*, 14(5), 612–619. <https://doi.org/10.1123/ijsp.2018-0204>
- Memmert, D., & Harvey, S. (2008). The game performance assessment instrument (GPAI): Some concerns and solutions for further development. *Journal of Teaching in Physical Education*, 27(2), 220–240. <https://doi.org/10.1123/jtpe.27.2.220>
- Molik, B., Lubelska, E., Kosmol, A., Bogdan, M., Yilla, A. B., & Hyla, E. (2008). An examination of the international wheelchair rugby federation classification system utilizing parameters of offensive game efficiency. *Adapted Physical Activity Quarterly*, 25(4), 335–351. <https://doi.org/10.1123/apaq.25.4.335>
- Morgulec-Adamowicz, N., Kosmol, A., Bogdan, M., Molik, B., Rutkowska, I., & Bednarczyk, G. (2010). Game efficiency of wheelchair rugby athletes at the 2008 paralympic games with regard to player classification. *Human Movement*, 11(1), 29–36. <https://doi.org/10.2478/v10038-010-0002-6>
- O'Brien, T. J., Briley, S. J., Murphy, C., & Goosey-Tolfrey, V. L. (2025). The role of power and kinetic asymmetry in differentiating elite vs. sub-elite wheelchair rugby sprint performance. *Journal of Sports Sciences*, 43(10), 926–932. <https://doi.org/10.1080/02640414.2025.2481346>
- O'Donoghue, P. (2015). *An introduction to performance analysis of sport*. Taylor & Francis.
- Orr, K., & Malone, L. A. (2010). Wheelchair Rugby. In V. Goosey-Tolfrey (Ed.), *Wheelchair sport: A complete guide for athletes, coaches, and teachers*. Human Kinetics.

- Ortega, E., Villarejo, D., & Palao, J. (2009). Differences in game statistics between winning and losing rugby teams in the six nations tournament. *Journal of sports science & medicine*, 8, 523–527.
- Parmar, N., James, N., & Kraak, W. (2023). Performance analysis in rugby. In C. Twist & P. Worsfold (Eds.), *The science of rugby* (2nd ed.). Taylor & Francis. <https://doi.org/10.4324/9781003045052-12>
- Quinn, L. O., Bruce, L. M., & Young, C. M. (2024). The impact of wheelchair rugby classification lineup structure on possession outcome. *Journal of Science and Medicine in Sport*, 27(7), 493–498. <https://doi.org/10.1016/j.jsams.2024.03.011>
- Rhodes, J. M., Mason, B. S., Malone, L. A., & Goosey-Tolfrey, V. L. (2015). Effect of team rank and player classification on activity profiles of elite wheelchair rugby players. *Journal of Sports Sciences*, 33(19), 2070–2078. <https://doi.org/10.1080/02640414.2015.1028087>
- Rhodes, J. M., Mason, B. S., Paulson, T. A. W., & Goosey-Tolfrey, V. L. (2017). A Comparison of Speed Profiles During Training and Competition in Elite Wheelchair Rugby Players. *International Journal of Sports Physiology & Performance*, 12(6), 777–782. <https://doi.org/10.1123/ijsp.2016-0218>
- Tabachnick, B. G., & Fidell, L. S. (2019). *Using Multivariate Statistics* (7th ed.). Pearson.
- Twist, C. (2023). Modified rugby. In C. Twist & P. Worsfold (Eds.), *The science of rugby* (2nd ed.). Taylor & Francis. <https://doi.org/10.4324/9781003045052>
- Vaz, L., Hendricks, S., & Kraak, W. (2019). Statistical review and match analysis of rugby world cups finals. *Journal of Human Kinetics*, 66, 247–256. <https://doi.org/10.2478/hukin-2018-0061>
- World Wheelchair Rugby. (2025). *World Rankings*. World Wheelchair Rugby. Retrieved 28/03/2026 from <https://worldwheelchairrugby/world-rankings/>
- World Wheelchair Rugby. (2026). *International rules for the sport of wheelchair rugby*. World Wheelchair Rugby.

Author Contributions (CRediT)

Conceptualization: M.D.C.A. and E.C.S.

Methodology: M.D.C.A., E.C.S., and L.S.O.

Formal analysis: M.D.C.A. and L.S.O.

Investigation: M.D.C.A.

Data curation: M.D.C.A. and L.S.O.

Writing – original draft preparation: L.S.O. and A.L.P.S.R.

Writing – review and editing: A.L.P.S.R., L.S.O., G.R.B., and E.C.S.

Visualization: A.L.P.S.R. and L.S.O.

Supervision: G.R.B. and E.C.S.

Conflict of interest

The authors have declared that there is no conflict of interest.

Funding

The authors received no specific funding for this work.

Data availability statement

These data were derived from the following resources available in the public domain:

<https://www.youtube.com/abrcrugby>.

Corresponding author: Elaine Cappellazzo Souto (ecsouto@gmail.com)

This preprint was submitted under the following conditions:

- The authors declare that the necessary Terms of Free and Informed Consent of participants or patients in the research were obtained and are described in the manuscript, when applicable.
- The authors declare that the preparation of the manuscript followed the ethical norms of scientific communication.
- The authors declare that they are aware that they are solely responsible for the content of the preprint and that the deposit in SciELO Preprints does not mean any commitment on the part of SciELO, except its preservation and dissemination.
- The authors declare that the data, applications, and other content underlying the manuscript are referenced.
- The deposited manuscript is in PDF format.
- The authors declare that the research that originated the manuscript followed good ethical practices and that the necessary approvals from research ethics committees, when applicable, are described in the manuscript.
- The authors declare that once a manuscript is posted on the SciELO Preprints server, it can only be taken down on request to the SciELO Preprints server Editorial Secretariat, who will post a retraction notice in its place.
- The authors agree that the approved manuscript will be made available under a [Creative Commons CC-BY](#) license.
- The submitting author declares that the contributions of all authors and conflict of interest statement are included explicitly and in specific sections of the manuscript.
- The authors declare that the manuscript was not deposited and/or previously made available on another preprint server or published by a journal.
- If the manuscript is being reviewed or being prepared for publishing but not yet published by a journal, the authors declare that they have received authorization from the journal to make this deposit.
- The submitting author declares that all authors of the manuscript agree with the submission to SciELO Preprints.