TITLE

Variability and physical demands of international seam bowlers in one-day and Twenty20 international matches across five years.

AUTHOR

Bliss, Alex; Ahmun, Robert; Jowitt, Hannah; et al.

JOURNAL

Journal of Science and Medicine in Sport

DATE DEPOSITED

20 November 2020

TITLE
Variability and physical demands of international seam bowlers in one-day and Twenty20 international matches across five years.

AUTHOR
Bliss, Alex; Ahmun, Robert; Jowitt, Hannah; et al.

JOURNAL
Journal of Science and Medicine in Sport

DATE DEPOSITED
UNSPECIFIED

This version available at
http://research.stmarys.ac.uk/id/eprint/4453/

Manuscript

Abstract:

Objectives: To quantify and compare the match demands and variability of international One-Day (ODI) with Twenty20 (T20) cricket matches and to compare ODI match demands when competing home and away.

Design: Single cohort, longitudinal observation.

Methods: Thirteen international male seam bowlers across 204 matches (ODI= 160; T20= 44) were investigated over five-years (2015-2019). Using global positioning sensors and accelerometers, physical demands were quantified using distance covered at different velocities and the number of entries into high and low intensity acceleration and deceleration bands. Variability was quantified using coefficient of variation (CV) and smallest worthwhile change.

Results: Significantly greater ($p < 0.05$) match demands were found for all physical variables relative to minutes played for T20 against ODI matches, except for distance covered 20-25 $km \cdot h^{-1}$ which was greater for ODI. Distance covered between 0-7 $km \cdot h^{-1}$ showed no significance difference ($p = 0.60$). The number of moderate decelerations (2-4 $m \cdot s^2$) were greater ($p = 0.04$) away compared to home in ODI. All other variables showed no significance. Relative to minutes played, decelerations <-4 $m \cdot s^2$ (within-player ODI CV= 75.5%. T20= 72.0%) accelerations >4 $m \cdot s^2$ (within-player ODI CV= 79.2%. T20 CV= 77.2%. Between-player ODI CV= 84.7%. T20= 38.8%) and distance covered >25 $km \cdot h^{-1}$ (within-player ODI CV= 65.5%. T20= 64.1%) showed the greatest variability.

Conclusions: Players are exposed to different physical demands in ODI Vs T20 matches, but not for home Vs away ODI matches. Practitioners should be aware of the large variability in high-speed/intensity accelerations and decelerations across matches.

Keywords: One-Day International, T20, elite, longitudinal, seam bowling,

Introduction:

International one-day cricket matches are played in either fifty-over (one-day international (ODI)) or twenty-over (T20) format. The physical demands of cricket, like most team sports, are dependent on playing position, with seam bowlers in cricket experiencing the greatest physical demands when compared to other positions such as batters and wicket keepers.[1,2] With the addition of T20 matches, the number of competitive days of international single day cricket has increased.[3] Given seam bowlers present the highest injury risk and greatest workload of all playing positions,[4,5] it is essential that the time motion demands of international cricket are well understood.

To quantify external physical demands, cricket match play has been monitored using global positioning system (GPS) technology and inertial sensors.[6] Previous research has indicated that when compared to other positions, seam bowlers perform the most high-intensity actions when the team is fielding across all cricket formats (multi-day, ODI and T20) in both youth and senior cricket.[2,7,8] However, these analyses were conducted on a limited number of games and players. Presently, there are no published time motion data on seam bowlers in competitive international matches in ODI or T20 matches. Aside from any physical differences in ODI and T20 international match play, elite international cricket is played in countries on multiple continents and the effect of playing home vs away is unknown. In other team sports such as soccer, greater high-speed running distance and total distance when playing at home have been reported,[9] while maximal accelerations have been shown to be greater when playing away.[10] Furthermore, in rugby sevens, weather conditions have been shown to have an impact on physical performance, with poor weather (rain) possibly limiting high speed running and maximal speeds achieved in matches.[11] Given the global nature of international cricket, it is reasonable to suggest that contextual factors such as weather, ground size or home advantage may influence the physical demands of seam-bowling in ODI and T20 match play, though this hypothesis remains untested.

Considerable variability in the physical demands of match play, both within and between players has been demonstrated over the course of a season in team sports such as rugby union.[12] Conversely, other than high speed actions, the demands of Australian football are relatively stable from match-to-match.[13] Establishing variability in physical demands is necessary to inform training prescription[1] of seam bowlers and provide information pertaining to changes that occur between matches for individual athletes.[14,15] To date, only two studies have reported the variability in the physical demands of cricket match play in seam bowlers. These were a single athlete case-study over a season[16] and a study of eight seam bowlers across only 17 matches in T20 county cricket (United Kingdom) over two seasons.[17] Whilst these studies offer some indications of the variability associated with cricket seam bowling, international ODI and T20 matches remain unknown. The studies also did not report acceleration and deceleration data, which might provide additional useful information on match variability.

The present study had three aims: 1) Investigate the physical demands of elite international match play for seam bowlers during fielding in ODI and T20 matches, 2) investigate the effects of match location (home vs away) on physical demand in ODI matches, 3) investigate the within- and between-player variability of physical demands across ODI and T20 matches. The hypotheses were that ODI matches would present a greater physical demand than T20 matches in absolute terms, but relative to minutes played, T20 would be more physically demanding. Second, ODI away matches would present greater physical demand than home matches. Finally, variability would be greater for ODI matches when compared to T20.

Methods:

Thirteen international male seam bowlers (age 28 ± 4.2 y, stature 1.87 ± 0.07 m, body mass 85.8 ± 6.6 kg) from 204 internationally sanctioned matches (ODI= 160 T20= 44) were involved in this five-year (2015-2019) retrospective analysis. Using the same data set, the difference in physical performance in ODI matches when competing at home (n= 87) compared to away (n= 73) was investigated. Home vs away analysis was not carried out for T20 owing to the smaller sample size and imbalanced number of home (n= 8) and away (n= 36) matches. Away ODI matches were played in: Abu Dhabi, Australia, Bangladesh, India, New Zealand, Scotland, South Africa, Sri Lanka, and the West Indies. Retrospective ethical approval for the study was granted through the University's Ethics Committee (reference: SMEC_2019-20_028) and was conducted in accordance with the Declaration of Helsinki.

During international fixtures, players wore a tight-fitting vest carrying a GPS device (2015-2018 Catapult OptimEye S5 unit; 2018-2019 Catapult Optimeye G5, both Catapult Innovations, Melbourne, Australia) positioned on the upper back, between the shoulder blades, sampling at 10 Hz. The units additionally housed triaxial accelerometers (range of 3D ± 16 g), gyroscopes (range of 3D $2000°\cdot sec^{-1}$), and magnetometers, all sampling at 100Hz. Both the S5[18] and G5[19] units have been shown to be reliable and valid and share the same componentry.[20] Units were activated at least 15 minutes prior to match start and data collected from the units were exported from Catapult's OpenField Cloud database for analysis. Only the period of fielding (including bowling) was analysed in this study. Non-fielding and bowling activities (e.g. warm up, batting) were removed from the analysis. All physical performance measures were represented as absolute and relative (per minute) values. For home compared to away analyses, data collected from all players were used. However, for the assessment of physical performance variability for ODI and T20 matches, players' inclusion required them to have completed a minimum of three matches in the respective match format.[12] This resulted in the variability analysis of ODI matches being reduced to 157 and T20 reduced to 38 matches, respectively.

Physical demands were quantified using distance covered in pre-selected and recommended velocity bands (0-7 $km \cdot h^{-1}$; 7-15 $km \cdot h^{-1}$; 15-20 $km \cdot h^{-1}$; 20-25 $km \cdot h^{-1}$; >25 $km \cdot h^{-1}$)[21] as per manufacturer guidelines. These velocity bands are utilised in the investigated team's day-to-day operations and are in accordance with previous research in cricket.[2] The number of entries into pre-selected acceleration (2-4 $m \cdot s^2$; >4 $m \cdot s^2$), and deceleration (-2-4 $m \cdot s^2$; <-4 $m \cdot s^2$) bandwidths were also used in accordance with previous research.[22] Other variables analysed were maximal velocity, total distance covered and total duration of fielding, the latter being used to calculate the aforementioned relative measures. Information on overs bowled, were obtained from a specialist cricket database (www.espncricinfo.com). Latitude, longitude, and altitude of the match location were obtained from Google Maps (Google LLC, California, USA). Location data were used to obtain the corresponding number of satellites and horizontal dilution of precision (HDOP) statistics from a global position system website (www.gnssplanning.com Trimble Terrasat GmhH, Germany, Trimble Inc. v. 1.4.6.0)[23] and are reported in line with recommendations on reporting standards for research utilising GPS technology.[20]

Data are reported as mean ± SD, with an alpha level $\leq$0.05 set *a priori*. Maximal values are added for additional context. All completed matches were analysed but minimum values are not reported as the bottom of the ranges may have been affected due to weather stoppages or reduced over matches. Match data statistical analysis were performed in SPSS (IBM SPSS Statistics, v.24, IBM Corp.). All dependent variables were screened for normality using the Kolmogorov-Smirnov test, as well as visual inspection of histograms and Q-Q plots. Non-normal data were transformed using the decadic logarithm. Mixed linear modelling (MLM) was conducted with T20 and ODI as fixed factors, and individual players as random factors. A further MLM was constructed with home and away matches modelled as fixed factors, and players as random factors for ODI matches. Where significance was observed between fixed factors, Bonferroni *post-hoc* tests were used for pairwise comparisons.

Variability was expressed using within- and between-participant coefficient of variation (CV%) with 90% confidence intervals (CI). The smallest worthwhile change (SWC) was calculated from between-participant standard deviations (0.2*SD) for each dependent variable.[14] Cohen's *d* effect sizes were used with ODI and T20 matches, and between home and away ODI matches and were classified as 0.0-0.19= trivial; 0.20-0.49= small; 0.5-0.79= moderate. >0.8= large with a 90% CI as it allows for clear outcomes to be identified if effects are unlikely to be substantial.[24]

Results:

Satellite data for ODI vs T20 were as follows: ODI: mean satellites available= 16 ± 1. HDOP= 0.69 ± 0.05 %. T20: mean satellites available= 15 ± 1 HDOP= 0.74 ± 0.05 %. ODI Home: mean satellites available= 17 ± 1. HDOP= 0.68 ± 0.03%. ODI Away: mean satellites available= 16 ± 1. HDOP= 0.69 ± 0.06%. Descriptive data and variability statistics for ODI vs T20 matches are displayed in Table 1. Descriptive data for ODI home vs away are in Table 2. Bonferonni *post hoc* pairwise comparisons (absolute and relative ODI vs T20; absolute and relative home vs away) are displayed in Figure 1 alongside effect sizes and 90% confidence intervals. For decelerations <-4 $m \cdot s^2$, one players' bowling action caused an artificial inflation of this metric and consequently was removed from the analysis of this dependent variable only.

Discussion:

This study aimed to quantify the physical match demands and variability of ODI and T20 international cricket matches. The study also compared the physical ODI match demands when competing home and away. Contrary to our hypothesis, when T20 matches were compared to ODI matches the absolute number of high intensity decelerations (<-4 $m.s^2$) and accelerations (>4 $m.s^2$) were not greater in ODI matches despite lasting over twice as long as T20. This contrasts with all other physical demand variables and may be explained, in part, by the higher variability (CV up to 84%) observed in this study for high intensity decelerations and accelerations across matches. Match durations were also shown to be greater away compared to home, which likely contributed to the larger distances covered.

In accordance with previous research,[26] international T20 cricket demonstrated greater match demands relative to time played than ODI matches. Here, entries into all acceleration and deceleration bands, metres per minute, and distances covered at 7-15, 15-20, and >25 km·h^{-1} were greater for T20 when compared to ODI, relative to time. The only variable demonstrated to be greater in ODI matches compared to T20 relative to time was distance covered in the 20-25 km·h^{-1} speed band. It is likely that this is attributable to bowling run up speeds as (owing to the maximum allowable overs in each format) approximately three times more overs are bowled in ODI matches by seam bowlers.

The data presented here also provides normative data for the physical demands of playing at home (England or Wales) or away in ODI matches. These analyses have not been performed in cricket, but recent work in football and rugby sevens has shown that differences do exist in physical demand when situational factors such as match location and weather are considered.[10,11] The present study observed that only the number of decelerations -2-4 m·s^2 were greater away from home in ODI matches and that there were no differences in any other physical variables relative to match duration (Figure 1). Speculatively, this could be due to situational differences such as ground layout and size of outfields being larger away from home in ODI matches (players covered more total distance and distance in the 0-7km·h^{-1} zone in matches away from home), or individual player differences in bowling action (stopping aggressively after delivery stride for example). However, as this was the only variable affected relative to time played, it suggests that despite the potential of environmental and other situational factors, match location has little effect on the overall physical demand in ODI matches.

To date, only one study has provided information with regards the variability of international cricket match play, however, this was a single-athlete case study.[16] Petersen et al observed considerable variability in seam bowlers' physical demands during both ODI and T20 match play. In absolute and relative terms, the variability for accelerations and decelerations are high (24.9 – 84.7%), with the most intense accelerations and decelerations showing the largest variability. The trend for variability to increase as actions become faster or more intense has been demonstrated in T20 county cricket.[17] We also found that as running speed increases, or accelerations become more intense, the variability increases. This is consistent with the only other study that has investigated variability in match demands relative to time played.[17] The absolute between-player variability for total distance covered in T20 matches appears to be almost identical in international cricket (absolute CV% = 10.7) as demonstrated here, and county cricket (CV%= 10.6).[17] However, as the maximum time allowed for T20 county matches is shorter than international cricket, it is most pertinent to look at variability relative to time played. Metres per minute is less variable in international cricket (CV%= 7.9) than county cricket (CV%= 11.2). T20 international cricket is also less variable than county cricket when considering peak speed (international CV%= 3.6. County CV%= 12.1), and high-intensity running efforts (international 20-25 $km \cdot h^{-1}$ CV%= 26.7. County >18 $km \cdot h^{-1}$ CV% = 49.6). This may be as a result of less player-to player variability in average fitness levels across the squad as performance level increases. It has been demonstrated in football that as competition standard increases, high-speed running decreases despite similar physical capacities amongst players.[27] However, as physiological fitness data in elite cricket are lacking in comparison to other team sports, comparing international cricket teams to national or county teams fitness qualities remains elusive. Given that the time motion demands of matches vary between positions in cricket,[28] it is likely that the changing fielding positions during a match or between matches will contribute to the variability seen here. Finally, it is logical to suggest that the number of runs (particularly through boundaries and non-boundaries) will also contribute to match variability, though it is beyond the scope of our findings.

Between-player ODI variability has not previously been studied. A single athlete (within-player) case-study demonstrated lower variability in physical demands for ODI cricket than has been reported here.[16] When compared to the aforementioned case study,[16] the seam bowlers in the present study demonstrated greater variability in distance covered walking, total distance covered, and all speed bands > 15 $km \cdot h^{-1}$. Like T20 cricket, the data presented here also suggests that as running speed increases, so does within-player and between-player variability in ODIs. However, making comparisons against a single athlete case study is problematic and it is likely that data collected from a team will be inherently more variable than from one player.

Despite acceleration being an important measure for team sports,[29] there is no consensus on how to accurately quantify the metric[29] and investigations into decelerations particularly are limited in team-sports which may be in part due to inconsistencies in descriptors for the thresholds used.[21] No other study has investigated the variability in accelerations and decelerations in cricket. The present study suggests across ODI and T20, accelerations and decelerations are highly variable, both within- and between-player, and that the more intense the acceleration, the more variable the measure. The variability here is likely a result of some players achieving multiple entries into these bandwidths per game, while others only achieve a few entries across the entire study. The inconsistencies in within- and between-player accelerations (>4 $m \cdot s^2$) and decelerations (<-4 $m \cdot s^2$) observed in this study likely owe to a number of contextual and situational factors that are inherently variable such as: fielding position; quality of opposition; match importance; innings length; size of outfield; boundary rope proximity to stands; as well as individual factors such as bowling action and number of overs bowled. The variability observed may also be compounded by reporting accuracy of the GPS units. Although accuracy improves for multi-plane actions in the x- and y-axes as accelerations increase in intensity, around a 5% error remains for accelerations ~5 $m \cdot s^2$.[18] Future studies may wish to consider investigating these situational and contextual factors as they relate to physical demand. Additionally, it might be that utilising the 4 $m \cdot s^2$ acceleration and deceleration bands might be too high for cricket performance. Previously, it has been demonstrated in Australian football that, because players often accelerate from a moving start, 4 $m \cdot s^2$ was too high to capture maximal accelerative efforts.[30] In cricket, players will “walk in” during the bowler's run up when fielding, meaning that they too have a moving start and that their maximal accelerations might not be consistently captured. Future research should consider whether the 4 m·s^2 acceleration and deceleration zones are utilised.

Conclusion:

This study is the first to investigate the variability of physical demands in international cricket. It is also the first to investigate the role of playing home or away on physical demand. Our data show that T20 matches are more physically demanding than ODI matches relative to match minutes played, particularly for the number of accelerations and decelerations, metres covered per minute, and distances covered in most speed bands. We also show that there is limited evidence for playing home or away having an influence on physical demand in ODI cricket. Decelerations -2-4 m·s^2 was the only variable that was greater away from home. High-speed or high-intensity accelerations and decelerations were shown to be particularly variable both within- and between-player. Total distance, metres per minute, and maximum velocity demonstrated the smallest variability. Future research should investigate the variability of physical demands for multi-day formats, tournament cricket, and other playing positions in the team.

Practical Implications: (3 to 5 bullet points):

- The physical demands of ODI and T20 matches should not be considered interchangeable and as such, specific preparation of athletes performing in either format is required. However, conditioning requirements for players who play both formats will remain complex and challenging.
- The number of decelerations -2-4m·s^2 performed are higher in away matches but all other variables show no difference. Practitioners can expect their players to have a higher decelerative demand during games where these factors are present. The lack of other differences in physical demand between playing at home and away in ODI

cricket suggests that either there is limited rationale for specific physical preparation of players for home and away matches, However, it is important to acknowledge that the internal responses may differ between individuals despite the same demands, especially given the differing environmental factors.

- Quantifying low intensity physical demands is achievable, but with the data showing high variability of acceleration and decelerations, it suggests that making judgements on training prescription or load monitoring from these metrics remains difficult. Practitioners must act to ensure that all efforts are made to reduce errors that may further compound the quality of data obtained.

Acknowledgements:

No funding was obtained for this research.

References:

1. Petersen C, Pyne D, Portus M et al. Quantifying positional movement patterns in Twenty20 cricket. *Int J Perf Analysis Sport* 2009. 9(2): 165-170
2. Cooke K, Outram T, Brandon R et al. The Difference in Neuromuscular Fatigue and Workload During Competition and Training in Elite Cricketers. *Int J Sports Perf Phys* 2018. 14(4): 439-444
3. McNamara D, Gabbett T, Naughton G. Assessment of workload and its effects on performance and injury in elite cricket fast bowlers. *Sports Med* 2017. 47: 503-515

4. Orchard J, James T, Portus M et al. Fast bowlers in cricket demonstrate up to 3- to 4-week delay between high workloads and increased risk of injury. *Am J Sports Med* 2009; 37:1186–1192.
5. Orchard J, James T, Kountouris A, et al. Changes to injury profile (and recommended cricket injury definitions) based on the increased frequency of Twenty20 cricket matches. *Open Access J Sports Med* 2010. 1:63-76
6. Jowitt H, Durussel J, Brandon R et al. Auto detecting deliveries in elite cricket fast bowlers using microsensors and machine learning. *J Sports Sci* 2020. DOI: 10.1080/02640414.2020.1734308
7. Sholto-Douglas R, Cook R, Wilkie M et al. Movement demands of an elite cricket team during the Big Bash League in Australia. *J Sports Sci Med* 2020. 19: 59-64
8. Vickery W, Duffield R, Crowther R, et al. Comparison of the physical and technical demands of cricket players during training and match-play. *J Strength Cond Res* 2016. 32(3): 821–829
9. Castellano J, Blanco-Villaseñor A, & Álvarez D. Contextual variables and time-motion analysis in soccer. *Int J Sports Med* 2011. 32(6): 415–421
10. Oliva-Lozano J, Rojas-Valverde D, Gómez-Carmona C et al. Impact of contextual variables on the representative external load profile of Spanish professional soccer match-play: a full season study. *Eur J Sports Sci* 2020 DOI: 10.1080/17461391.2020.1751305
11. Henderson M, Fransen J, McGrath J et al. Situational factors affecting rugby sevens match performance. *Sci Med Football* 2019. 3(4): 275-280
12. McLaren S, Weston M, Smith A et al. Variability of physical performance and player match loads in professional rugby union. *J Sports Med Sci* 2016. 19: 493-497
13. Kempton T, Sullivan C, Bilsborough J et al. Match-to-match variation in physical activity and technical skill measures in professional Australian Football. *J Sports Med Sci* 2015. 18(1): 109-113

14. Hopkins W. How to interpret changes in an athletic performance test. *Sportscience* 2004. 8: 1-7
15. Batterham A, Hopkins W. Making meaningful inferences about magnitudes. *Int J Sports Phys Perf* 2006. 1(1): 50-57.
16. Petersen C, Pyne D, Portus M et al. Variability in movement patterns during one day internationals by a cricket fast bowler. *Int J Sports Phys Perf* 2009. 4: 278-281
17. Bray J, Fogarty M, Barrett S et al. Using microtechnology to evaluate the between and within-match variability of professional Twenty20 cricket fast bowlers. *Prof Str Cond J.* 43: 19-26
18. Nicolella D, Torres-Ronda L, Saylor K et al. Validity and reliability of an accelerometer-based player tracking device. *PLoS ONE* 2018. 13(2): e0191823.
19. Barrett S, Midgley A, Lovell R. PlayerLoad: reliability, convergent validity, and influence of unit position during treadmill running. *Int J Sports Phys Perf* 2014. 9(6): 945-52.
20. Malone J, Jaspers A, Helsen W et al. Seasonal training load and wellness monitoring in a professional soccer goalkeeper. *Int J Sports Phys Perf* 2018. 13(5): 672-675,
21. Sweeting A, Cormack S, Morgan S et al. When is a sprint a sprint? A review of the analysis of team-sport athlete activity profile. *Frontiers Phys* 2017. 8: 432
22. Higham D, Pyne D, Anson J et al. Movement patterns in rugby sevens: effects of tournament level, fatigue and substitute players. *J Sci Med Sport* 2012. 15: 277-282
23. Waldron M, Highton J, Daniels M et al. Preliminary evidence of transient fatigue and pacing during interchanges in Rugby League. *Int J Sports Phys Perf* 2013. 8(2): 157-164
24. Hopkins W, Marshall S, Batterham A, Hanin, J. Progressive statistics for studies in sports medicine and exercise science. *Med Sci Sports Exerc.* 2009. 41(1): 3-12
25. Vickery W, Dascombe B, Duffield R. Physiological movement and technical demands of centre-wicket Battlezone, traditional net-based training and one-day cricket

matches: a comparative study of sub-elite cricket players. *J Sports Sci* 2014. 32: 722–737.

26. Petersen C, Pyne D, Dawson B et al. Movement patterns in cricket vary by both position and game format. *J Sports Sci* 2010. 28(1): 45-52
27. Bradley P, Carling C, Diaz A et al. Match performance and physical capacity of players in the top three competitive standards of English professional soccer. *Human Movement Sci* 2013. 32: 808-821
28. Turner T, Cooper S, Davies R et al. Fieling specific walk/run patterns in English professional Cricket. *J Spo Ex Sci.* 2020. 4(1): 11-17
29. Delaney J, Cummins C, Thornton H et al. Importance, reliability, and usefulness of acceleration measures in team sports. *J Strength Cond Res* 2018. 32(12): 3494-3502
30. Aughey R, and Falloon C. Description of accelerations in Australian rules football: a new insight into high intensity activity. *Coach Sport Sci.* 2008. 3, 16.

Tables:

Table 1: Descriptive Data (mean ± standard deviation and variability statistics for ODI vs T20.

	ODI **n= 157** (max value)	**T20** **n= 38** (max value)	**ODI** **Within-player** **CV%** (± 90% CI)	**ODI** **Between-player** **CV%** (± 90% CI)	**T20** **Within-player** **CV%** (± 90% CI)	**T20** **Between-player** **CV%** (± 90% CI)	**ODI** **SWC**	**T20** **SWC**
Absolute Physical Performance								
Decelerations <-4 m·s^{2} (n)	2.7 ± 2.3 (13.0)	3.0 ± 2.3 (8.0)	68.7 (51.2, 105.0)	29.1 (23.4, 41.0)	64.6 (38.1, 211.7)	47.3 (30.4, 106.6)	0.2	0.3
Decelerations -2-4 m·s^{2} (n)	25.9 ± 12.6 (69.0)	19.1 ± 7.8 (34.0)	37.0 (31.6, 44.5)	32.8 (26.9, 48.7)	36.2 (28.4, 49.9)	24.4 (19.8, 31.8)	1.9	0.9
Accelerations 2-4 m·s^{2} (n)	35.8 ± 18.9 (104.0)	29.1 ± 13.8 (56.0)	35.8 (30.0, 46.6)	39.6 (32.3, 65.6)	30.8 (25.4, 39.1)	40.1 (29.0, 64.9)	3.5	2.1
Accelerations >4 m·s^{2} (n)	4.2 ± 6.3 (37.0)	4.1 ± 3.1 (11.0)	79.6 (57.9, 148.5)	83.8 (53.7, 517.7)	64.9 (42.2, 139.8)	46.1 (32.0, 82.2)	0.7	0.3
Maximum Velocity (km·h^{-1})	29.2 ± 2.5 (36.6)	30.0 ± 2.8 (35.6)	7.9 (7.5, 8.39)	4.4 (4.3, 4.6)	7.7 (7.2, 8.3)	3.6 (3.5, 3.8)	0.3	0.2
Total Distance (m)	11927.0 ± 2726.1 (17048.5)	6616.8 ± 969.2 (8966.7)	21.5 (19.2, 24.5)	6.7 (6.4, 7.2)	12.7 (11.4, 14.3)	10.7 (9.7, 11.9)	157.3	136.0
Distance 0-7 km·h^{-1} (m)	8317.5 ± 1919.5 (13185.5)	4115.4 ± 970.5 (6047.8)	50.8 (18.8, 23.6)	8.2 (7.8, 8.9)	19.6 (16.6, 23.9)	20.8 (17.3, 25.9)	131.2	161.4
Distance 7-15 km·h^{-1} (m)	2147.4 ± 665.7 (4159.3)	1545.2 ± 441.3 (2434.8)	30.9 (26.6, 37.6)	11.3 (10.5, 12.8)	20.6 (17.5, 24.9)	20.6 (17.2, 25.7)	49.8	60.4
Distance 15-20 km·h^{-1} (m)	563.0 ± 180.7 (1086.8)	453.0 ± 160.4 (868.99)	29.5 (25.5, 35.5)	14.1 (12.9, 16.4)	26.7 (21.9, 34.2)	25.1 (20.2, 33.0)	16.9	21.0
Distance 20-25 km·h^{-1} (m)	840.8 ± 298.2 (1410.9)	354.5 ± 155.9 (689.7)	31.6 (27.2, 38.3)	23.2 (20.1, 30.2)	28.4 (23.2, 36.6)	27.8 (22.0, 37.8)	38.1	21.2
Distance >25 km·h^{-1} (m)	57.1 ± 46.7 (253.2)	61.1 ± 36.3 (124.9)	65.2 (496, 110.5)	44.4 (34.2. 79.8)	55.8 (37.9, 106.0)	27.3 (21.7, 37.0)	5.8	3.3
Overs	7.3 ± 2.2 (10.0)	2.4 ± 0.5 (4.0)	25.4 (22.3, 29.8)	17.0 (15.2, 20.4)	32.7 (25.7, 44.6)	7.6 (7.0, 8.2)	0.2	0.04
Duration (mins)	208 ± 37 (295)	101 ± 15 (136)	17.0 (15.7, 18.7)	3.6 (3.5, 3.7)	16.0 (13.9, 18.7)	8.3 (7.7, 9.1)	1.5	1.7

Relative Physical Performance								
Decelerations <-4 m·s^2 (n·min^{-1})	0.01 ± 0.009 (0.05)	0.03 ± 0.03 (0.11)	75.5 (54.4, 123.4)	33.7 (27.0, 44.8)	72.0 (38.9, 482.2)	57.2 (34.2, 174.7)	0.008	0.004
Decelerations -2-4 m·s^2 (n·min^{-1})	0.13 ± 0.06 (0.35)	0.19 ± 0.06 (0.33)	35.3 (29.8, 43.2)	29.8 (24.9, 37.3)	30.8 (25.0, 40.0)	20.4 (17.1, 25.4)	0.008	0.007
Accelerations 2-4 m·s^2 (n·min^{-1})	0.18 ± 0.10 (0.54)	0.29 ± 0.12 (0.53)	34.6 (28.7, 43.7)	41.1 (32.2, 56.7)	24.9 (21.0, 30.8)	37.8 (27.8, 59.0)	0.02	0.02
Accelerations >4 m·s^2 (n·min^{-1})	0.02 ± 0.03 (0.17)	0.04 ± 0.03 (0.12)	79.2 (56.3, 133.9)	84.7 (54.1, 196.0)	77.2 (45.5, 256.7)	38.8 (28.3, 61.6)	0.003	0.003
Metres per minute (m·min^{-1})	58.0 ± 10.3 (73.7)	66.0 ± 7.6 (90.7)	15.9 (14.7, 17.3)	6.9 (6.6, 7.3)	8.5 (8, 9.2)	7.9 (7.3, 8.5)	0.8	1.0
Distance 0-7 km·h^{-1} (m·min^{-1})	40.3 ± 6.9 (54.9)	41.2 ± 8.9 (67.4)	14.2 (13.3, 15.3)	8.8 (8.3, 9.4)	15.5 (13.7, 17.8)	18.4 (15.7, 22.4)	0.7	1.5
Distance 7-15 km·h^{-1} (m·min^{-1})	10.5 ± 3.0 (19.2)	15.4 ± 4.3 (25.7)	28.7 (24.8, 33.9)	10.1 (9.4, 10.8)	19.3 (16.6, 23.0)	18.2 (15.5, 22.0)	0.2	0.5
Distance 15-20 km·h^{-1} (m·min^{-1})	2.7 ± 0.8 (4.8)	4.5 ± 1.3 (7.5)	23.7 (21.2, 26.9)	14.5 (13.2, 16.0)	18.8 (16.4, 22.0)	21.9 (18.1, 27.7)	0.08	0.2
Distance 20-25 km·h^{-1} (m·min^{-1})	4.1 ± 1.5 (10.3)	3.5 ± 1.4 (5.9)	30.1 (26.3, 35.1)	22.7 (19.7, 26.8)	24.3 (20.1, 30.7)	26.7 (21.3, 35.8)	0.2	0.2
Distance 25+ km·h^{-1} (m·min^{-1})	0.3 ± 0.2 (1.4)	0.6 ± 0.4 (1.7)	65.5 (48.0, 102.7)	51.4 (38.2, 78.3)	64.1 (401, 160.1)	29.6 (23.1, 41.2)	0.03	0.03

CV%= coefficient of variation. CI= confidence interval. SWC= smallest worthwhile change.

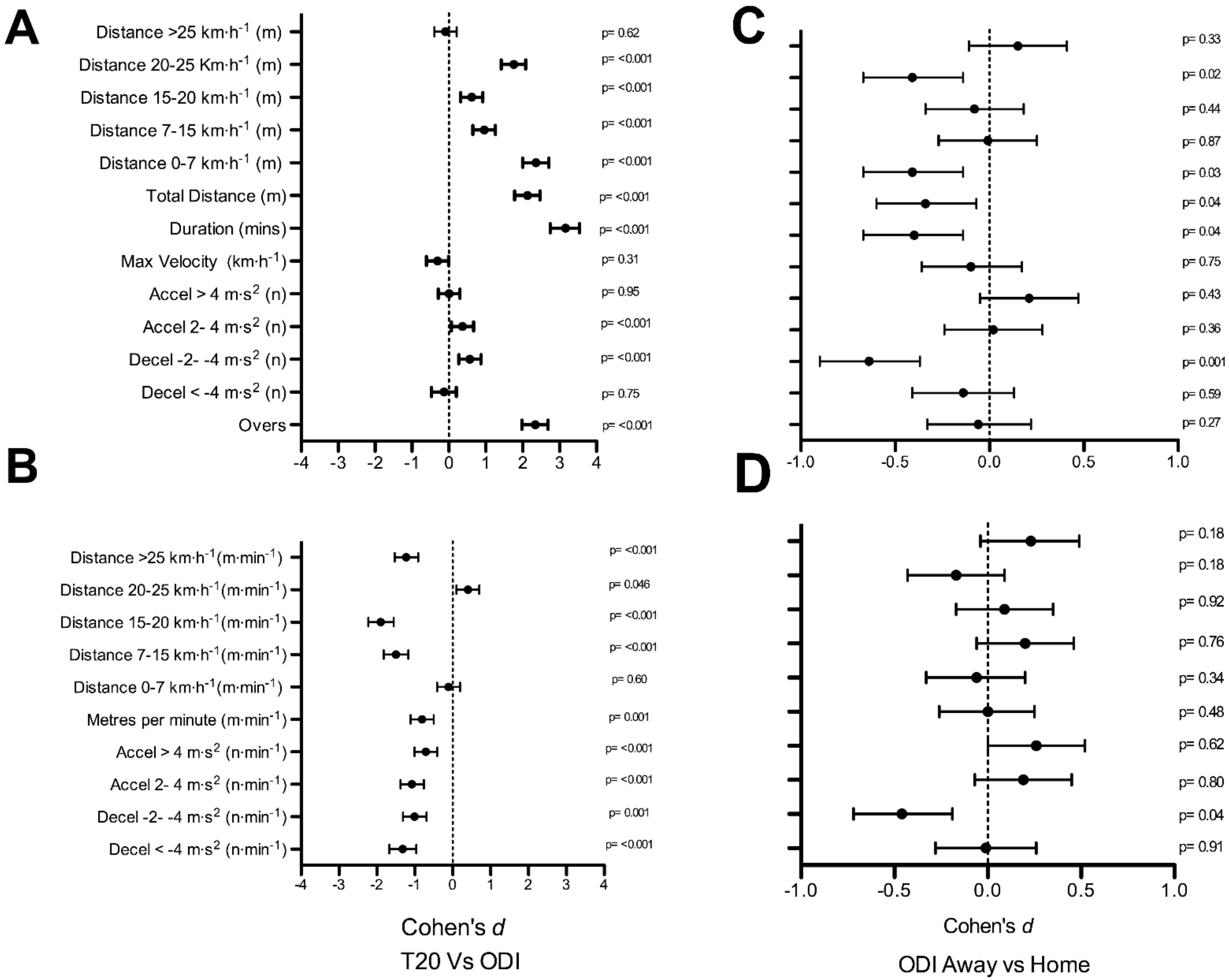
Table 2: Descriptive Data (mean ± standard deviation) for ODI home vs away matches.

	ODI	
	Home	**Away**
	n= 87	n= 73
Absolute Physical Performance		
Decelerations <-4 $m \cdot s^2$ (n)	2.5 ± 1.7	3.4 ± 1.8
Decelerations -2-4 $m \cdot s^2$ (n)	22.6 ± 10.8	30.6 ± 14.5
Accelerations 2-4 $m \cdot s^2$ (n)	36.3 ± 19.1	36.0 ± 19.0
Accelerations >4 $m \cdot s^2$ (n)	4.8 ± 7.3	3.5 ± 4.6
Maximum Velocity ($km \cdot h^{-1}$)	29.1 ± 2.3	29.4 ± 2.5
Total Distance (m)	11499.8 ± 2919.2	12409.3 ± 2363.8
Distance 0-7 $km \cdot h^{-1}$ (m)	7945.3 ± 1930.5	8718.3 ± 1843.4
Distance 7-15 $km \cdot h^{-1}$ (m)	2149.3 ± 755.5	2158.4 ± 537.8
Distance 15-20 $km \cdot h^{-1}$ (m)	555.9 ± 203.0	571.5 ± 149.8
Distance 20-25 $km \cdot h^{-1}$ (m)	786.2 ± 316.3	904.2 ± 256.7
Distance >25 $km \cdot h^{-1}$ (m)	62.5 ± 51.8	55.1 ± 44.5
Overs	7.2 ± 2.2	7.4 ± 2.0
Duration (mins)	201 ± 38	216 ± 36

Relative Physical Performance		
Decelerations <-4 m·s^2 (n·min^{-1})	0.01 ± 0.01	0.02 ± 0.01
Decelerations -2-4 m·s^2 (n·min^{-1})	0.12 ± 0.05	0.14 ± 0.07
Accelerations 2-4 m·s^2 (n·min^{-1})	0.19 ± 0.10	0.17 ± 0.09
Accelerations >4 m·s^2 (n·min^{-1})	0.02 ± 0.04	0.02 ± 0.02
Metres per minute (m·min^{-1})	58.0 ± 11.8	58.0 ± 8.3
Distance 0-7 km·h^{-1} (m·min^{-1})	40.1 ± 7.7	40.6 ± 5.8
Distance 7-15 km·h^{-1} (m·min^{-1})	10.8 ± 3.4	10.3 ± 2.8
Distance 15-20 km·h^{-1} (m·min^{-1})	2.8 ± 0.8	2.7 ± 0.8
Distance 20-25 km·h^{-1} (m·min^{-1})	4.0 ± 1.5	4.3 ± 1.5
Distance 25+ km·h^{-1} (m·min^{-1})	0.3 ± 0.3	0.3 ± 0.2

Figure Legends:

Figure1: Comparison of absolute (A) and relative (B) physical demand of ODI vs T20 and absolute (C) and relative (D) physical demands of home vs away comparison. Effect sizes ± 90% CI. P values = Bonferroni *post-hoc* pairwise comparisons.


A
Distance >25 km·h^{-1} (m)
Distance 20-25 Km·h^{-1} (m)
Distance 15-20 km·h^{-1} (m)
Distance 7-15 km·h^{-1} (m)
Distance 0-7 km·h^{-1} (m)
Total Distance (m)
Duration (mins)
Max Velocity (km·h^{-1})
Accel > 4 m·s^2 (n)
Accel 2- 4 m·s^2 (n)
Decel -2- -4 m·s^2 (n)
Decel < -4 m·s^2 (n)
Overs
p= 0.62
p= <0.001
p= <0.001
p= <0.001
p= <0.001
p= <0.001
p= <0.001
p= 0.31
p= 0.95
p= <0.001
p= <0.001
p= 0.75
p= <0.001
-4 -3 -2 -1 0 1 2 3 4
B
Distance >25 km·h^{-1}(m·min^{-1})
Distance 20-25 km·h^{-1}(m·min^{-1})
Distance 15-20 km·h^{-1}(m·min^{-1})
Distance 7-15 km·h^{-1}(m·min^{-1})
Distance 0-7 km·h^{-1}(m·min^{-1})
Metres per minute (m·min^{-1})
Accel > 4 m·s^2 (n·min^{-1})
Accel 2- 4 m·s^2 (n·min^{-1})
Decel -2- -4 m·s^2 (n·min^{-1})
Decel < -4 m·s^2 (n·min^{-1})
p= <0.001
p= 0.046
p= <0.001
p= <0.001
p= 0.60
p= 0.001
p= <0.001
p= <0.001
p= 0.001
p= <0.001
-4 -3 -2 -1 0 1 2 3 4
Cohen's *d*
T20 Vs ODI
C
p= 0.33
p= 0.02
p= 0.44
p= 0.87
p= 0.03
p= 0.04
p= 0.04
p= 0.75
p= 0.43
p= 0.36
p= 0.001
p= 0.59
p= 0.27
-1.0 -0.5 0.0 0.5 1.0
D
p= 0.18
p= 0.18
p= 0.92
p= 0.76
p= 0.34
p= 0.48
p= 0.62
p= 0.80
p= 0.04
p= 0.91
-1.0 -0.5 0.0 0.5 1.0
Cohen's *d*
ODI Away vs Home

Figures:

Supplementary material: