The analysis of physical performance during official competitions in professional English football. Do positions, game locations, and results influence players' game demands?

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Abstract

This study aimed, firstly, to verify if physical parameters were different between players' positions during official matches in English professional football, and secondly, if the game location (H and A) or results (W, L, D) affected players' physical performance. Twenty-five male professional football players of the same team were included in this data analysis (age = 27 ± 9 years) during the 2022-23 season. Players were divided into positions: center backs, wide backs, center midfielders, attacking midfielders, and strikers. The external load parameters were distance covered, high-speed running (HSR), sprinting distance, accelerations, decelerations, and high metabolic load distance (HMLD, meters > 25.5 $w \cdot kg^{-1}$) that were monitored using GNSS Apex (STATSports). Linear mixed models' analysis for positions reported a significant difference in total distance ($p = 0.011$), HSR ($p < 0.001$), sprinting distance ($p < 0.001$), accelerations ($p = 0.003$), decelerations ($p = 0.002$), and HMLD ($p < 0.001$). Centre backs showed the lowest physical performance in the metrics analyzed, while players in the other positions frequently displayed a similar physical performance. Regarding locations and results, differences were only found between locations for decelerations ($p = 0.041$) and between results for HMLD ($p = 0.010$). In conclusion, physical performance was influenced by players' positions, while game location or results seem to not affect physical performance during official competitions. Consequently, practitioners can physically prepare their players independently from the location of the match or of the possible game results, while specific positional training is requested to optimally prepare their players.

Key words: Soccer; Team Sports; Performance; GPS; Monitoring

Introduction

Football is a sport that requires a combination of physical capacities, with technical and tactical skills (32). From a physical perspective, players need to be both aerobically and anaerobically fit to fulfill the requirements of the match (3). This is due to the fact that the football model is intermittent, where high-intensity actions are interspersed with low-intensity actions (15). Based on the current evidence, football players need to cover approximately 10-13 km during a match, where high-intensity running accounts for around 10-20% of such distance (32). This high intensity distance is commonly classified as a combination of high-speed running (HSR > 19.8 $km \cdot h^{-1}$) and sprinting distance (> 25.2 $km \cdot h^{-1}$) (7,24). In addition to HSR and sprinting distances, high-intensity actions such as accelerations, decelerations, and changes of directions are very important for the players' technical and tactical success during the game (6,39). Moreover, accelerations and decelerations are important contributors to the players' mechanical and metabolic demands (6,41). Previous research reported that players change activity (accelerating or decelerating) on average every 4 seconds during the match, which highlights the frequency and importance of such tasks in football (32,39).

Consequently, the monitoring of match demands in modern football is a critical task commonly performed by coaches and sport scientists in professional clubs (24,27). This monitoring allows staff to quantify the external load demands of the players, design the most suitable training sessions to develop the physical capacities needed to compete, and to tailor recovery strategies for the players based on the load accumulated during the game (24,27,33). Currently, global navigation satellite systems (GNSS) are commonly used to monitoring of training and match demands in football. From a validity and reliability point of view, many researchers assessed GNSS technology (i.e., STATSports Apex units), which was found to be valid and reliable for the quantification of both linear and soccer-specific tasks (error of < 2.5%) (5) as well as for the quantification of sprinting actions (e.g., peak speed) (8). Consequently, performance staff can confidently use GNSS technology to quantify external load metrics during training sessions and matches (25). The most commonly recorded metrics in football are total distance, HSR, sprinting distances, accelerations, and decelerations (24,28,39); additionally, some clubs record other metrics related to metabolic power, which is an indirect estimation of the energy demands of acceleration and deceleration events derived from GNSS units (36).

Performance staff can monitor a range of distances (at various speeds), acceleration and deceleration actions during the game, however, previous research indicated a high match-to-match variability in performance characteristics of elite soccer players (23), which can complicate the interpretation of these external load metrics. These activities can be influenced by some independent parameters (contextual factors) such as players' positions (17,19,22). Previous research reported that players in different positions cover different amounts of distance as well as perform a different number of accelerations and decelerations. For instance, Connor at al., (17) reported that central backs cover a lower distance (per minute) compared to other positions, while central midfielders covered the greatest distance during English Championship matches. Another research group found differences among positions, but these differences (because of their magnitude) were very limited (19). Other research reported mixed results when positions were compared, for instance when HSR was assessed, wide midfielders seemed to be the players that cover the greatest distance, while when repeated high-speed bouts were assessed, full-back, wide midfielders, and central midfielders performed more actions than central defenders or attackers (16).

Physical demands may also be affected by other contextual factors such as game location and results (31,34,40). For instance, playing at home could be considered an advantage from a physical point of view, and therefore, it could be expected that home teams run more than away teams; the same hypothesis could be thought for game results (34), where a losing team could perform more physical activity to try to come back. However, such information is quite limited and also quite unclear (31), and therefore more research on this topic should be warranted (e.g., in League 1 English Football). Furthermore, Bradley and colleagues, (14) reported that physical capacity changes among players of different competitive standards (i.e., English professional football), therefore, the evidence associated with a specific football tier should not be blindly applied to other tiers, consequently, more research is needed to assess how positions affect the physical demands of players of different levels.

Considering the lack of information reported so far, this study aimed, firstly, to verify if physical parameters were different between players' positions during official matches in English Football League 1, secondly, if the game location (H and A) or results (W, L, D) affected players' physical performance. The authors' hypothesis was that players' positions, game location, and game results would affect physical performance during official matches.

Methods

Experimental Approach to the Problem

To answer the research questions of this study, we compared players' external load based on their match position, game location, and game result. All players were included in this study independently from their play time (i.e., starter and nonstarter players). The external load metrics selected (see the procedure section) were assessed per unit of time played to account for the difference in time exposure among players. Players were divided into positions such as center backs (CB), wide backs (FB), center midfielders (CM), attacking midfielders (AM), and strikers (ST). The specific number of data points per position is reported in the Supplementary material. Matches were categorized based on their location such as home (H = 23) and away (A = 23), as well as based on the final result such as games won (W = 28), lost (L = 4), and drew (D = 14). The team played a major part of the matches with this 3-5-2 formation, however, this information should only be considered as a generic indication, because the formation was not static and players modify it frequently during the game, specifically, in possession of the ball, the formation frequently become a 3-3-5, while during the defensive phase, the team frequency used a 4-3-3 formation. For this reason, players were categorised (a posteriori) according to their playing position match by match.

Subjects

Twenty-five male professional football players of the same club were included in this data analysis (age = 27 ± 9 years and body mass = 78 ± 14 kg) during the 2022-23 season. The inclusion criteria included their participation in the official competition. Goalkeepers were excluded from this study, therefore, only outfield players' match data were evaluated. The external training load data was recorded as part of the regular monitoring routine of the club and was only analyzed *a posteriori*. The sample size estimation was calculated using G*power (Düsseldorf, Germany) for a one-way ANOVA fixed effect that indicated a total of 195 individual data points would be required to detect a *small* effect (f = 0.25) with 80% power and an alpha of 5%. The actual sample size of this study was 665 individual data points, with a real power of >95%, which reduced the likelihood of type 2 errors (false negative) (4). The Ethics Committee of the University of Suffolk (Ipswich, UK) approved this study (project code: RETHS22/016). Informed consent to take part in this research was signed by the club. All procedures were conducted according to the Declaration of Helsinki for human studies.

Procedure

Global Navigation Satellite System (GNSS)

Global Positioning systems and global navigation satellite systems (GNSS) are very commonly used wearable technology in sport (2,12). Although the terms are sometimes used in the same way, actually, GNSS devices can use navigational satellites from other networks beyond the GPS system (satellite-navigation system owned by the United States government), therefore, by using more satellites, increases its accuracy and reliability (5). In this study STATSports 10 Hz GNSS Apex units (Northern Ireland, UK) were used to monitor official matches (46 games) GNSS technology tracks multiple satellite systems (i.e., global positioning systems, GLONASS) to provide highly accurate and reliable positional information (5). Moreover, Apex units are integrated with a 100 Hz triaxial accelerometer (9). Before each warm-up session (e.g., 15 minutes), the GNSS Apex units were turned on to allow the units to track an adequate number of satellites. The Devices were worn in a custom-made vest and worn under the team's jersey and the same units were worn by the same players to avoid issues with the interunit reliability (5,12). These units reported the number of satellites tracked that ranged between 17 and 23, average horizontal dilution of precision was 0.64 ± 0.22, which is in line with previous literature (8). All data recorded by the Apex units were downloaded, cleaned and categorized by STATSports software (Apex version Sonra v4.4.17) before being exported as a CSV file for further analysis. Only the official game was analyzed in this study, therefore all warm-up activities were removed. Previous research reported the validity and reliability of this technology during linear and soccer-specific tasks reporting an error of < 2.5% (5). The reliability (inter-unit) during sprinting actions (range: 5 to 30 m) was *excellent* (intra-class correlation coefficient = 0.99), with a typical error of measurement of 1.85% (8). Very recently, a research reported that total distance, HSR, peak speed, accelerations, decelerations, and metabolic distance are reliable metrics using GNSS Apex during intermittent running activities (12).

External load metrics

External load metrics were quantified and reported as frequency per minute to account for the difference in time exposure among players. In this study, GNSS recorded metrics were distance covered ($m \cdot min^{-1}$), HSR distance (>19.8 $km \cdot h^{-1}$; 5.5 $m \cdot s^{-1}$), and sprint distance (>25.2 $km \cdot h^{-1}$; 7.0 $m \cdot s^{-1}$) (7). The number of high-intensity accelerations (>3 $m \cdot s^{-2}$) and decelerations (<-3 $m \cdot s^{-2}$) were quantified using GNSS technology (39). High metabolic load distance (HMLD) measured in meters > 25.5 $w \cdot kg^{-1}$ was calculated following di Prampero's proposed model (35).

Statistical Analyses

Descriptive statistics are reported as mean ± standard deviation (SD). A Shapiro-Wilk test was used to check the assumption that the data conforms to a normal distribution and that the residuals were found normally distributed for the linear mixed model (LMM). The primary analysis was an LMM, which used the Satterthwaite method (degrees of freedom estimation based on analytical results) to assess if significant differences exist between positions (CB, WB, CM, AM, and ST; fixed effects) across several dependent variables (30). Players were considered as random effect grouping factors. During the secondary analysis, games' location (H and A, fixed effects) and result (W, L, D, fixed effects) and players (random effects) were analyzed using again a LMM. When significant differences were found in the LMM model, an estimation of marginal means (contrasts) was performed using Holm's corrections for multiple comparisons. Estimates of 95% confidence intervals (CIs) were calculated and reported in the figures (Box Plots). Effect sizes were calculated from the *t* and *df* of the contrast and interpreted using Cohen's *d* principle as follows *trivial* < 0.2, *small* 0.2 - 0.6, *moderate* 0.6 - 1.2, *large* 1.2 - 2.0, *very large* > 2.0 (26). Unless otherwise stated significance was set at $p < 0.05$ for all tests. Statistical analyses were performed in JASP (JASP Version 0.16.13. Amsterdam, Netherlands).

Results

The summary of the comparison between positions (CB, WB, CM, AM, and ST) are reported in Figure 1 (distance), Figure 2 (HSR), Figure 3 (sprinting), Figure 4 (accelerations), Figure 5 (decelerations), and Figure 6 (HMLD).

A significant difference was reported for the following metrics: total distance ($F = 15.140$, p =

0.011), HSR ($F = 16.506$, $p < 0.001$), sprint distance ($F = 10.331$, $p < 0.001$), accelerations ($F = 5.237$, $p = 0.003$), decelerations ($F = 7.228$, $p = 0.002$), and HMLD ($F = 16.929$, $p < 0.001$).

Estimated marginal means, 95% CIs for positions (CB, WB, CM, AM, and ST), and contrasts analysis were reported in the Supplementary Material.

The influence of game location (H and A) and result (W, L, D) on physical performance can be found in Figure 7 (distance), Figure 8 (HSR), Figure 9 (sprinting), Figure 10 (accelerations), Figure 11 (decelerations), and Figure 12 (HMLD).

Game location (H and A) and result (W, L, D) analysis reported a significant difference in the interaction between location * result for total distance ($F = 4.461$, $p = 0.028$), between locations for decelerations ($F = 4.557$, $p = 0.041$), among results for HMLD ($F = 4.801$, $p = 0.010$). While total distance did not report significant differences for location ($F = 1.463$, $p = 0.247$) and results ($F = 1.349$, $p = 0.269$), HSR did not report significant differences for location ($F = 0.052$, $p = 0.982$) and results ($F = 1.972$, $p = 0.174$), sprinting distance did not report significant differences for location ($F = 2.079$, $p = 0.157$) and results ($F = 0.503$, $p = 0.611$), accelerations did not report significant differences for location ($F = 2.021$, $p = 0.156$) and results ($F = 1.173$, $p = 0.317$), decelerations did not report significant differences for results ($F = 0.348$, $p = 0.706$), HMLD did not report significant differences for location ($F = 0.270$, $p = 0.604$).

Estimated marginal means, 95% CIs for positions game location (H and A) and result (W, L, D), and contrasts analysis were reported in the Supplementary Material.

Discussion

This study verified if physical parameters were different between players' positions during official matches in English Football League 1; moreover, this study evaluated if the game location (H and A) or results (W, L, D) affected players' physical performance. We found that physical performance was influenced by players' positions, while we did not find clear evidence to support the hypothesis that game location or results can affect physical performance during official competitions.

Positions

Previous research reported players' positions can influence the physical demands during the game. Connor and colleagues, (17) analyzed a team playing in the English Championship and they found that CB players cover a lower distance (per minute) compared to other positions, while CM covered the greatest distance. Our study found that players' positions affect the physical demands of the game ($p < 0.011$, Figure 1), where CB cover around 97 $m \cdot min^{-1}$, which was significantly lower than AM ($p < 0.001$, $d = 3.49$, 109.7 $m \cdot min^{-1}$) and ST ($p = 0.030$, $d = 3.1$, 110 $m \cdot min^{-1}$), while CM were the players that covered the greatest distance among positions (117.4 $m \cdot min^{-1}$). It was previously shown HSR and sprinting distance are very important parameters for both training prescription and game performance (24) as well as they may play a role in the reduction of the likelihood of hamstrings muscle injuries (18). For such a reason, the monitoring of those metrics during the game can help practitioners to tailor the subsequent training sessions with the aim to prepare players for the competitions as well as correctly expose players to high-speed intensities, which may reduce the risk of hamstrings muscle injuries (7,18,24). In this study, CB covered the lowest HSR distance (4.0 $m \cdot min^{-1}$) among positions (see Figure 2), while AM reported a greater distance (7.6 $m \cdot min^{-1}$) among all positions. CB reported a *very large* difference compared to AM ($p<0.001$), CM ($p = 0.03$), ST ($p < 0.001$), and WB ($p < 0.001$). A previous review reported that wide midfielders seem to be the players that cover the greatest HSR distance during matches (16), which is in line with the current study since our AM players covered the greater HSR (Figure 2). Regarding sprinting distance (see Figure 3), our study confirms that the players that run greater distance are AM (2.2 $m \cdot min^{-1}$), ST (1.6 $m \cdot min^{-1}$), and WB (2.4 $m \cdot min^{-1}$). While players that play in more constricted spaces or with a minor necessity to achieve sprinting velocities cover generally a lower amount of sprint distance such as CB (0.8 $m \cdot min^{-1}$) and CM (1.1 $m \cdot min^{-1}$). The evaluation of such differences among positions in sprint distance is very important for coaches and practitioners because they need to tailor their training sessions in accordance with their specific match demands (10). Recent research reported that HSR and sprint distances change very much among sided games (e.g., small, medium, and large formats), where larger-sided games are the only ones to offer similar sprinting distances (per min) of matches, as well as, that positions during training sessions play a key role for the overall HSR and sprinting distance exposition (11).

Accelerations and decelerations are other key physical aspects in football, specifically, previous research reported the importance of such actions for performance and training perspective (6,39,41). This study found that accelerations are affected by players' positions, specifically CB (0.8 $n \cdot min^{-1}$) and CM (0.8 $n \cdot min^{-1}$) perform a lower amount (See Figure 4) compared to AM, ST, and WB (1.0 $n \cdot min^{-1}$). These differences were significant (i.e., CM vs. AM, $p = 0.013$; CM vs. ST, $p = 0.011$; see supplementary material for the rest of the contrasts), and although at first glance they may seem trivial, they actually are important: using the data reported in this study is possible to estimate that a CB playing for 90 min (during a game) would perform 72 high-intensity accelerations (>3 $m \cdot s^{-2}$), while a ST would perform 90 accelerations (>3 $m \cdot s^{-2}$), therefore, practitioners need to be aware of these different match physical requirements. Similar results were found for decelerations, where AM (1.0 $n \cdot min^{-1}$) and ST (1.0 $n \cdot min^{-1}$) showed a greater number of actions compared to CB (0.75 $n \cdot min^{-1}$). Specifically, CB reported a significantly lower number of decelerations compared to AM ($p < 0.001$, *very large*), CM ($p = 0.023$, *very large*), ST ($p < 0.001$, *very large*), and WB ($p = 0.004$, *large*). These results are supported at both match and training level, where wider positions generally perform more external load (1,39), and in particular, defenders usually perform fewer decelerations (n = 78) than midfielders (n = 85) or ST during matches (n = 90) (22). It is very interesting to notice that, in our study, ST did exactly the same number of decelerations (on average = 90 <-3 $m \cdot s^{-2}$) reported by Fleming and colleagues, (22), while AM and CM did more accelerations (around 90). This means that for some positions, decelerations demands are greater in English League 1 than in English League 2 players. In addition to these accelerations and deceleration information, this study analyzed another metric that evaluates the distance covered during explosive actions such as HMLD, which is an indirect estimation of the energy demands (> 25$W \cdot kg^{-1}$) of acceleration and deceleration events derived from GNSS units (36). The analysis of HMLD reported that AM (23.7 $m \cdot min^{-1}$) covered greater ($p<0.001$, *very large*) distance than CB (15.9 $m \cdot min^{-1}$), while other positions have similar demands (CM, ST, WB, see Figure 6). The HMLD values reported in this study are similar to previous research data that showed English League 1 players to cover an average of 20.7 $m \cdot min^{-1}$ (37). However, the current study makes a step forward compared to Reynold and colleagues, (37) because it shows as practitioners need to consider the different players' positions match demands when they design their training drills in order to correctly train their players. Overall, some of the variation found in this study among the physical demands analysis could be due to the formation used by the club, which was a fluid 3-5-2 (13,20). This formation could have required less effort from the CB players compared to the other positions. From a training perspective, the different demands of the players' positions reported in this study offer interesting insights to practitioners, specifically, a one-size fit all approach cannot be used (10,11,29); this study showed that different positions required different physical intensities, and therefore, practitioners need to tailor their drills to fulfill the demands of the game for each position.

Game location and game results

In the authors' hypothesis, game location and game results would have affected the players' physical demands during official matches. However, contrary to what we thought, the total distance did not report significant differences for location ($p = 0.247$) and results ($p = 0.269$), see Figure 7. These findings are supported by previous evidence, specifically, Connor and colleagues, (17) did not find any difference between matches location (H vs. A). Although that, it is interesting to observe that, on average (although this difference is not significant), the greater distance covered was during away-lost matches (distance = 112.2 $m \cdot min^{-1}$). In the authors' opinion, although this study cannot demonstrate that match location and results can influence the distance covered during matches, future research should try to evaluate other teams and football leagues to confirm our results. Regarding HSR and sprint distance (Figure 8 and Figure 9), locations and results did not affect players' physical demands. HSR ranged from 6.3 $m \cdot min^{-1}$ (away – drew matches) to 7.2 $m \cdot min^{-1}$ (away – won matches), while sprinting distance ranged from 1.5 $m \cdot min^{-1}$ (away – lost matches) to 2.3 $m \cdot min^{-1}$ (home – lost matches). Therefore, the current study showed that personalizing physical training based on the location of the next game or in case of game pace strategy changes (based on the results) is not something scientifically sound. In particular for sprinting distance, it is clear that there is some variability in the data, and practitioners need to consider the effect of match-to-match variability before to take training decisions, as it was previously described in a study that evaluated Premier League footballers. (23). Very likely, other technical and tactical parameters may be more influenced by these independent variables, and they may play a more important role in both match preparation (based on the location) and the match outcome (e.g., game pace strategy).

On the same line, accelerations (Figure 10) did not show any difference among location and match result (with an average acceleration of 0.9 $n \cdot min^{-1}$), while decelerations reported a significant difference ($p = 0.041$, $d = 0.76$, *moderate*; Figure 11) between home and away games. However, in the authors' opinion, this analysis needs to be evaluated not only from a statistical perspective but also from a practical one: although this difference is reported as significant and with a *moderate* effect size, the actual number of decelerations is 0.98 $n \cdot min^{-1}$ and 0.94 $n \cdot min^{-1}$ for away and home games, respectively. This would translate, for a 90 min match, to 88.3 vs. 84.6 decelerations for away and home games, respectively, therefore, practitioners should evaluate if this difference is practically important. Moreover, we believe that although we found a significant difference in this analysis, future studies should verify if it was due to the p-value used in this study since "1 in 20 comparisons in which null hypothesis is true will result in a significant result when $p < 0.05$" (4,38), or because away games are more physically demanding than home games. Regarding HMLD, which is a parameter that takes into account both acceleration and deceleration activities, we found that location does not play a role in its variation ($p = 0.604$, Figure 12), while, we found a significant variation in results ($p = 0.010$), specifically (after a contrast analysis), we found non-significant differences between drew vs. lost ($p = 0.851$) and lost vs. won ($p = 0.188$), but we found differences between drew vs. won ($p = 0.012$, *very large*). However, these HMLD values in practical terms are 21.4 $m \cdot min^{-1}$ (1926 m per 90 min match), 21.2 $m \cdot min^{-1}$ (1908 m per 90 min match), and 22.7 $m \cdot min^{-1}$ (2043 m per 90 min match), for drew, lost and won, respectively – these results are in line with previous research on this topic that found that English League 1 players cover an HMLD of 1990 m per match (37). Considering what is said above, it is important for practitioners to understand if these variations among match results in term of HMLD is actually meaningful and therefore, deserves to be considered for tailoring the training strategies ahead of a match or following it.

Limitations and future directions

This study is not without limitations, first, only one team was analyzed in this research (which used a specific and unique formation), therefore, our results cannot be blindly extended to all teams (using different formations or players of difference in ability levels) in League 1 English Football. Second, the external metrics used in this research are among the most commonly used in professional football, however, other metrics that are recorded by GNSS units can offer other insights into the understanding of physical performance in football. Thirdly, this study did not enroll any female subjects, therefore, future studies could investigate if players' positions, game locations, and game results can affect physical demands in women's professional football. Moreover, the use of substitute players was not analyzed as an independent variable, therefore future studies could investigate if these players perform greater external load than starters. Lastly, a recent scoping review reported that the use of individualized players' speed thresholds (e.g., sprinting speed or maximal aerobic speed) could be helpful in training load monitoring (21). Future studies could investigate if the use of individualized thresholds, for instance, using the peak speed (e.g., recorded by GNSS) could give additional insights into the monitoring of physical performance in professional football.

Practical applications

This study verified that physical parameters were different between players' positions during official matches in English League 1 football, in particular, CB were the players that covered the lower amount of distance, HSR, sprinting distance, accelerations, decelerations, and HMLD. This could be due to the formation used in this game.. From a training perspective, the demands of the players' position reported in this study offer interesting insights to practitioners, specifically, a one-size fit all approach cannot be used; this study showed that different positions required different physical intensities, and therefore, practitioners need to tailor their drills to fulfill the demands of the game. In addict to that, this study showed that game location (H and A) and results (W, L, D) trivially affected players' physical performance. Consequently, practitioners can prepare their players from a physical perspective independently of the location of the next match. Moreover, it is clear that different match results do not lead to different physical match demands (e.g., pace strategy changes); therefore, coaches should focus on other elements, specifically, technical and tactical, that could be more influenced by game results, and they may be more related to the actual outcome of the match. In conclusion, we found that physical performance was influenced by players' positions, while we did not find clear evidence to support the hypothesis that game locations or results can affect physical performance during official competitions.

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Figure 1. Comparisons of distance among players' positions.

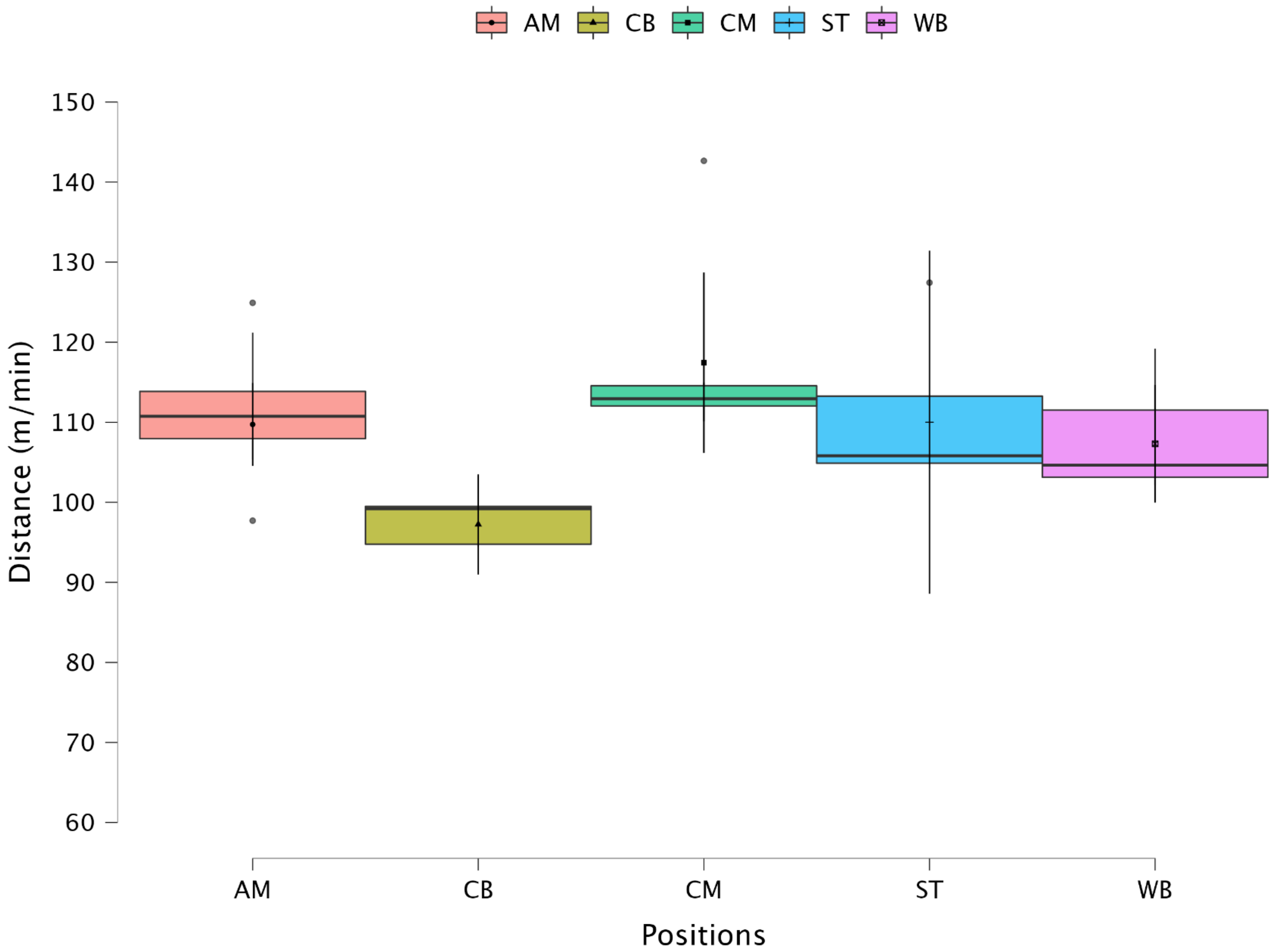

Figure 2. Comparisons of high-speed running among players' positions.

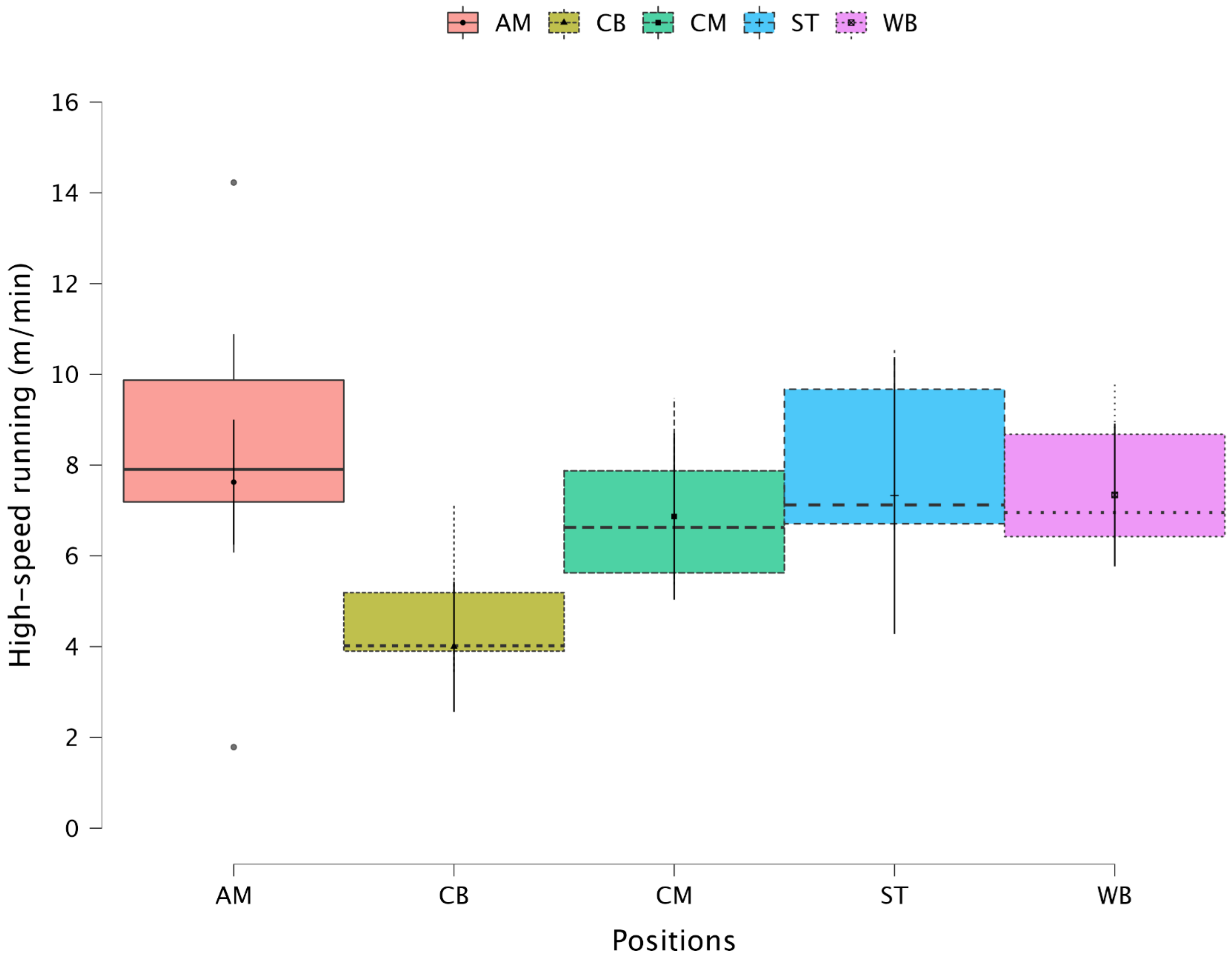

Figure 3. Comparisons of sprinting distance among players' positions.

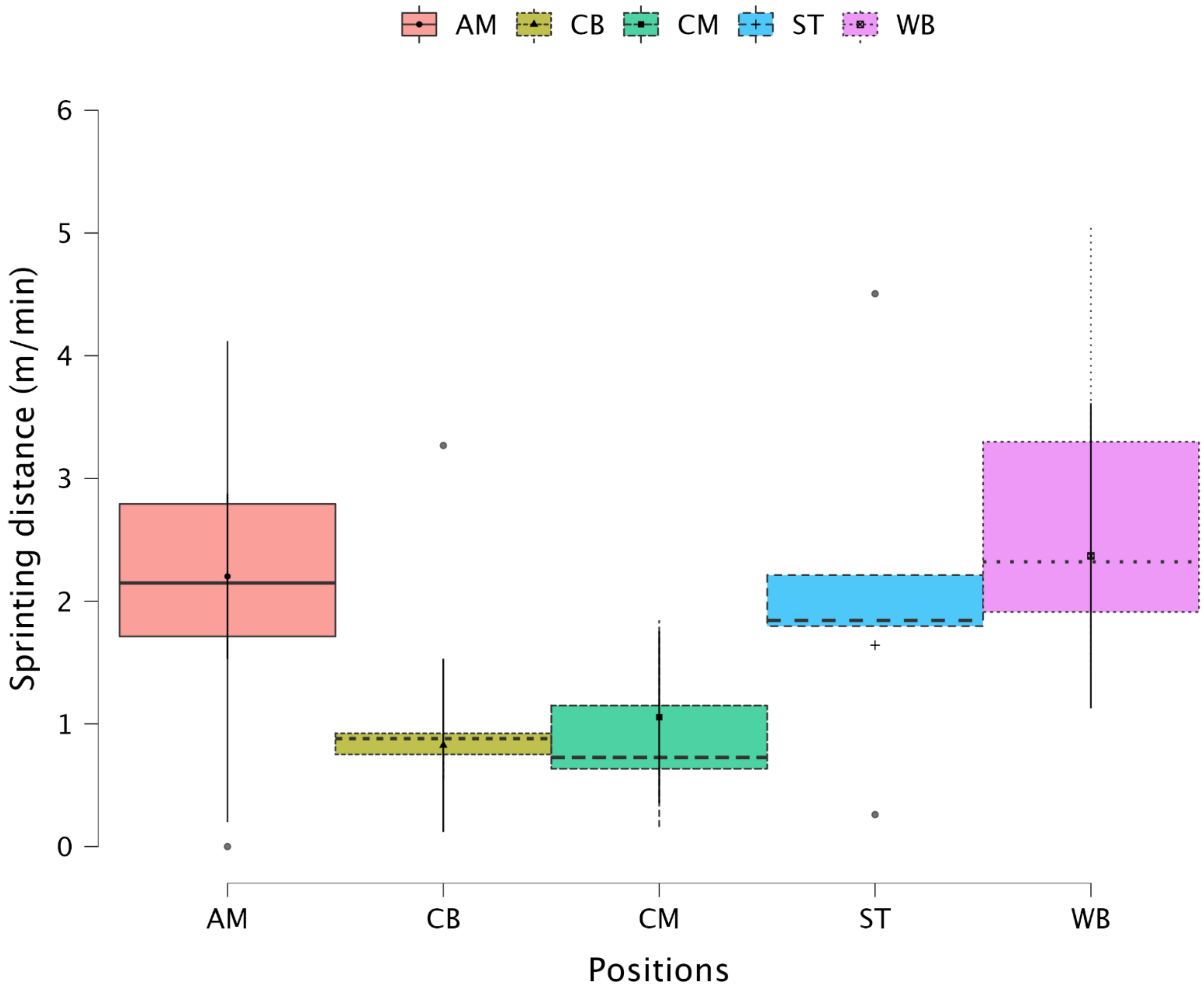

Figure 4. Comparisons of accelerations among players' positions.

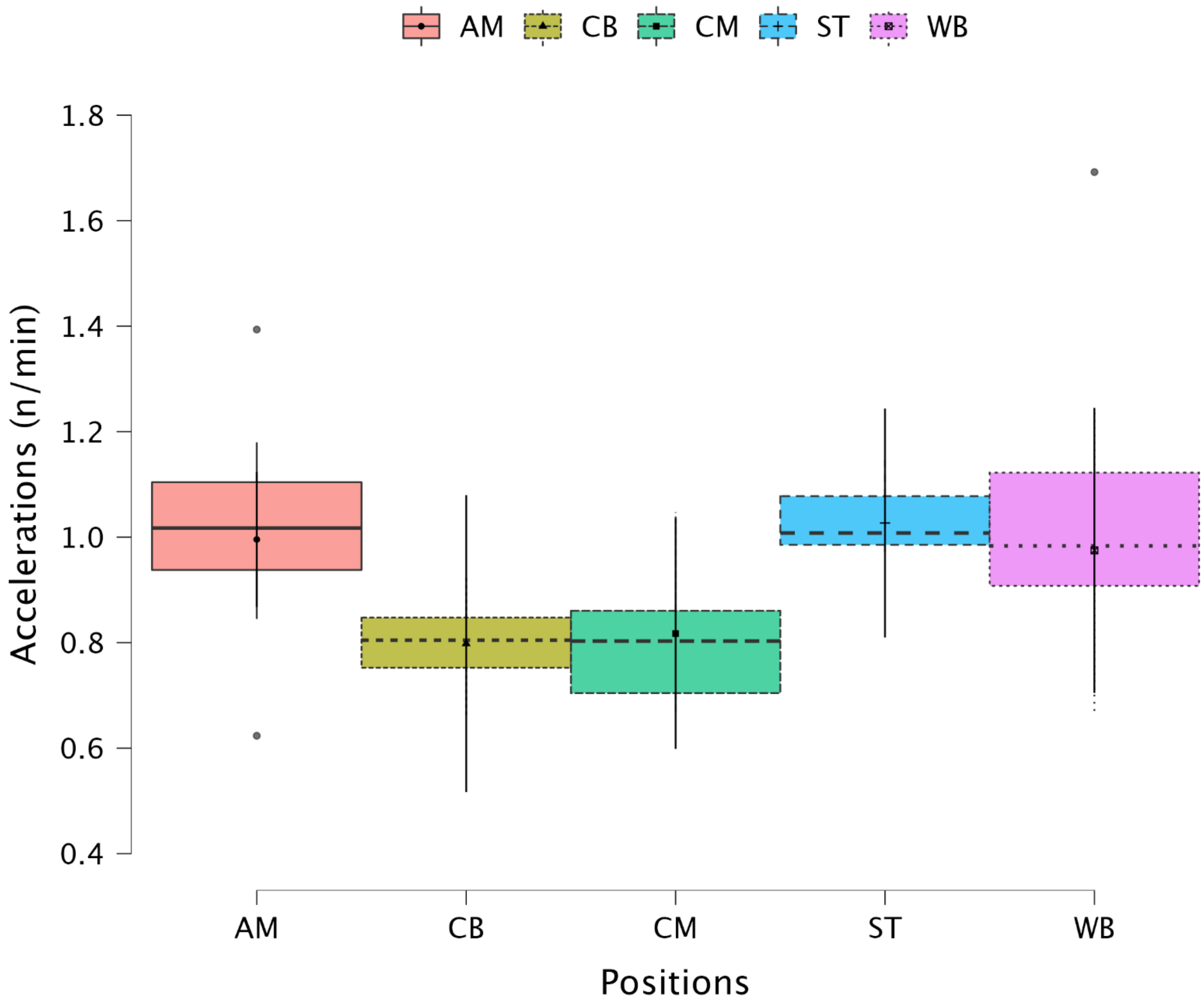

Figure 5. Comparisons of decelerations among players' positions.

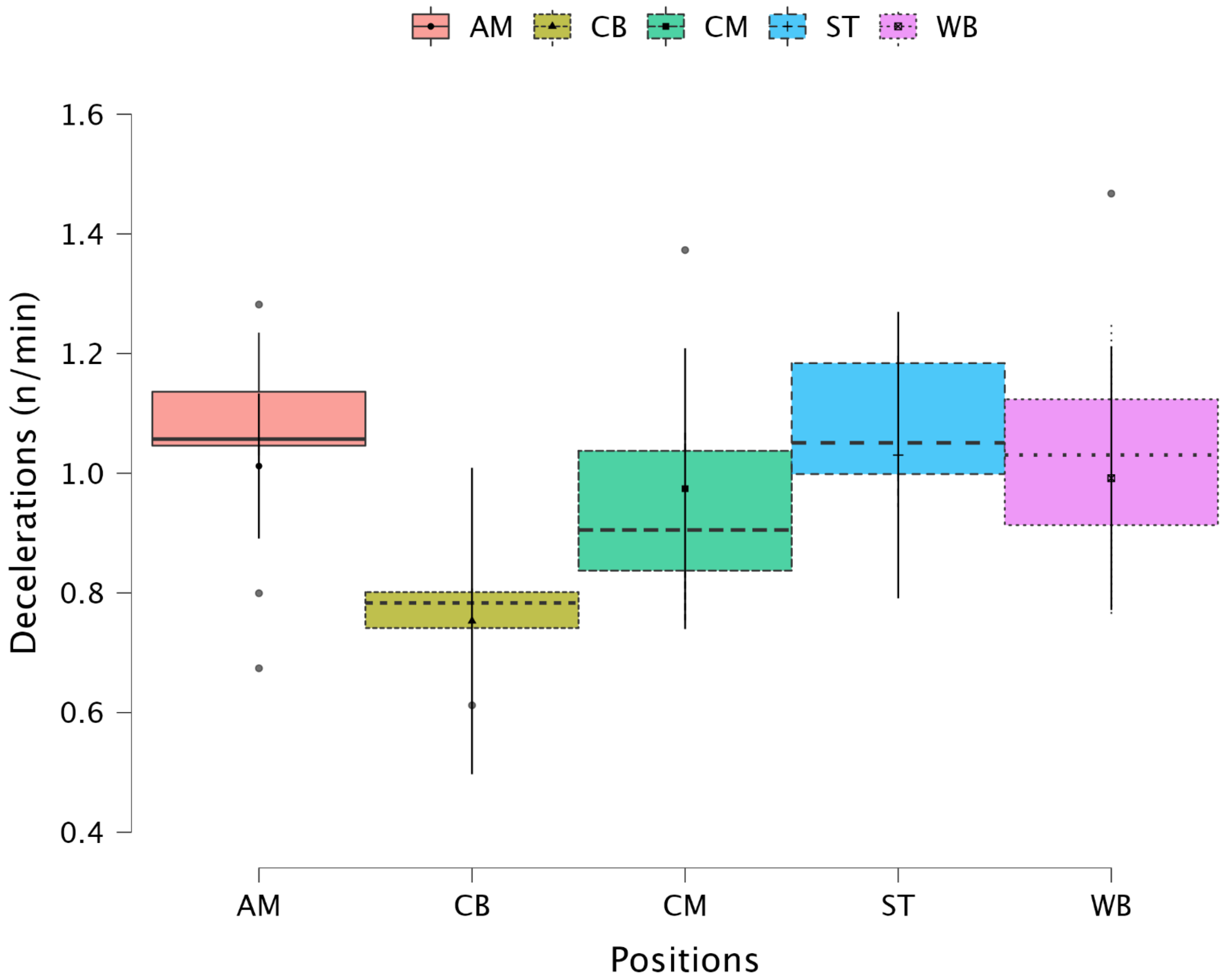

Figure 6. Comparisons of high metabolic load distance among players' positions.

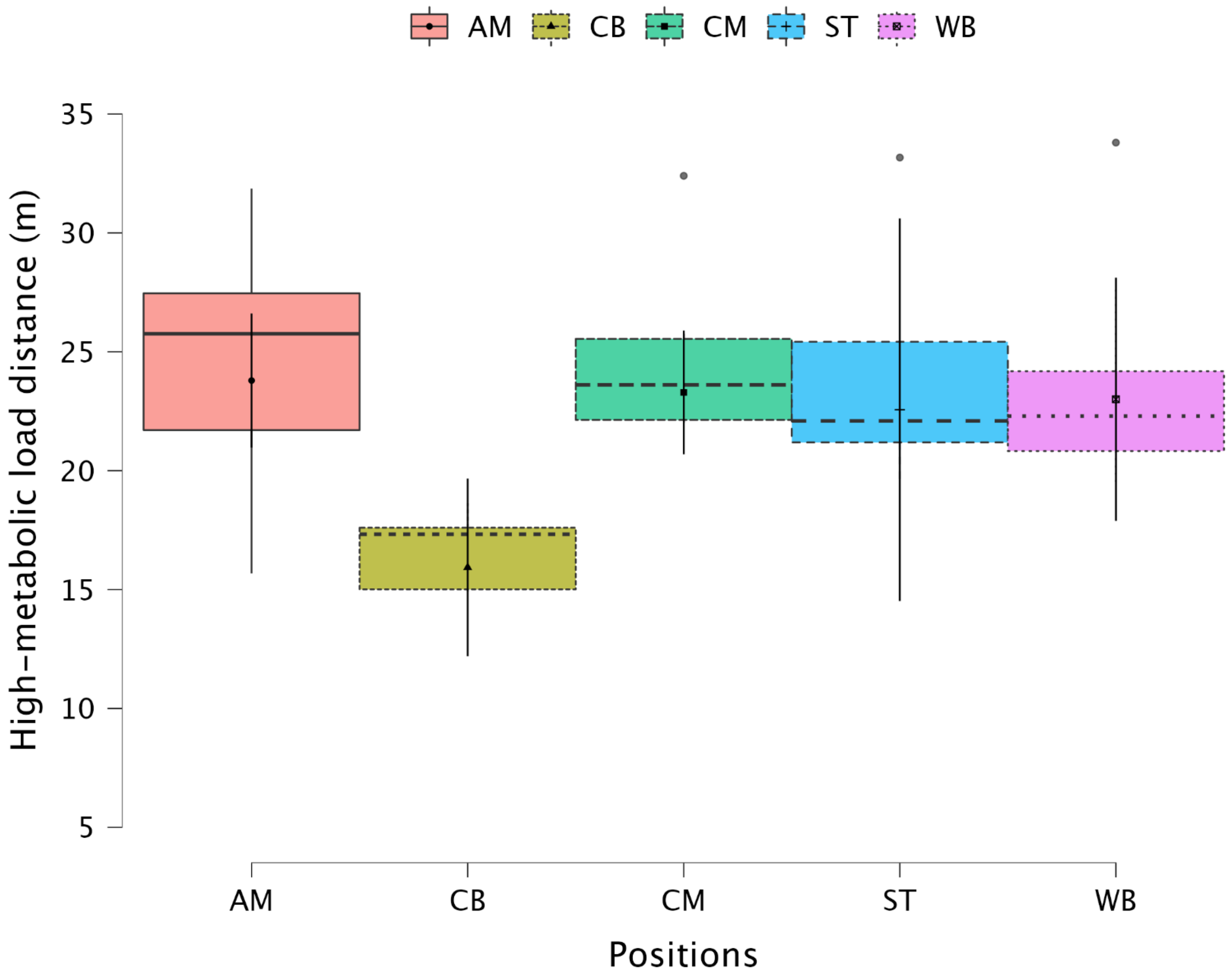

Figure 7. Comparisons of distance among game locations (H and A) and results (W, L, D).

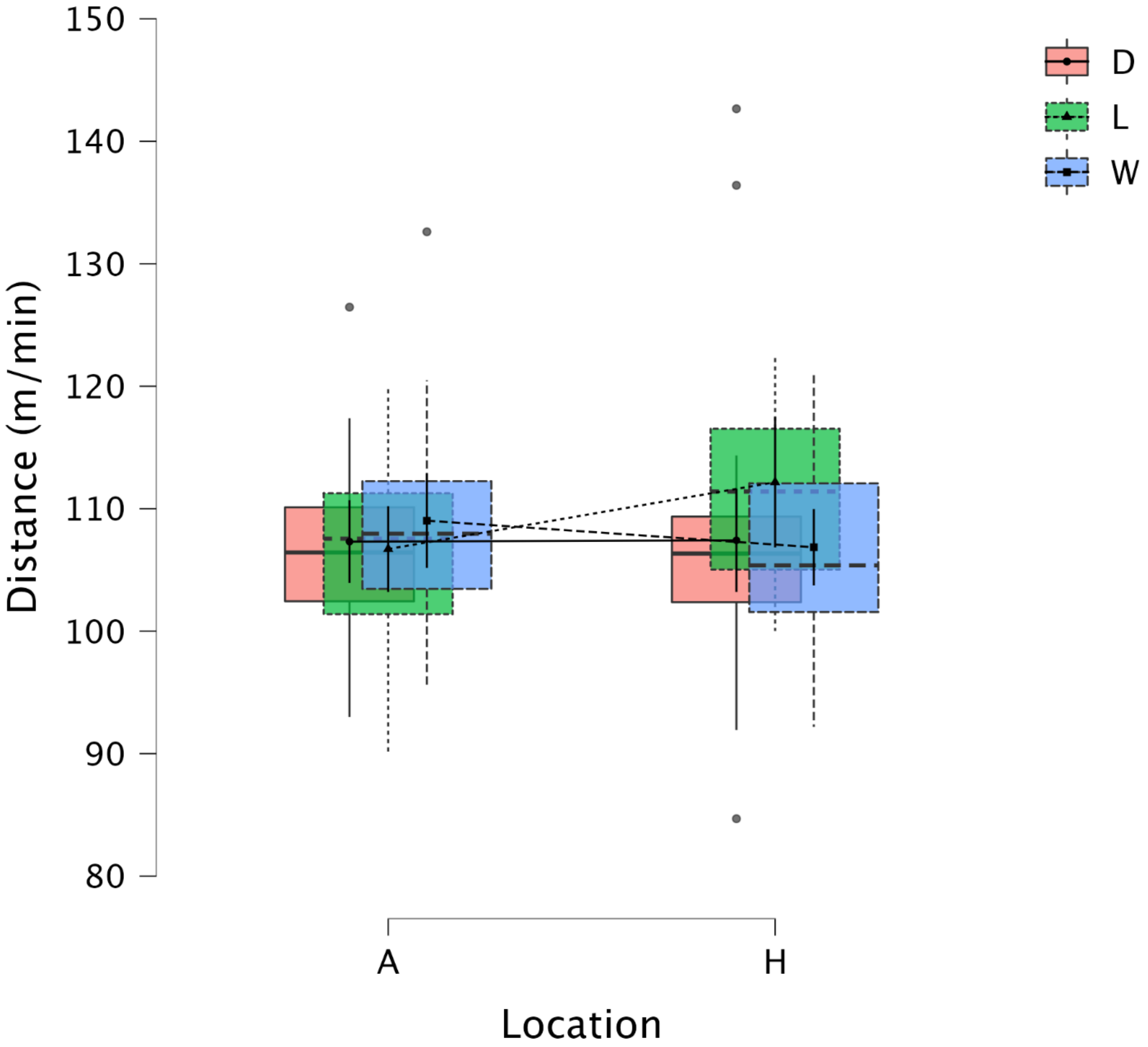

Figure 8. Comparisons of high-speed running distance among game locations (H and A) and results (W, L, D).

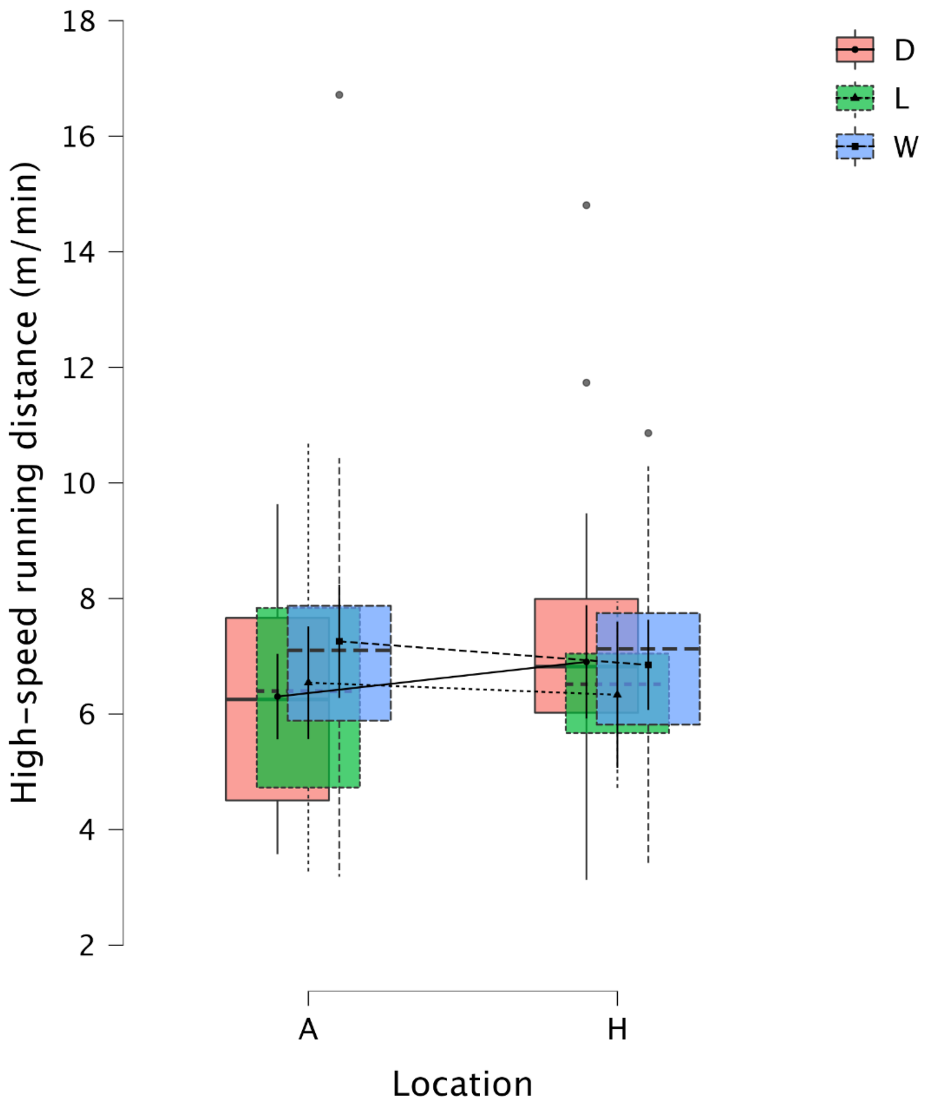

Figure 9. Comparisons of sprinting distance among game locations (H and A) and results (W, L, D).

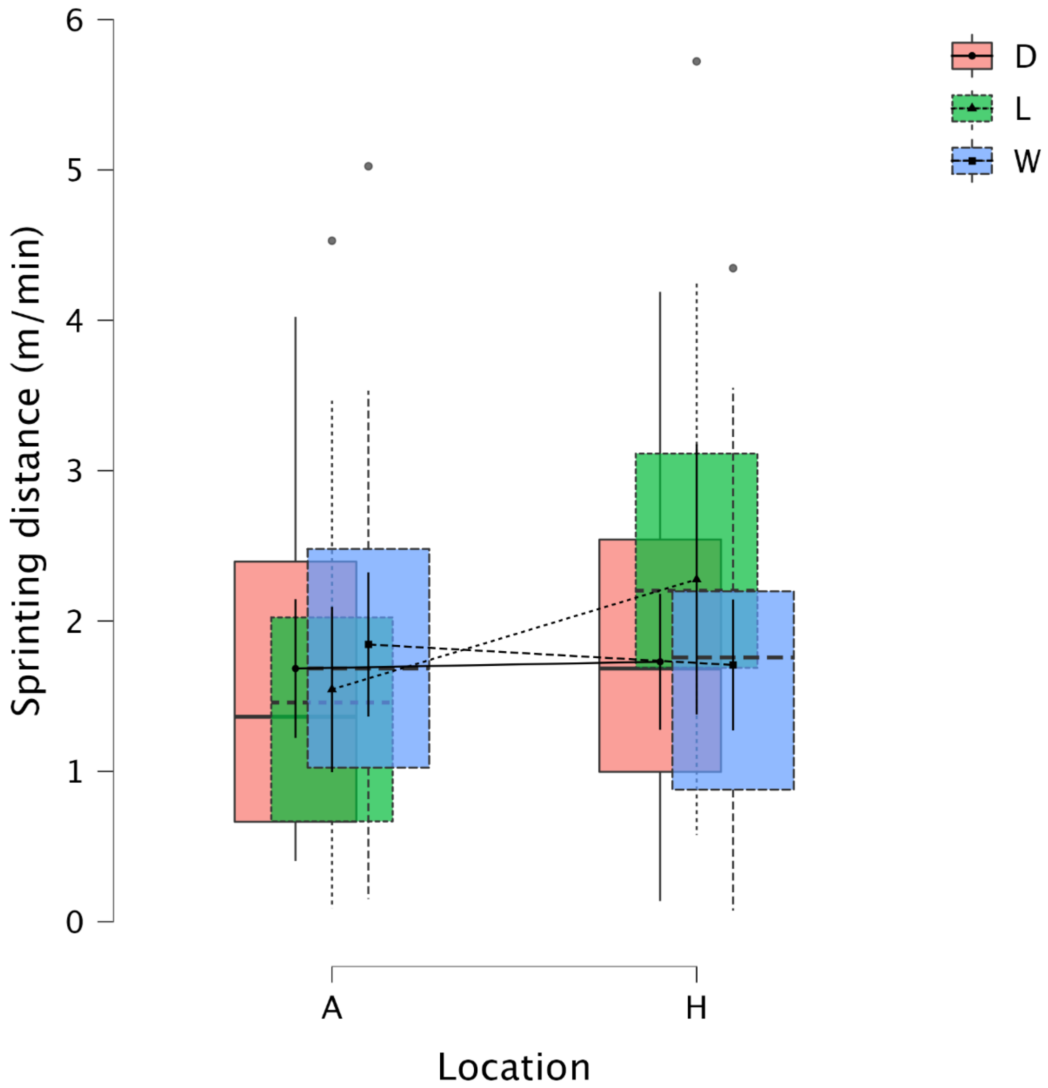

Figure 10. Comparisons of accelerations distance among game locations (H and A) and results (W, L, D).

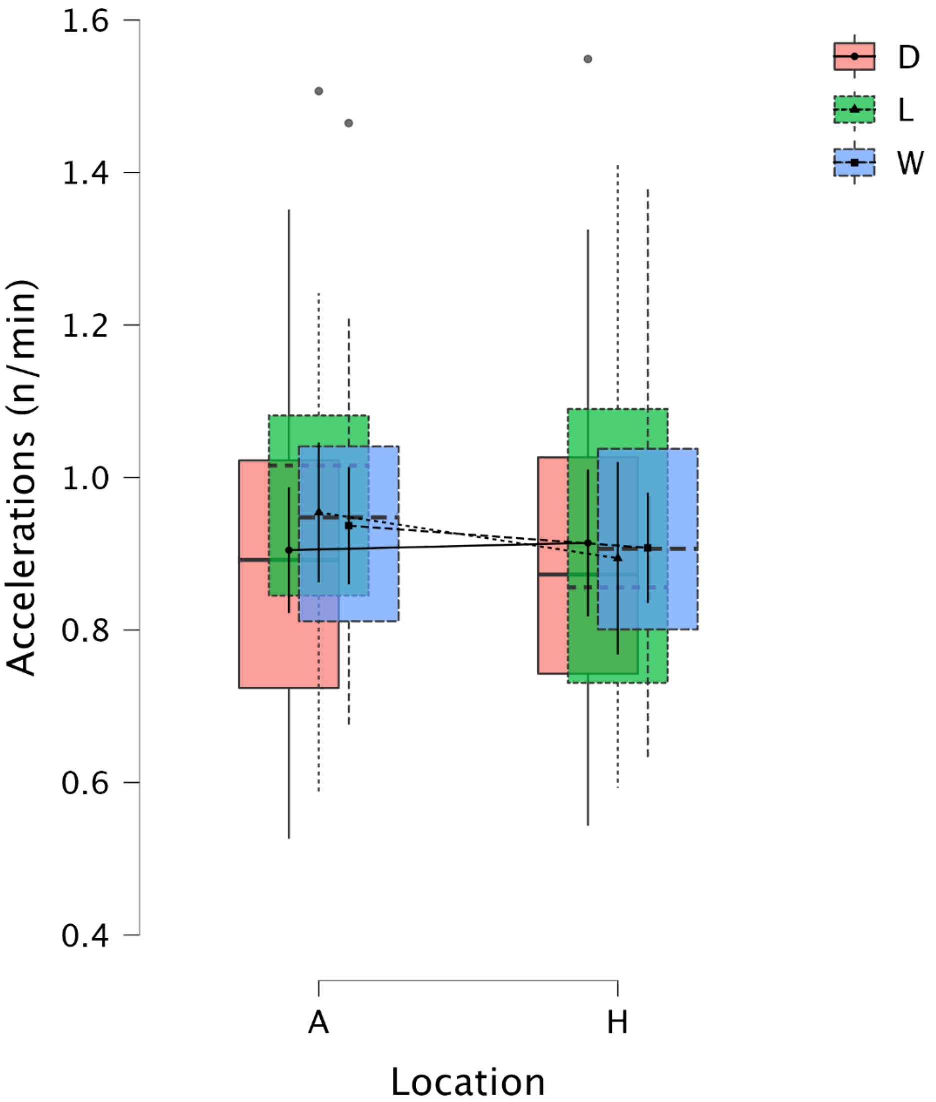

Figure 11. Comparisons of decelerations running distance among game locations (H and A) and results (W, L, D).

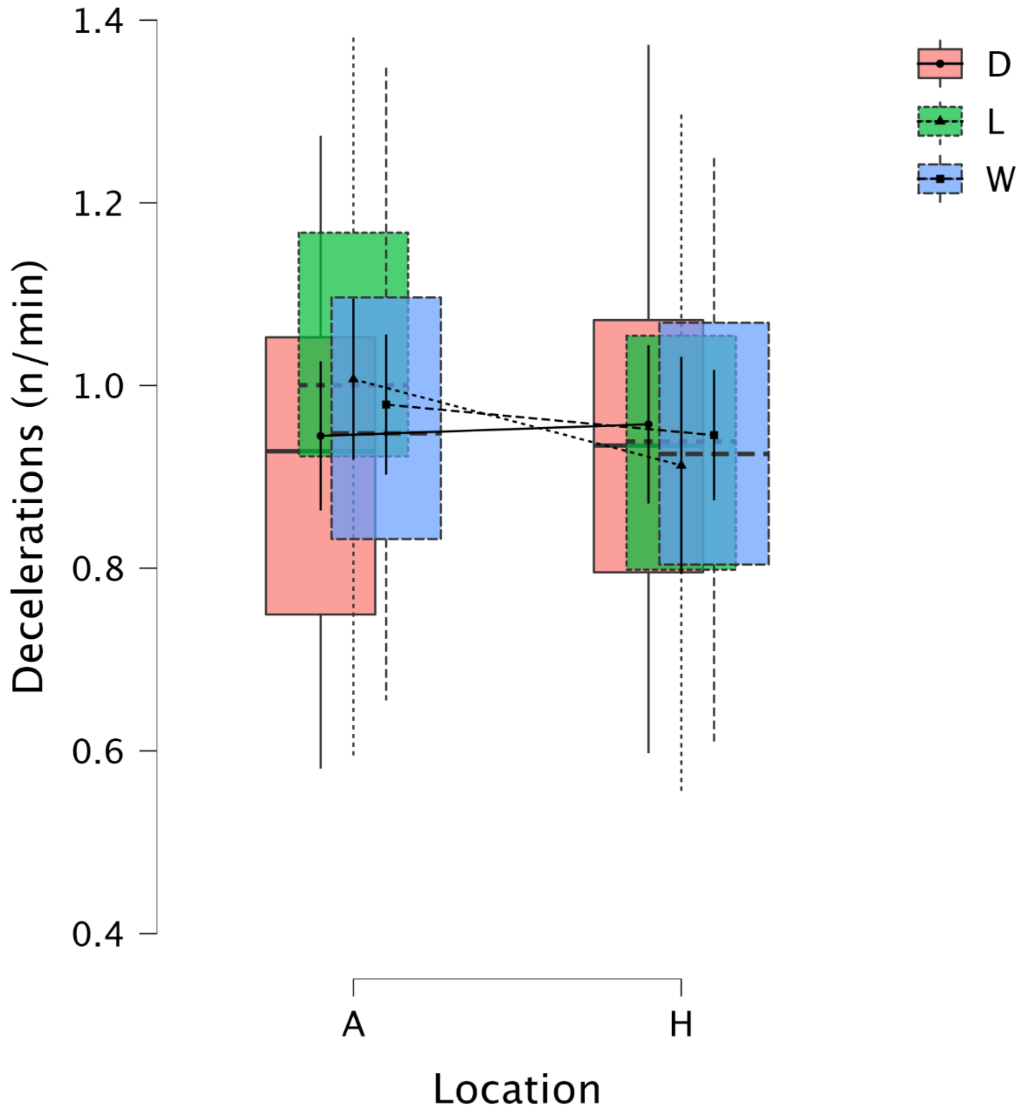

Figure 12. Comparisons of high-metabolic load distance among game locations (H and A) and results (W, L, D).