Reliability of Ankle Mechanics During Jump Landings in Turned-Out and Parallel Foot Positions in Professional Ballet Dancers

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Authors:
Adam M. Mattiussi[1,2,*], Joseph W. Shaw[1,2], Phil Price[1], Derrick D. Brown[3], Daniel D. Cohen[4], Jack Lineham[1], Charles R. Pedlar[1,5], Jamie Tallent[6,7], Alexandra C. Atack[1]

Institutional/Corporate affiliations:
[1] Faculty of Sport, Allied Health and Performance Science, St Mary’s University, Twickenham, UK
[2] Ballet Healthcare, The Royal Ballet, Royal Opera House, London, UK
[3] Institute of Sport Science, Dance Science, University of Bern, Bern, Switzerland
[4] Faculty of Health Sciences, University of Santander, Bucaramanga, Colombia
[5] Division of Surgery and Interventional Science, University College London, UK
[6] School of Sport, Rehabilitation and Exercise Sciences, University of Essex, Colchester, UK
[7] Faculty of Medicine, Nursing and Health Science, Monash University, Melbourne, Australia

[*]**Correspondence**:
Adam Mattiussi
Mattiussi.adam@gmail.com

Royal Opera House
Bow Street
Covent Garden
London
WC2E 9DD
United Kingdom

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Adam Mattiussi	Twitter: @adammattiussi	Orcid ID: 0000-0001-7287-6501
Joseph Shaw	Twitter: @josephshaw	Orcid ID: 0000-0002-1538-9966
Daniel Cohen	Twitter: @danielcohen1971	Orcid ID: 0000-0002-0899-4623
Phil Price	Twitter: @thepricep	Orcid ID: 0000-0001-8849-2959
Derrick Brown	Twitter: @ddbrown__	Orcid ID: 0000-0001-9220-8025
Charles Pedlar	Twitter: @pedlarcr	Orcid ID: 0000-0002-3075-9101
Jamie Tallent	Twitter: @jamietallent	Orcid ID: 0000-0002-4354-9912
Alexandra Atack	Twitter: @a_atack2	Orcid ID: 0000-0001-5766-5861

ABSTRACT

This study aimed to determine the within- and between-session reliability of ankle mechanics and vertical ground reaction forces (vGRF) during jump landings in turned-out and parallel foot positions in professional ballet dancers. Twenty-four professional ballet dancers (men = 13, women = 11) attended two data collection sessions where they completed five maximal countermovement jumps in each foot position. The ankle joint mechanics and vGRF of the right limb were recorded via a seven-camera motion capture system and one force platform. Within- and between-session intraclass correlation coefficients (ICC), coefficients of variation (CV), standard error of measurement, and minimal detectable change were calculated for three-dimensional ankle excursion, peak ankle angle, ankle joint velocity, moment, and power, as well as peak landing vGRF, time to peak landing vGRF, loading rate, and jump height. Across both foot positions, within- (ICC: 0.17–0.96; CV: 1.4–82.3%) and between-session (ICC: 0.02–0.98; CV:1.3–57.1%) reliability ranged from *poor* to *excellent*, with ankle excursion, peak ankle angle, and jump height demonstrating the greatest ICC values (ICC: 0.65–0.96; CV: 1.4–57%). Jump landings in a turned-out foot position demonstrated better within-session reliability compared to a parallel position, however, no difference in between-session reliability across the foot positions was observed. Most ankle mechanics provide adequate between-session, but not within-session, reliability during jump landings in professional ballet dancers.

Keywords: Biomechanics, Joint Mechanics, Intraclass Correlation Coefficient, Kinetics, Kinematics, Minimal Detectable Change

INTRODUCTION

High rates of jumping are observed during a performance in professional ballet compared to other dance genres (Wyon et al., 2011). It is perhaps unsurprising, therefore, that jumping and landing activities have been identified as a common mechanism of injury in professional ballet dancers, accounting for 27% and 38% of all time-loss injuries in women and men, respectively (Mattiussi, Shaw, Williams, et al., 2021). Further, the foot and ankle demonstrate the greatest burden of injury in professional ballet dancers compared to all other anatomical locations (Mattiussi, Shaw, Williams, et al., 2021), and thus ankle biomechanics during jumping and landing actions are of interest to science and medicine practitioners working in ballet (Moran et al., 2019).

Ballet-specific jumping is unique and investigating jumping actions in balletic positions may offer a more ecologically valid insight into biomechanics compared to traditional jumping (i.e., jumping with feet in parallel). For example, several articles have investigated jumping actions in ballet dancers and identified a more upright torso, greater external rotation of the lower limb, and an increased contribution of ankle joint mechanics during a *sauté* (a jump with externally rotated lower limbs) compared to a neutral foot position (Imura & Iino, 2017; Ravn et al., 2007). Similar considerations are present in sport, and, when investigated, sport-specific jumps are typically less reliable than traditional jumps (Currell & Jeukendrup, 2008; Requena et al., 2014; Rodríguez-Rosell et al., 2017). Ballet, however, is an aesthetic art and the reproducibility of technique is a key performance indicator, potentially increasing the reliability of ballet-specific jumps.

Understanding the reliability of kinetic and kinematic variables, derived from ecologically valid jumping actions, is critical when interpreting the results of both cross-sectional and longitudinal research in professional ballet (Howarth et al., 2021; Rodríguez-Rosell et al., 2017). Further, establishing the minimal detectable change (MDC) of these variables may provide researchers and applied practitioners with tangible information pertaining to the success of an intervention (Howarth et al., 2021). No published data exist that have investigated the reliability of joint mechanics or vertical ground reaction forces (vGRF) during ballet-specific jump landings. The aim of this study was to establish the within- and between-session reliability of ankle joint mechanics and vGRF during jump landings in a turned-out and parallel foot position.

METHODS

Study Design

A within-subject test-retest design was employed to investigate the reliability of ankle joint mechanics and vGRFs during jump landings in a turned-out (i.e., externally rotated lower extremity) and a parallel foot position in professional ballet dancers (Figure 1). *A priori* power analysis is outlined in Supplementary File 1. Participants attended two data collection sessions—separated by 6.3 ± 3.1 days—in which five jumps in a turned-out and five jumps in parallel foot position were completed. Internal training load was calculated for the 48 hours preceding testing using the session rating of perceived exertion method for each participant (Shaw et al., 2020). All testing was conducted in the Royal Opera House, London.

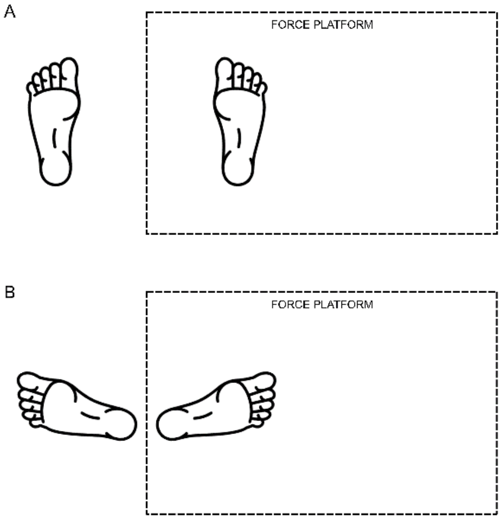

Figure 1. (A) Parallel foot position with reference to force platform; (B) Turned-out foot position with reference to force platform.

Participants

A sample of 24 professional ballet dancers (men: *n* = 13, age: 26.8 ± 5.1 y, height: 1.79 ± 0.04 m, mass: 73.0 ± 5.2 kg; women: *n* = 11, age: 24.3 ± 3.6 y, height: 1.68 ± 0.04 m, mass: 55.2 ± 3.6 kg) volunteered to participate in this study. Participants were required to have been free from a lower extremity time-loss injury in the six weeks prior to testing. Ethical approval was granted by St Mary’s University in accordance with the Declaration of Helsinki and informed consent was provided by all participants prior to data collection.

Procedure

Participants completed a standardised and progressive warm-up prior to testing. Retroreflective markers were placed on the right foot and shank (Figure 2). Additional detail on marker placement can be found in Supplementary File 1.

Participants completed five maximal bilateral countermovement jumps (CMJ) in a turned-out and parallel foot position, where foot position was maintained during take-off and landing. The right limb was positioned on the force platform and the left limb was positioned on a wooden frame that surrounded the force platform (Figure 1). The participants were instructed to place their hands on their shoulders during CMJs. Order effects were mitigated by counterbalancing CMJs in a turned-out and parallel foot position until five CMJs were performed in each position. Twenty seconds of rest was provided between each CMJ (Pereira et al., 2008).

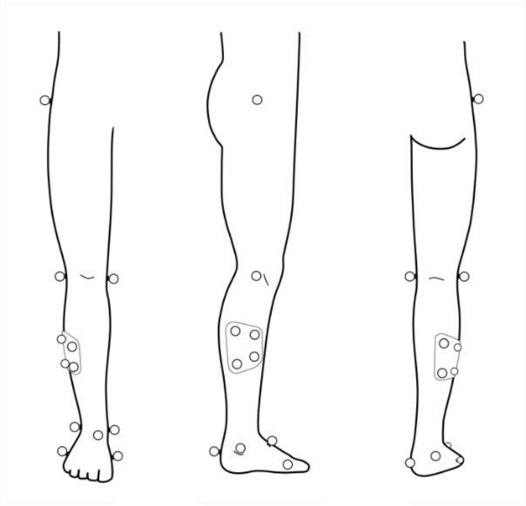

Figure 2. Marker placement on the right limb from the anterior, lateral, and posterior aspects.

Data Collection

A seven-camera motion capture system (MX3/MX3+, Vicon Motion Systems Ltd, Oxford, United Kingdom) sampling at 200 Hz, and one piezoelectric force platform (9268A, Kistler, Winterthur, Switzerland) sampling at 1000 Hz synchronously recorded retroreflective marker coordinates and ground reaction forces, respectively.

Data Analysis

Marker trajectories were reconstructed and tagged in Vicon Nexus (Vicon Motion Systems Ltd, Oxford, United Kingdom) before being processed in Visual 3D (v2021.113 C-Motion©, USA). All marker trajectory gaps consisted of seven frames or fewer and were interpolated using cubic splines. A foot and a shank segment were created to calculate ankle mechanics (Supplementary File 1). An inverse kinematics approach was used to estimate the pose of the segments (Lu & O'Connor, 1999), filtered at 8 Hz and allowing three degrees of rotation but no translation between the foot and shank segments. A full list of calculated variables can be found in Supplementary File 1. Ankle joint angles were calculated using an XYZ Cardan rotation sequence whilst the proximal segment was used as both the reference segment and the resolution coordinate system when determining ankle angular velocity. Kinematic data and segmental inertial data were combined with ground reaction force data to calculate joint kinetics using an inverse dynamics approach (de Leva, 1996). Marker and ground reaction force data were filtered at 8 Hz using a low pass fourth-order Butterworth filter, determined via residual analysis (Winter, 2009). Ankle joint moment and joint power were normalised (Hof, 1996)—leg length was replaced with height (Atack et al., 2019) and an adjusted calculation for normalized power was used (Bezodis et al., 2010) as follows:

$$Normalised\ Ankle\ Moment = \frac{M}{mgh}$$

$$Normalised\ Ankle\ Power = \frac{P}{mg^{3/2}h^{1/2}}$$

The vGRF data were reprocessed and filtered at 250 Hz using a low pass fourth-order Butterworth filter, determined via residual analysis (Winter, 2009), to calculate normalised landing vGRF:

$$Normalised\ vGRF = \frac{F}{mg}$$

The start of each landing phase was identified where vGRF was >50 N following the period of flight. The end of each landing phase was calculated at the end of the trial. Data were extracted from the landing phase and variables were computed. Peak values of ankle mechanics and vGRF measures were then calculated through all planes of motion. Ankle excursion was calculated by subtracting the minimum ankle angle from the peak ankle angle. Loading rate was calculated using the following equation:

$$Loading\ Rate = \frac{Normalised\ Peak\ Landing\ vGRF}{Time\ to\ Normalised\ Peak\ Landing\ vGRF}$$

Jump height was calculated as the difference between the height of the greater trochanter in standing and at the peak of flight using the raw marker coordinates.

Statistical Analysis

Two-way mixed-effects models were used to calculate ICCs, with 95% confidence intervals, for within- (ICC: 2, *k*) and between-session (ICC: 2,1) reliability across all variables and positions using the *irr* R package (Gamer et al., 2019). The within-session reliability was calculated across the five trials of the first session whereas between-session reliability was calculated using the mean of the five trials. The ICC was interpreted in line with Koo and Li (2016) where < 0.50 was considered *poor*; 0.50–0.75 was considered *moderate*; 0.75–0.90 was considered *good*; > 0.90 was considered *excellent*. The within- and between-session coefficient of variation (CV) was calculated using the *EnvStats* R package (Millard, 2013). Standard error of measurement (SEM) was calculated using the following equation:

$$SEM = SD_{baseline}\sqrt{1 - ICC_{between}}$$

Where $SD_{baseline}$ was considered the between-subject standard deviation (SD) of each variable during the first testing session, and $ICC_{between}$ was considered the between-session ICC (Haley & Fragala-Pinkham, 2006). The MDC was calculated using the following equation (Haley & Fragala-Pinkham, 2006):

$$MDC = 1.96 \times \sqrt{2} \times SEM$$

A paired samples t-test was used to investigate differences in the mean internal training load between sessions using the *stats* R package (R Core Team, 2022). All analyses were conducted using R (version 4.2.1, R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Data from 23 dancers were included for within-session ICCs during jump landings in a turned-out foot position, as only four were successfully processed for one dancer during the first testing session. No differences in internal training load prior to the first (mean ± SD: 1389 ± 660, range: 150–2872 arbitrary units) and second (mean ± SD: 1473 ± 783, range: 90–2772 arbitrary units) data collection sessions were observed (t = -0.53, *p* = .604).

Within-session reliability ranged from *poor* to *excellent*, with ICC values between 0.17–0.96 during jump landings in parallel and 0.20–0.96 during jump landings in a turned-out position (Table 1). Peak vGRF, time to peak vGRF, loading rate and peak transverse plane ankle joint velocity and power demonstrate the lowest within-session reliability across both jump conditions (ICC: 0.17–0.48), whereas jump height, and peak ankle angle and ankle excursion through all planes demonstrated the greatest within-session reliability (ICC: 0.65–0.96). The between-session reliability ranged from *poor* to *excellent*, with ICC values between 0.14–0.98 during jump landings in parallel and 0.02–0.98 during jump landings in turnout (Table 2, Figure 3, and Figure 4). Peak ankle velocity in the frontal and transverse plane demonstrated the lowest between-session reliability across both jump conditions (ICC: 0.02–0.43), whereas jump height, and peak ankle angle and ankle excursion through all planes demonstrated the greatest between-session reliability (ICC: 0.67–0.98). Notable between-participant variability was observed during jump landings in both turned-out and parallel foot positions (Figures 3 and 4), which may have impacted the MDC (Table 2). Sagittal plane MDC values were generally the lowest when compared to frontal and transverse plane MDC values (1.2–23.2% vs. 8.8–142.2% of the group mean). No substantial difference was observed between MDC values in turned-out and parallel foot positions (Table 2).

Table 1. The within-session interclass correlation coefficient and coefficient of variation across jumps in parallel and turnout.

Outcome Variable	Plane	Parallel			Turnout		
		n	ICC (95% CI)	CV (%)	*n*	ICC (95% CI)	CV (%)
Peak Ankle Moment (Nm·kg·m^{-1})							
	Sagittal	24	0.40 (0.21–0.61)	9.7	23	0.66 (0.50–0.81)	9.6
	Frontal	24	0.35 (0.17–0.57)	54.1	23	0.26 (0.09–0.49)	82.3
	Transverse	24	0.46 (0.27–0.66)	56.8	23	0.46 (0.27–0.67)	66.6
Peak Ankle Power (W·kg·m^{-1})							
	Sagittal	24	0.32 (0.15–0.54)	15.5	23	0.64 (0.47–0.80)	11.9
	Frontal	24	0.67 (0.51–0.82)	32.4	23	0.76 (0.62–0.87)	24.9
	Transverse	24	0.28 (0.11–0.51)	31.8	23	0.48 (0.29–0.68)	31.8
Peak Ankle Velocity (°·s^{-1})							
	Sagittal	24	0.41 (0.24–0.62)	7.7	23	0.58 (0.39–0.76)	5.8
	Frontal	24	0.42 (0.24–0.63)	46.2	23	0.40 (0.22–0.62)	48.6
	Transverse	24	0.21 (0.05–0.43)	42.4	23	0.43 (0.25–0.65)	36.7
Peak Ankle Angle (°)							
	Sagittal	24	0.87 (0.77–0.93)	1.4	23	0.89 (0.81–0.94)	1.5
	Frontal	24	0.65 (0.49–0.80)	52.8	23	0.74 (0.60–0.86)	51.8
	Transverse	24	0.89 (0.81–0.94)	27.9	23	0.87 (0.78–0.93)	46.3
Ankle Excursion (°)							
	Sagittal	24	0.74 (0.60–0.86)	5.0	24	0.80 (0.67-0.89)	3.4
	Frontal	24	0.66 (0.50–0.81)	11.3	24	0.77 (0.63-0.88)	9.5
	Transverse	24	0.78 (0.65–0.88)	18.6	24	0.81 (0.70-0.90)	15.3
Peak Landing vGRF (BW)		24	0.17 (0.03–0.39)	26.1	23	0.44 (0.25–0.65)	23.4
TTP Peak Landing vGRF (s)		24	0.37 (0.19–0.58)	20.4	23	0.21 (0.05–0.44)	23.7
Loading Rate (BW·s^{-1})		24	0.20 (0.05–0.41)	45.6	23	0.20 (0.04–0.43)	50.5
Jump Height (cm)		24	0.96 (0.93–0.98)	3.6	23	0.96 (0.93–0.98)	3.4

ICC, interclass correlation coefficient; CV, coefficient of variation; vGRF, vertical ground reaction force; TTP, time to peak

Table 2. The between-session interclass correlation coefficient, coefficient of variation, standard error of measurement, and minimal detectable change across jumps in parallel and turnout.

Outcome Variable		Parallel				Turnout			
	n	ICC (95% CI)	CV	SEM (95% CI)	MDC (%)	ICC (95% CI)	CV	SEM (95% CI)	MDC (%)
Peak Ankle Moment (Nm·kg·h^{-1})									
Sagittal	24	0.68 (0.25–0.86)	5.9	0.005 (0.000–0.016)	0.015 (15.2)	0.79 (0.52–0.91)	5.6	0.004 (0.000–0.012)	0.011 (12.0)
Frontal	24	0.83 (0.60–0.93)	24.5	0.004 (0.000–0.012)	0.011 (59.0)	0.82 (0.60–0.92)	57.1	0.004 (0.000–0.011)	0.010 (103.8)
Transverse	24	0.53 (0.00–0.80)	35.3	0.004 (0.000–0.012)	0.011 (102.6)	0.61 (0.10–0.83)	39.4	0.002 (0.000–0.005)	0.005 (102.6)
Peak Ankle Power (W·kg·h^{-1})									
Sagittal	24	0.70 (0.31–0.87)	8.5	0.10 (0.00–0.30)	0.28 (23.2)	0.75 (0.40–0.89)	8.6	0.07 (0.00–0.22)	0.20 (16.0)
Frontal	24	0.66 (0.23–0.85)	28.1	0.02 (0.00–0.06)	0.05 (48.3)	0.62 (0.14–0.83)	21.5	0.02 (0.00–0.07)	0.06 (39.8)
Transverse	24	0.72 (0.35–0.88)	21.3	0.01 (0.00–0.04)	0.04 (46.6)	0.65 (0.20–0.85)	20.7	0.02 (0.00–0.05)	0.05 (51.4)
Peak Ankle Velocity (°·s^{-1})									
Sagittal	24	0.64 (0.19–0.84)	4.6	43 (0–129)	120 (13.2)	0.70 (0.29–0.87)	4.1	30 (0–89)	83 (8.9)
Frontal	24	0.35 (0.00–0.72)	31.2	36 (0–106)	99 (100.8)	0.02 (0.00–0.59)	28.5	42 (0–124)	116 (128.1)
Transverse	24	0.14 (0.00–0.63)	32.4	50 (0–147)	138 (107.5)	0.43 (0.00–0.75)	22.7	42 (0–125)	117 (73.0)
Peak Ankle Angle (°)									
Sagittal	24	0.91 (0.80–0.96)	1.3	0.4 (0.0–1.3)	1.2 (1.2)	0.89 (0.75–0.95)	1.3	0.5 (0.0–1.5)	1.4 (1.3)
Frontal	24	0.67 (0.22–0.86)	57	1.2 (0.0–3.5)	3.2 (142.2)	0.79 (0.47–0.91)	38.9	0.9 (0.0–2.6)	2.4 (105.4)
Transverse	24	0.89 (0.75–0.95)	28.1	0.6 (0.0–1.7)	1.6 (20.6)	0.89 (0.74–0.95)	46	0.7 (0.0–2.0)	1.9 (52.2)
Ankle Excursion (°)									
Sagittal	24	0.87 (0.70–0.94)	4	1.1 (0.0–3.3)	3.1 (5.0)	0.86 (0.68–0.94)	3.2	0.9 (0.0–2.5)	2.4 (3.5)
Frontal	24	0.81 (0.56–0.92)	8.2	1.0 (0.0–2.9)	2.7 (13.0)	0.88 (0.71–0.95)	6.8	0.7 (0.0–2.1)	2.0 (8.8)
Transverse	24	0.75 (0.42–0.89)	17.4	1.0 (0.0–2.9)	2.7 (24.2)	0.80 (0.54–0.91)	15.1	1.1 (0.0–3.2)	3.0 (18.4)
Peak vGRF (BW)	24	0.71 (0.24–0.88)	11.9	0.3 (0.0–0.9)	0.8 (41.4)	0.69 (0.29–0.87)	13.9	0.3 (0.0–0.8)	0.8 (37.7)
TTP Peak vGRF (s)	24	0.87 (0.70–0.94)	8.7	0.006 (0.000–0.018)	0.017 (19.0)	0.63 (0.18–0.84)	16.9	0.012 (0.000–0.035)	0.032 (37.9)
Loading Rate (BW·s^{-1})	24	0.81 (0.57–0.92)	18.4	6 (0–17)	16 (60.0)	0.67 (0.24–0.85)	31.2	10 (0–30)	28 (91.3)
Jump Height (cm)	24	0.98 (0.96–0.99)	2.5	0.2 (0.0–0.6)	0.6 (1.4)	0.98 (0.96–0.99)	2.8	0.2 (0–0.6)	0.5 (1.3)

ICC, interclass correlation coefficient; CV, coefficient of variation; vGRF, vertical ground reaction force; SEM, standard error of measurement; MDC, smallest detectable change; TTP, time to peak

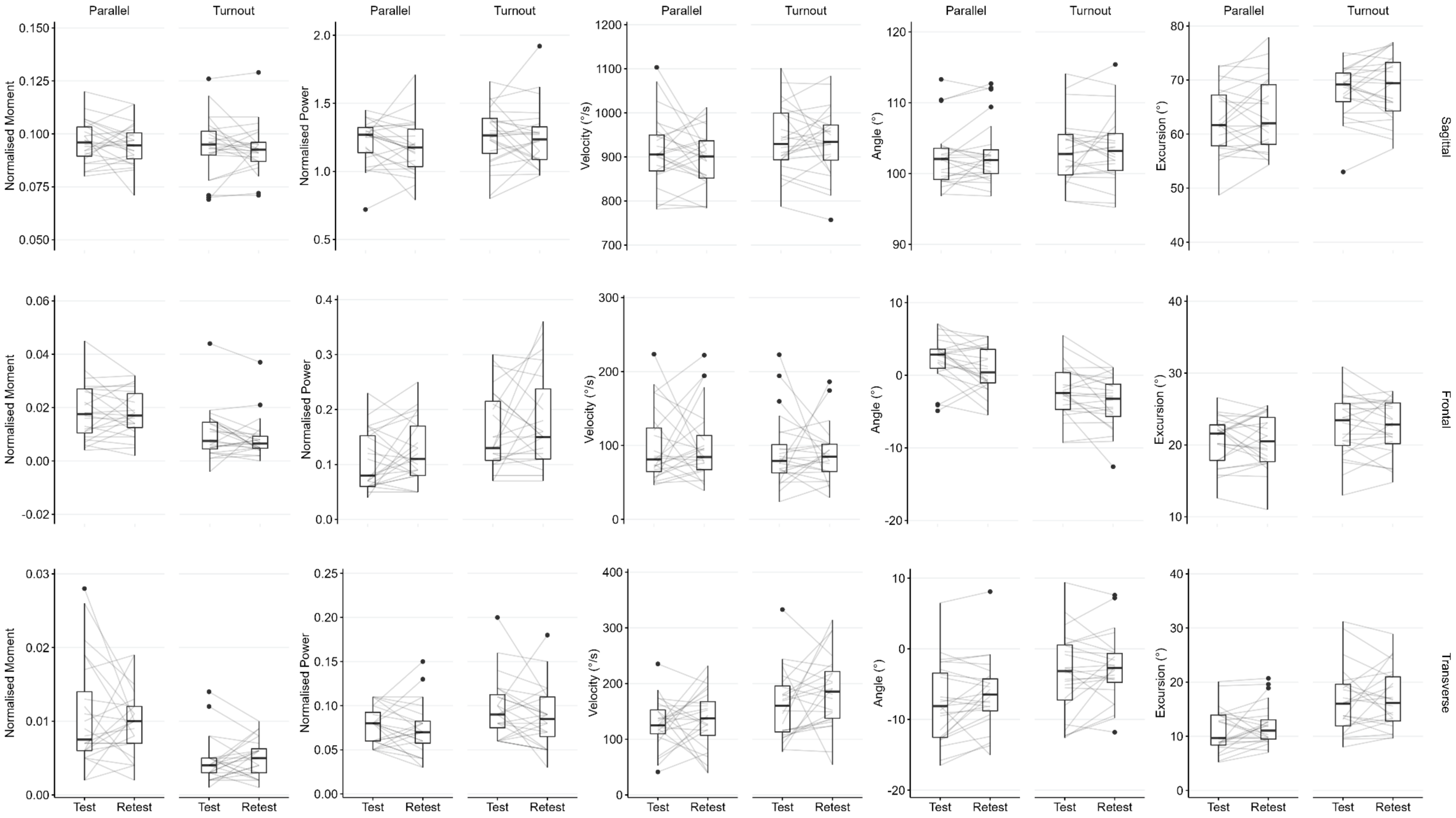

Figure 3. Box plots and individual test-retest values across ankle joint kinetic and kinematic variables during jumps in parallel and turnout. Black points indicate outliers.

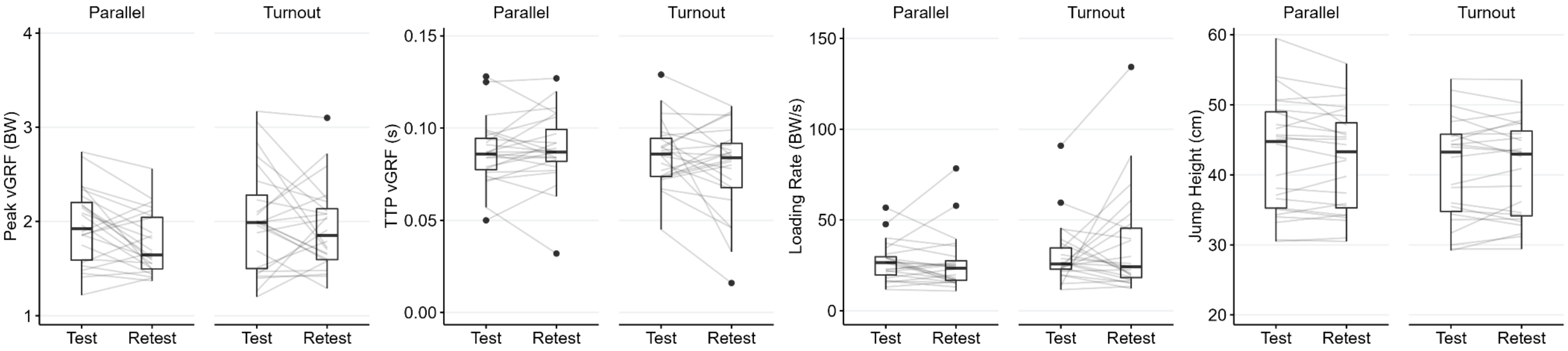

Figure 4. Box plots and individual test-retest values across vertical ground reaction force variables and jump height during jumps in parallel and turnout. Black points indicate outliers. TTP, Time to Peak; vGRF, vertical ground reaction force; BW, body weigh

DISCUSSION

The present study aimed to establish the within- and between-session reliability of ankle mechanics and vGRFs during jump landings in turned-out and parallel foot positions in professional ballet dancers. The between-session reliability was typically greater than the within-session reliability, which is contrary to previous findings investigating walking (Kadaba et al., 1989), running (Ferber et al., 2002; Queen et al., 2006), and jumping (Ditroilo et al., 2011; Ford et al., 2007). Greater between-session reliability may be because the mean of multiple trials is used when calculating between-session ICCs, as opposed to individual trials in within-session ICCs (Milner et al., 2011). Using the mean of multiple trials potentially provides a more accurate representation of the true value, however, it is not a unique feature of the present study, as most studies will process data in this manner (Bates et al., 1992; James et al., 2007).

Lower within-session reliability was likely not a result of kinematic crosstalk (Ford et al., 2007) as *poor* reliability was observed across some, but not all, of the kinetic and kinematic outcome variables in the present study. Within-session reliability may have been influenced by skin artefact errors due to underlying muscular contractions or inertial effects upon impact (Taylor et al., 2005). Future work may wish to utilise rigid marker sets at the foot to minimize the effects of such errors. We speculate that the poorer within-session reliability observed in the present study may have been due to greater movement variability. Participants were instructed to jump maximally whereas both the aforementioned studies investigating jumping controlled for jump height by setting a target at 80% max jump height (Milner et al., 2011) or providing a box (31 cm) from which participants jumped (Ford et al., 2007).

Between-session reliability was typically *moderate* to *good* with several exceptions, such as *poor* peak ankle velocity reliability in the frontal and transverse planes and *excellent* reliability across sagittal plane peak ankle angle. Few studies have reported the reliability of ankle joint velocity, making comparison challenging. Between-session ankle moment and angle ICCs were in line with previously reported values of *good* and *excellent* during landing activities (Ford et al., 2007), although three of the six ankle moments in the sagittal and transverse planes were classified as *moderate* in the present study. No studies have reported the reliability of ankle power during landing activities, however, comparable values classified as *good* to *excellent* have been reported in running (Ferber et al., 2002). No previous work investigating biomechanics during jump landings has provided MDC values; nonetheless, our results indicate that most sagittal plane outcome variables require a smaller change to detect the success, or lack thereof, of an intervention when compared to frontal or transverse plane outcome variables.

Landing biomechanics were reliable across both ballet-specific and traditional jump landings in professional ballet dancers. Twelve of the nineteen within-session ICCs were greater during jump landings in a turned-out foot position compared to a parallel foot position, with three ICCs being equal. On the contrary, between-session ICCs were similar across jump landings in turned-out and parallel foot positions, with differences being negligible in many instances. Similarly, MDC values were largely the same between turned-out and parallel foot positions, with few exceptions. Ballet is an aesthetic performing art and success is subjectively quantified, in part, by the ability to reproduce technique. Thus, it may be expected that the variability from jump to jump may be better during ballet-specific jump landings compared to traditional jump landings.

CONCLUSION

This is the first study to investigate the within- and between-session reliability of ankle mechanics and vGRF variables during jump landings in turned-out and parallel foot positions in professional ballet dancers. Most, but not all, ankle mechanics and vGRF outcome variables were deemed to be reliable, with between-session reliability better than within-session reliability. Jump height, peak ankle angle, and ankle excursions were considered the most reliable, however, all sagittal plane variables were deemed to be appropriate to use when assessing landing mechanics in ballet dancers. Further, this study has established the MDC of ankle mechanics and vGRF variables that can be used to determine the success of an intervention.

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SUPPLEMENTARY MATERIAL

Supplementary File 1. Additional Methodological Detail

Power Analysis

A priori power analysis revealed a minimum of two replicants and 9 participants were required to calculate intraclass correlation coefficients (ICC) ($\alpha = 0.05$, $\beta = 0.80$) based on an expected reliability (ρ_1) ≥ 0.9 (Ford et al., 2007) and an acceptable reliability (ρ_0) ≥ 0.5 (Koo & Li, 2016; Walter et al., 1998).

Marker Placement

Retroreflective markers (22 mm diameter) were attached to the right: greater trochanter, medial and lateral joint lines of the knee, medial and lateral malleolus, posterior aspect of the calcaneus, superior aspect of the navicular, medial aspect of the 1st metatarsal head, and the lateral aspect of the 5th metatarsal head. Curved rigid moulded clusters with four retroreflective markers were attached to the lateral aspect of the right shank (Figure 2).

Foot and Shank Segments

The foot segment was defined by the posterior aspect of the calcaneus as the proximal endpoint and the medial aspect of the 1st metatarsal head and the lateral aspect of the 5th metatarsal head as the distal endpoints. The shank segment was defined by the medial and lateral joint lines of the knee as the proximal endpoints and the medial and lateral malleolus as the distal endpoints. All markers were used to track segments during dynamic trials.

Target Variables

Variable	Plane
Moment	X
Moment	Y
Moment	Z
Angle	X
Angle	Y
Angle	Z
Power	X
Power	Y
Power	Z
Velocity	X
Velocity	Y
Velocity	Z
Excursion	X
Excursion	Y
Excursion	Z
Vertical Ground Reaction Force	-
Time to Peak vGRF	-
Loading Rate	-
Jump Height	-