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Research Article

Metabolic Equivalent Distance Across Game Quarters and Athlete Position in Female Collegiate Lacrosse Players

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Abstract

As a sport, field lacrosse requires seamless transitions between acceleration and deceleration. Unfortunately, linear displacement variables at a constant speed underestimate the energy demand in team sports, as they fail to account for the additional energy expended during acceleration and deceleration. In order to address these additional energy costs and offer a more precise measure of an athlete's workload, the metric called metabolic equivalent distance (MED) was developed. The purpose of the study was to assess the differences in MED across game quarters and athlete positions among female collegiate lacrosse players and determine potential relationships between MED and other workload variables. Seventeen female collegiate lacrosse players wore global positioning systems units, and data were collected over the course of 17 games. Performance variables were analyzed per minute played (min PT) and included: MED (m), total distance (m), accelerations (count), decelerations (count), total sprints (count), metabolic peak power (J), metabolic energy cost (J/kg/m), and equivalent distance index (%). No difference was found between athlete position. Performance variables did not differ between game quarters, except for playing time ($p < .001$). Athlete playing time was reduced in the 3rd and 4th quarters compared to quarter 1 ($p < .001$). MED showed a perfect correlation with total distance and metabolic energy cost ($r = 1$; $p < .001$) and a near-perfect correlation with accelerations and total sprints ($r = .93$; $p < .001$). Decelerations exhibited a strong correlation with MED ($r = .86$; $p < .001$). MED was moderately correlated with metabolic peak power ($r = .34$; $p < .001$); whereas equivalent distance index displayed a small correlation ($r = .15$; $p = .02$). Athletes exhibited a consistent output in metabolic workload variables across position and game per minute of play. MED could serve as a surrogate workload variable to better understand the athlete's energy expenditure during high-intensity training and game play.

Keywords

Field Lacrosse, Acceleration, Deceleration, Energy Expenditure, Metabolic Power, Equivalent Distance

1. Introduction

Women's field lacrosse is an internationally recognized sport, with participation from 30 different countries at the highest competitive level [1]. Its popularity within the United States of America continues to grow, with 96,762 female high school athletes and 13,294 National Collegiate Athletic Association (NCAA) athletes competing in women's field lacrosse in 2022 [2, 3]. With the increasing popularity of women's field lacrosse at the club, high school, universi-

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ty/college, and national levels, and with a scarcity of scientific literature specifically addressing women's field lacrosse, it is crucial for athletes, training staffs, coaches, and scientists to explore and develop appropriate training and game strategies to optimize performance in women's field lacrosse.

As a sport, field lacrosse requires its players to exhibit a high level of coordination, agility, and speed. Player performance involves swift changes in direction, sustained activity, numerous instances of intermittent high-intensity sprints, and seamless transitions between acceleration and deceleration [4]. Studies investigating sprint-related workloads during a female NCAA field lacrosse game found that players can cover a total distance of 4,732 m and reach average speeds of 24.1 to 26.4 $km \cdot h^{-1}$ [5-7]. The increased use of global positioning systems (GPS) has popularized the use of displacement variables, specifically total distance and average speed, as indicators of the amount and rate of work done [8]. Polglaze et al. [8] contended that distance and speed have become criterion measures for assessing the energy demands of team sports by default. Unfortunately, these displacement variables underestimate the energy demand of team sport, as they assume that the movements performed during training and in-game competition are performed at a constant speed, instead of considering the continuously changing series of accelerations and decelerations typically associated with team sport [8].

Research investigating female collegiate lacrosse has demonstrated that the frequency of high-intensity accelerations ($\geq 3\ m \cdot s^{-2}$) during game competition can vary greatly, ranging from 51 to 204 for attackers and from 50 to 210 for midfielders [6, 9]. Similarly, the occurrence of decelerations (high-intensity; $\leq 3\ m \cdot s^{-2}$) during a game can also vary significantly, from 41 to 82 repetitions for attackers and from 36 to 128 repetitions for midfielders [6, 9]. As a result of the acceleration and deceleration dynamics associated with game performance, the lacrosse athlete would be required to exert a greater energetic cost than that predicted by a constant speed workload equation [10]. Consequently, the energy cost of continuously changing speed, associated with transitioning between acceleration and deceleration, must be considered to fully understand the energy demands of team sport activity [8].

In an attempt to account for the additional energy cost associated with acceleration and deceleration, as well as to provide a more representative measure of an athlete's effort during team sport activity, sport microtechnology companies have developed their own proprietary measures via GPS. GPS technologies, such as Catapult and GPSports, have developed their own proprietary calculations, which have been used to study positional differences in female collegiate and elite male field hockey [11, 12]. One such measure is metabolic equivalent distance (MED), created by VX Sport. This proprietary measure estimates the additional energy cost associated with an athlete's accelerations and decelerations and converts it into additional meters covered. As a result, MED combines this estimated extra meters with the total distance covered by the athlete to provide a more representative measure of the energy demands of team sport activity. To date, MED as a measure has seen limited use in sport science research, and its application in women's field lacrosse research is even rarer. However, Bynum et al. did show a moderate relationship between MED and scoring production in women's collegiate field lacrosse, indicating a need for further investigation [9, 13]. Additionally, Thornton et al. found MED to be significantly elevated in conference games verse non-conference games in collegiate division 1 women's lacrosse [13].

If MED proves effective in estimating the energy demands of team sports, it could become a valuable and efficient method for measuring an athlete's workload during field lacrosse training and games. Coaching staffs, sports scientists, and healthcare professionals, such as athletic trainers and physical therapists, may use this information to replicate the physiological demands associated with game performance during training, tailor athlete training based on the MED load requirements of the position played, and establish a progressive scale for an athlete's return to play following an injury conditioning program [5]. The current exploratory study aimed to assess the differences in MED and other GPS-metrics of workload across different game quarters and athlete positions. It was hypothesized that MED would decrease across the four quarters of the game, and the midfielders would display the highest values of MED. In addition, we investigated potential relationships between MED and other GPS-metrics of workload. It was hypothesized that MED would have moderate or strong relationships with the GPS metrics examined in this study.

2. Methods

2.1. Study Design and Participants

This study employed a prospective observational design, involving 17 female lacrosse players (20.6 ±1.2 years, 168.0 ±5.7 cm, 66.3 ±6.3 kg) across 17 NCAA Division I collegiate games in the 2022-2023 season. Participant data were categorized based on positions: attackers (n = 7), midfielders (n = 7), and defenders (n = 3). Individuals were eligible to participate in the study if they were 18 years of age or older and members of the university varsity female lacrosse team. Participants were excluded if they removed themselves from the team, were determined unfit by a healthcare professional, played less than 50% of the games during the competitive season, or were deemed ineligible by the NCAA. The university's Institutional Review Board approved this study and all participants completed an informed consent prior to the start of the study.

2.2. Data Collection

VX Sport vests, GPS devices, and heart rate monitors

(Wellington, New Zealand) were assigned to each player. VX Sport units have been previously found to be accurate and reliable, and displacement data were collected at 10 Hz [14, 15]. GPS units were activated prior to the start of each game, with athletes using the same unit throughout the entire year. After the completion of each game, the GPS units were immediately collected, and data were downloaded from each unit. The data were then placed into the VX Sport software and edited to remove nonessential information before and after the game. Furthermore, game data were divided based on four 15-minute quarters. Dependent variables included playing time (min.), total distance (m), metabolic equivalent distance (MED, m), equivalent distance index (%; percentage of energy devoted to accelerating/decelerating), high-intensity accelerations (number of efforts), high-intensity decelerations (number of efforts), metabolic cost (J/kg/m; energy required to cover a distance of one meter), metabolic power peak (W/kg), and high-intensity sprints (number of efforts). Accelerations and decelerations were quantified by the VX Sport software when an athlete accelerated or decelerated by greater than 3 m s^{-2}. MED is a proprietary calculation by VX Sport that estimates and transforms the additional energy cost of accelerating and decelerating in meters, adding this value to the total distance covered by the athlete. Prior to the start of the competitive season, maximum sprint speed was ascertained via two different fly-in sprint assessments as described by Alphin et al [14]. Data from maximum sprint speed were used to determine thresholds for sprinting. Variables for analysis were chosen to align with previous research in women's field lacrosse [16, 17].

All dependent variables with exception of playing time were expressed per minute of playing time (/min PT). Playtime was calculated by analyzing the GPS data for each individual athlete from each game. Accumulated playtime was recorded by adding the total time corresponding to GPS spikes within the game data that indicated the athlete's movement [9]. After recording all the GPS spikes, an overall playing time for each athlete was calculated, excluding stoppages between quarters, timeouts, and breaks [9].

3. Statistical Analysis

Data are presented as means ± standard deviations, and statistical analysis was performed using SigmaStat version 3.5 (Systat Software, Inc., San Jose, CA, USA). An alpha level of 0.05 was used to determine significance. Data were confirmed to be normally distributed with the exception equivalent distance index and decelerations. Parametric analysis was still used because the majority of the variables meet the assumptions. Changes in dependent variables were analyzed using a two-way repeated measures analysis of variance (ANOVA). The analysis included one group factor (athlete position: attack, midfielder, defender) and one within-group factor (game quarter: first quarter, second quarter, third quarter, fourth quarter). Post-hoc analysis was performed using Tukey's correction for pairwise multiple comparisons. Partial eta squared ($\eta 2$) effect sizes (ES) were calculated to assess the magnitude of the differences for each comparison with a probability less than 0.05 [18].

To evaluate the association of MED with other performance measures, within-participant correlations and 95% confidence intervals (CI) were calculated [19]. Previous literature supports the use of this method and considers the repeated measurements taken from each athlete throughout the competitive season [20, 21]. Whole game data for total distance, accelerations, decelerations, equivalent distance index, metabolic cost, and metabolic peak power was correlated with MED. All correlation coefficients (r) were characterized as small ($r < 0.3$), moderate ($r = 0.3$ - 0.49), large ($r = 0.5 – 0.69$), very large ($r = 0.7 – 0.89$), and near perfect ($r > 0.9$) [22].

4. Results

Table 1 shows the means and standard deviations for all GPS metrics by position (attack, midfield, and defense) for all four quarters and across the entire game. Playing time demonstrated a 14.7% decrease in the third and fourth quarters [main effect for time, $F(3,42) = 7.374$, $p < 0.001$, $\eta 2 = 0.35$]. Post-hoc analysis revealed that both the third and fourth quarters showed a decrease in playing time by 2.3 minutes ($p < 0.001$). Peak metabolic power approached significance [$F(3,42) = 2.810$, $p < 0.051$, $\eta 2 = 0.17$], showing a 17.4%, 21.7%, and 26.1% increase in the second, third, and fourth quarters, respectively. No differences were found for any other GPS metric across game quarters (main effect for time). Furthermore, no main effect for position was found for any GPS metric.

All correlation coefficient values and CI, indicating an association between MED and all GPS metric outcomes, are reported in Figure 1. GPS metrics, metabolic cost per minute of playing time, and total distance demonstrated perfect positive relationships ($r = 1.0$, $p < 0.001$) with MED. The number of high-intensity accelerations and the number of high-intensity sprints per minute of playing time displayed near-perfect positive associations with MED ($r = 0.90$ and $r = 0.96$, respectively, $p < 0.001$). Very large positive relationships with MED were found for playing time ($r = 0.75$, $p < 0.001$) and the number of high-intensity decelerations per minute of playing time ($r = 0.86$, $p < 0.001$). A moderate positive association ($r = 0.34$, $p < 0.001$) was found for peak metabolic power per minute of playing time and MED. Lastly, the equivalent distance index demonstrated a small positive relationship with MED ($r = 0.15$, $p < 0.001$).

Table 1. *Table caption. Comparison of GPS-based metrics across game quarters and whole game.*

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Game
Playing Time (min)	Attack	16.7 ±8.2	16.2 ±8.1	14.0 ±6.8	14.5 ±6.1	
	Midfielder	11.7 ±6.5	11.2 ±4.5	10.9 ±5.4	10.6 ±6.0	
	Defense	22.9 ±2.7	18.9 ±6.0	17.6 ±3.1	17.6 ±3.3	
	Combined	15.7 ±7.7	14.6 ±6.8	13.4 ± 6.0 †	13.4 ± 6.0 †	58.0 ±26.2 *
Total Distance (m/min PT)	Attack	76.4 ±15.3	87.0 ±21.7	77.6 ±15.7	90.0 ±27.6	
	Midfielder	90.3 ±24.0	100.6 ±27.7	89.5 ±28.2	94.1 ±26.5	
	Defense	81.3 ±9.6	93.8 ±12.2	85.0 ±4.5	82.3 ±14.1	
	Combined	83.0 ±18.9	93.8 ±22.9	83.8 ±20.6	90.3 ±24.3	135.0 ±65.5
MED (m/min PT)	Attack	90.9 ±19.0	92.5 ±10.9	90.2 ±8.2	103.3 ±23.8	
	Midfielder	118.5 ±33.6	115.7 ±24.1	112.1 ±24.8	115.3 ±27.3	
	Defense	95.7 ±11.3	102.4 ±17.4	98.6 ±4.0	105.3 ±8.2	
	Combined	103.1 ±27.5	103.8 ±20.5	100.7 ±19.1	108.6 ±23.1	142.5 ±41.3
Equivalent Distance Index (%)	Attack	16.0 ±0.1	16.0 ±0.1	15.9 ±0.1	15.8 ±0.2	
	Midfielder	15.9 ±0.1	15.9 ±0.1	15.6 ±0.7	15.7 ±0.7	
	Defense	16.0 ±0.1	16.0 ±0.1	16.0 ±0.0	16.0 ±0.1	
	Combined	15.95 ±0.18	15.94 ±0.09	15.81 ±0.44	15.79 ±0.47	15.84 ±0.30
High-Intensity Acceleration (num/min PT)	Attack	1.4 ±0.3	1.6 ±0.6	1.3 ±0.4	1.5 ±0.7	
	Midfielder	1.6 ±0.6	1.7 ±0.4	1.4 ±0.5	1.4 ±0.6	
	Defense	1.6 ±0.2	1.7 ±0.5	1.4 ±0.1	1.2 ±0.1	
	Combined	1.5 ±0.4	1.7 ±0.5	1.4 ±0.4	1.4 ±0.6	2.2 ±1.3
High-Intensity Deceleration (num/min PT)	Attack	0.5 ±0.2	0.5 ±0.2	0.4 ±0.1	0.5 ±0.2	
	Midfielder	0.5 ±0.2	0.5 ±0.2	0.5 ±0.2	0.4 ±0.2	
	Defense	0.4 ±0.0	0.5 ±0.2	0.4 ±0.1	0.3 ±0.1	
Metabolic Cost (J/kg/m)	Attack	6.5 ±1.4	6.6 ±1.7	6.5 ±0.6	7.4 ±1.2	
	Midfielder	7.8 ±2.1	7.7 ±1.5	7.4 ±1.5	7.6 ±1.7	
	Defense	7.4 ±1.2	7.2 ±0.6	7.6 ±0.7	8.2 ±1.6	
	Combined	7.2 ±1.8	7.2 ±1.2	7.0 ±1.1	7.6 ±1.8	10.0 ±3.0
Metabolic Power Peak (W/kg)	Attack	2.1 ±1.1	2.3 ±1.2	2.5 ±1.1	2.8 ±1.5	
	Midfielder	2.8 ±1.2	3.2 ±0.7	3.3 ±0.6	3.3 ±1.1	
	Defense	1.6 ±0.1	2.3 ±0.9	2.2 ±0.2	2.4 ±0.5	
	Combined	2.3 ±1.1	2.7 ±1.0	2.8 ±0.9	2.9 ±1.2	1.2 ±0.9
High-Intensity Sprints (num/min pt)	Attack	0.24 ±0.21	0.20 ±0.14	0.19 ±0.13	0.20 ±0.14	
	Midfielder	0.17 ±0.10	0.16 ±0.05	0.18 ±0.08	0.15 ±0.08	
	Defense	0.10 ±0.02	0.13 ±0.04	0.10 ±0.07	0.08 ±0.06	
	Combined	0.18 ±0.15	0.17 ±0.10	0.17 ±0.10	0.16 ±0.11	0.24 ±0.18

Notes: Values are presented as means (±standard deviation). * $p < 0.05$, time effect across game. † $p < 0.05$, difference from quarter 1.

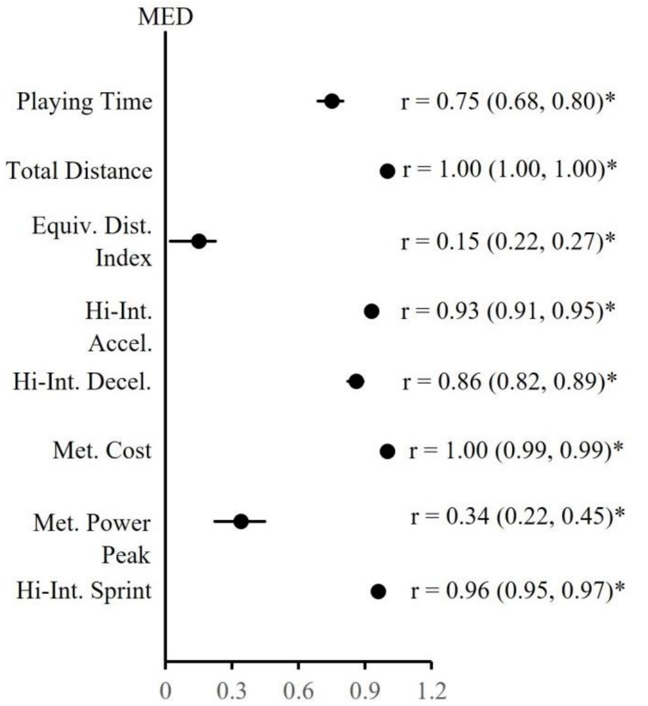

Figure 1. *Correlation coefficients, with 95% confidence interval, between metabolic equivalent distance and all GPS-metrics for collegiate female lacrosse players. * p < 0.001. MED = metabolic equivalent distance, Equiv. Dist. Index = equivalent distance index, Hi-Int. Accel. = number of high-intensity acceleration per minute of playing time, Hi-Int. Decel. = the number of high-intensity deceleration per minute of playing time, Met. Cost = metabolic cost per minute of playing time, Met. = metabolic, and Hi-Int. Sprint= number of high-intensity per minute of playing time.*

5. Discussion

The present exploratory study aimed to assess differences in MED and other GPS metrics of workload across athlete positions and game quarters in female field lacrosse. The results indicate no differences among any of the GPS metrics of workload, calculated per minute of playtime, by position or game quarter. Additionally, we investigated potential relationships between MED and other GPS metrics of workload, revealing strong correlations with its algorithm variables of total distance, high-intensity accelerations, and high-intensity decelerations. Collectively, these data suggest a use case for incorporating MED as a surrogate variable to encompass three commonly analyzed variables in field lacrosse: total distance, high-intensity accelerations, and high-intensity decelerations.

As a measure of an athlete's workload during team sport activity, MED offers great promise as a single metric. It estimates and incorporates the additional energy costs associated with the numerous accelerations and decelerations that occur during gameplay. Providing a more reflective estimate of an athlete's energy expenditure during a game, and perhaps more importantly, within specific time periods of a game, will enhance game preparation and training efficacy for coaching and training staff. When assessed across the four quarters of a female collegiate lacrosse game, MED displayed no change in the current study. Furthermore, it showed no differences between attackers, midfielders, and defenders. The lack of difference between positions for MED is consistent with the findings of Bynum et al. (2022), who also observed no practical disparity in MED between female collegiate attackers and midfielders [9]. Interestingly, they reported lower MED values in midfielders (-19%), while the present study found higher MED values in midfielders (22%) compared to attackers. The present study evaluated MED in conjunction with minutes played, but Bynum et al. did not factor in play time. Further research is needed to enable direct comparisons and fully elucidate MED's potential as a workload metric across different time points within a game and various positions.

The importance of acceleration and deceleration to an athlete's success in the sport of female field lacrosse cannot be understated, as a game is won as a result of the cumulative successes of one-on-one matchups by a team. Therefore, understanding the acceleration and deceleration profiles by position and within a game would be extremely valuable not only for comprehending the metabolic requirements of an athlete but also for athlete preparation by the coaching and training staff. Devine et al. compared the frequency of accelerations and decelerations across female collegiate lacrosse positions and found similar mean counts for high-intensity acceleration ($\geq 3m/s^2$; attackers = 51, midfielders = 50, and defenders = 52) and high-intensity deceleration ($\leq -3m/s^2$; attackers = 41, midfielders = 36, and defenders = 37) [6]. Vescovi and Frayne further found no difference between female collegiate field hockey forwards, midfielders, and defenders for both acceleration number and deceleration number [11]. Our results are in agreement and further demonstrate no positional difference in the number of high-intensity accelerations and high-intensity decelerations.

The current study also found no difference in high-intensity acceleration and high-intensity deceleration across the four quarters of a game. However, direct comparison cannot be made, as this is the first study to our knowledge that examines high-intensity accelerations and decelerations within female collegiate lacrosse players across the four-quarter game format. Thornton et al., on the other hand, investigated the frequency of accelerations and decelerations between the old game format (two, 30-minute halves) and the new 15-minute quarter game format in female collegiate lacrosse. It was determined that the number of accelerations and decelerations per minute of playing time did not differ between the first and second halves of the old format [13]. Additionally, when the acceleration and deceleration counts per minute of playing time were assessed between the two game formats, no differences were found [13]. The findings, both current and previous, illustrate that accelerations and decelerations play a significant role in the game of female field lacrosse, across all positions and throughout an entire game. Therefore, coaching and training staff need to prioritize these movements in game and training preparation, accounting for the extra energy costs of acceleration and deceleration in all positions and throughout the entire game when investigating an athlete's workload.

To underscore the significance of acceleration and deceleration and their imperative inclusion in assessing an athlete's estimated workload, it is essential to examine the equivalent distance index. The equivalent distance index, as determined by VXSport software, is defined as the percentage of a player's energy produced that is devoted to acceleration and deceleration compared to jogging at a constant speed. This percentage score, equivalent distance index by VXSport, generally falls between 0% and 20%, with a lower percentage score reflecting an activity with little to no acceleration or deceleration and a constant nature (i.e., walking). The results of the present study indicate that, in all positions and across all four quarters of the game, players devoted a considerable percentage of their energy expenditure to accelerating and decelerating movements (~16%). Again, direct comparison with previous research is not available for female college lacrosse players and for VXSport's measure of equivalent distance index. An analogous measure of equivalent distance index has been reported in the literature, expressing the intermittent nature of an activity. This equivalent distance index is "the ratio of distance covered if total energy is expended at a constant speed to the actual distance covered," with a higher ratio representing a more intermittent activity (i.e., dynamic activity involving accelerations and decelerations) [8, 12]. Utilizing this version of equivalent distance index, Vescovi and Frayne, like the present study, found no difference between forwards (ratio = 1.22), midfielders (ratio = 1.23), and defenders (ratio = 1.23) when examining female collegiate field hockey matches [11]. Swift changes in direction and seamless transitions between acceleration and deceleration are paramount to athlete performance during a field lacrosse game, and further research is needed to reveal the true impact of acceleration and deceleration on athlete workload by position and throughout a game.

Collectively, the examination of an athlete's workload, particularly through metrics such as the MED and equivalent distance index, provides valuable insights into the additional energy costs associated with team sports, specifically female field lacrosse. While caution is warranted in comparing findings with previous research due to measurement differences, the exploration of these metrics offers a foundation for understanding athlete workload and calls for further research to unveil the comprehensive impact of acceleration and deceleration on performance and workload across various positions and throughout a game.

MED was shown to have strong correlations with its algorithm variables of total distance (r = 1.0), accelerations (r = 0.9), and decelerations (r = 0.9). The perfect correlation coefficient between MED and total distance is as anticipated, indicating that as MED increases, so does the total distance covered. The high correlation coefficients between MED and total distance, combined with high-intensity acceleration and high-intensity deceleration, suggest robust associations between MED and the specific aspects of workload involving acceleration and deceleration. These findings highlight the potential of using MED as a comprehensive surrogate variable that encapsulates not only the energy costs associated with the total distance covered by the athlete but also the extra energy cost associated with high-intensity accelerations and decelerations, providing a more complete understanding of the metabolic demands in the context of female collegiate field lacrosse athletes. The difficulty in using this type of variable is that not all GPS units use the same name for this variable and the calculations for this variable are proprietary. Nevertheless, most GPS companies have some version of MED that is likely quite similar in its algorithm. This variable, regardless of GPS system used, is likely more useful and comparable than the all-in-one metric that several systems have proposed (e.g., Player Load, Athlete Load, Training Load). These variables vary widely in the components of their algorithms and units of measurement making cross-brand comparisons impossible [23].

The current exploratory analysis of MED in female collegiate lacrosse athletes has several limitations. Firstly, the data is derived from only one team, resulting in a small sample size for each position. To enhance our statistical power and reduce variability, it is essential to increase the number of participants within each position and draw them from multiple teams. Moreover, our study exclusively focused on female collegiate field lacrosse players, severely limiting generalizability. Future investigations should include different age levels, competition levels, and incorporate male participants to discern any sex-related differences in various GPS metrics of workload. Ultimately, variations in game analysis may stem from factors such as the team's playing style, match outcomes (winning or losing), home or away games, conference versus out-of-conference games, and the caliber of the opposing team.

6. Conclusion

Female collegiate lacrosse players exhibited comparable metabolic workload variables across positions and games per minute of play. Accelerations, decelerations, total distance, metabolic energy cost, and total sprints were found to be robustly correlated with MED. The use of GPS units in sports has provided ample data for sports scientists and coaches to use in training load management, reducing the risk of injuries, and optimizing recovery. However, the volume of data coming from the units can often feel overwhelming. The present study explored the use of MED in women's collegiate field lacrosse, and MED could serve as a surrogate workload variable to better understand the athlete's energy expenditure during high-intensity training and gameplay. Further investigation is required to assess MED's potential as a singular workload variable. Future research could evaluate the athlete's workload across different training drill types, examine the time-course changes across a season of training or gameplay, or over multiple seasons and teams. Additionally, the potential use of MED as a complementary measure to other workload measures should be explored.

Abbreviations

NCAA: National Collegiate Athletic Association
GPS: Global Positioning Systems
MED: Metabolic Equivalent Distance
ES: Effect Sizes
CI: 95% "Confidence Intervals

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Author Contributions

Conceptualization, T.B.S. and J.A.B.; Methodology, J.A.B.; Validation, T.B.S. and J.A.B.; Writing - Original Draft Preparation, T.B.S.; Writing - Review & Editing, J.A.B.; Supervision, J.A.B.; Project Administration, J.A.B.

Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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