

Validity and reliability of My Jump 2 and My Jump 3 versus the K-Deltas Force Platform for vertical jump assessment in college students with diverse athletic backgrounds

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Abstract:

Introduction: Accurate assessment of vertical jump performance is a critical component in sports science, as it serves as a key indicator for monitoring athletic development, evaluating training adaptations, and optimizing performance outcomes. Although force platforms (FP) are considered the gold standard, their high cost and limited portability restrict widespread use. Smartphone applications such as My Jump 2 and My Jump 3 have recently emerged as practical alternatives; however, evidence regarding their validity and reliability compared to force platforms remains limited. This study aimed to evaluate the validity and test–retest reliability of two smartphone applications, My Jump 2 and My Jump 3, compared to the Kinvent force platform (FP) for assessing vertical jump performance. Twenty-seven participants performed vertical jump tests at two time points. **Materials and Methods:** Validity was assessed using Pearson’s and Spearman’s correlation coefficients, Bland–Altman analyses and concordance correlation coefficients (CCC), while predictive validity was examined through linear regression and marginal means estimation. **Results:** Both applications demonstrated excellent validity against the FP, with strong linear and rank-order correlations ($r, \rho \geq .96$), minimal mean bias (≤ 0.59 cm) and high agreement ($CCC \geq .966$). Regression models indicated high predictive accuracy ($R^2 \geq .937$, $p < .05$). Reliability was assessed using intraclass correlation coefficients (ICC), standard error of measurement (SEM) and coefficient of variation (CV%). All devices exhibited excellent test–retest reliability ($ICC \geq .947$) with low SEM ($SEM_{K-Deltas\ FP} = 1.95$; $SEM_{MyJump2} = 2.13$; $SEM_{MyJump3} = 2.00$ cm) and CV% ($< 7.1\%$). Furthermore, CMJ height measured with the K-Deltas FP demonstrated excellent test–retest reliability ($ICC = 0.957$). **Conclusions:** These findings support the use of these tools as valid and reliable instruments for the assessment of vertical jump performance.

Keywords: Countermovement jump (CMJ); Athlete monitoring; Sports technology; Measurement agreement; Test–retest reliability; Portable assessment tools

Introduction

The assessment of vertical jump performance is a fundamental component in evaluating lower-body explosive power in athletes and physically active individuals (Bishop et al., 2023; Markovic et al., 2004; Rago et al., 2018). Several studies use jumping ability and specifically countermovement jump (CMJ) and single-leg CMJ measurements to assess performance and neuromuscular fatigue (Armada-Cortés et al., 2022; Gallardo-Fuentes et al., 2016; González-García et al., 2024). It is also used to identify asymmetries that may predict sports injuries (Merino Fernández et al., 2021; Michailidis et al., 2025; Rodríguez et al., 2025; Wrona et al., 2023). A wide range of tools may be used for CMJ measurements, including laboratory-grade force platforms and portable devices, as well as mobile applications designed to capture flight time and calculate jump height with high precision. When evaluating portable force plates, Lake et al. (2018) reported very high correlations ($r \geq 0.99$) between portable and laboratory-based systems in assessing vertical jump force–time characteristics. While small but significant differences were found in some variables, the overall limits of agreement yielded a mean value of just 1.7% relative to the laboratory system, indicating very good agreement (Lake et al., 2018).

My Jump 2 has been extensively validated against laboratory equipment in numerous studies. One study examining the applications’ validity in elderly populations found a near-perfect correlation ($r = 0.999$; $p < 0.001$) between My Jump 2 and contact mat measurements (Cruvinel-Cabral et al., 2018). The study revealed excellent intraday reliability for My Jump 2 ($ICC = 0.948$, $TEM = 1.150$ cm, $CV\% = 10.096$), comparable to the contact mat reference method ($ICC = 0.949$, $TEM = 1.128$ cm, $CV\% = 10.111$). The systematic bias between methods was

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minimal at just 0.096 cm ($p = 0.007$), demonstrating strong agreement between the app and the laboratory equipment (Cruvinel-Cabral et al., 2018). A meta-analysis by Gençoğlu et al. (2023) of My Jump validation studies confirmed these findings, showing no significant difference in raw scores between My Jump and criterion methods, high correlations for within-group rankings and nearly perfect reliability scores across studies. The researchers concluded that My Jump application appears to be a valid and reliable tool for sports scientists and strength and conditioning practitioners, offering a cost-effective and accessible way for accurately assessing vertical jump performance in various settings (Gençoğlu et al., 2023).

My Jump Lab (formerly My Jump 3) represents the latest evolution of this technology. Bishop et al. (2022) validated My Jump Lab for measuring time to take-off and reactive strength index in addition to jump height. Their results showed no significant differences in jump height between My Jump Lab and force plate measurements and nearly perfect correlations ($r = 0.98$; $p < 0.001$). Although, time to take-off initially showed significant differences, after applying a correction factor, the agreement between methods became nearly perfect with minimal bias estimate (Bishop et al., 2022). A more recent study by Şentürk et al. (2024) evaluated My Jump Lab and found high correlation with force plate measurements ($r = 0.968$, $p = 0.001$) and good agreement with a mean difference of 1.016 cm (95% confidence interval: -1.229 to -0.803 cm). The study also demonstrated high intra-session reliability for My Jump Lab (SEM = 0.43 cm; CV% = 1.23%; MDC = 1.20; SWC = 1.17), comparable to force platform measurements (SEM = 0.42 cm; CV% = 1.21%; MDC = 1.5; SWC = 1.12), (Şentürk et al., (2024). However, the artificial intelligence mode of My Jump Lab showed a tendency to overestimate jump height compared to force platforms. Bridgeman et al. (2025) reported a mean bias of 4.32 cm (95% CI: 3.4, 5.26) overestimation with 95% limits of agreement ranging from -3.33 cm to 11.98 cm, even though the reliability between sessions was good, with minimal mean bias of 0.25 cm (95% CI: -0.48 , 0.98). Extending beyond validation studies, My Jump applications have also been integrated into experimental designs that combine cognitive and physical assessments. Stafylidis et al. (2025b) investigated the effects of mental fatigue, induced through the SOMA NPT application, on neuromuscular and cognitive performance. In that study, the My Jump Lab Application was employed to evaluate lower-limb explosive power and jumping ability, illustrating its applicability in multidisciplinary contexts.

The Kinvent K-Deltas force platform has also undergone scientific validation for CMJ assessment. A recent study investigated their reliability and accuracy and found high test-retest reliability (ICC = 0.981), closely matching the performance of a contact mat (ICC = 0.987) and the My Jump app (ICC = 0.986), (Bagchi et al., 2024). Correlation analysis between instruments revealed strong relationships between K-Deltas and other measurement tools (K-Deltas vs. contact mat: $r = 0.987$; K-Deltas vs. My Jump: $r = 0.987$; contact mat vs. My Jump: $r = 0.996$), with no significant differences in jump height measurements ($p = 0.368$), (Bagchi et al., 2024). The study confirmed that "K-Deltas force platforms would have high test-retest reliability in comparison with Contact Mat and My Jump app," validating its use for assessing lower-body explosive power.

While My Jump 2 and My Jump 3 have been extensively validated against various force measurement systems for assessing CMJ performance (Balsalobre-Fernández & Varela-Olalla, 2024; Bogataj et al., 2020a; Chow et al., 2023; Cruvinel-Cabral et al., 2018; Murawa et al., 2024; Puljić et al., 2024; Sharp et al., 2019; Silva et al., 2021; Stanton et al., 2017; Tallis et al., 2023; Vieira et al., 2023), there is still a lack of research evaluating their validity and reliability in comparison to the K-Deltas force platform.

Given the growing use of portable and cost-effective tools in sports science, it is essential to determine the accuracy of these applications across diverse athletic populations. Therefore, this study aimed to evaluate the concurrent validity and test-retest reliability of My Jump 2 and My Jump 3 in measuring vertical jump height (CMJ), using the K-Deltas force platform as the criterion measure, among college students with varying athletic experience, to determine the efficacy of these applications in accurately capturing jump heights across a spectrum of performance levels, while also providing specific evidence regarding the agreement between smartphone-based applications and the K-Deltas system, thereby contributing to bridging the gap between laboratory-based validation and applied field-based performance monitoring.

Materials and methods

Participants

A total of 27 healthy college students (17 males, 63.0%; 10 females, 37.0%) voluntarily participated in the study, consisting of individuals with an amateur level of athletic involvement and non-athletes. All participants provided informed consent and were assured of their right to withdraw from the study at any time. The study protocol was approved by the institutional ethics committee (Protocol number: RES2024/014).

The participants had a mean age of 21.51 years (SD = 3.74; range = 18.4–32.9 years). Mean body mass was 75.67 ± 17.97 kg at the initial test and 75.70 ± 17.72 kg at the retest, while mean body height was 174.19 ± 8.94 cm. Most participants (96.3%) were right-foot dominant.

They reported an average of 7.54 ± 5.64 years of training experience and engaged in strength and conditioning training approximately 1.89 ± 0.97 times/week at the initial test and 1.96 ± 1.02 times/week at the retest. None had sustained injuries during the past six months. Their sport backgrounds included football (soccer), basketball, volleyball, and gym-based training.

Data Collection and Analysis Procedures

All measurements were conducted in a controlled laboratory environment. One week prior to data collection, participants attended a 45-minute familiarization session designed to ensure procedural consistency. This session comprised a 10-minute demonstration with accompanying verbal instructions, a standardized 10-minute warm-up, low- to moderate-intensity jumping drills with adequate recovery, 20 minutes of individualized feedback and a 5-minute cool-down. Demonstrations and instructions were provided by a certified strength and conditioning coach with expertise in sports science. Participants completed testing on two separate occasions, spaced one week apart. On each testing day, participants performed three maximal-effort countermovement jumps (CMJs), with two-minute rest intervals between attempts. The highest jump from each session was selected for analysis, following similar methodologies (Ding et al., 2024; Puljić et al., 2024).

Prior to jump testing, demographic and training background data were collected, such as gender, age, body mass, height, sport, training experience, frequency of participation in strength and conditioning programs, arm span, dominant leg and injuries during the past six months. Height and arm span length were measured using a Seca 201 measuring tape (Seca). Participants then completed a 12-minute warm-up protocol involving dynamic stretching and functional movement preparation focused on jumping mechanics, including instructions for proper CMJ technique. Technical instructions for CMJ execution were integrated into the warm-up, followed by two submaximal practice jumps to reinforce movement competency. Each participant performed three maximal CMJs per session, with a two-minute rest interval between jumps to ensure optimal neuromuscular recovery (Ding et al., 2024; Puljić et al., 2024). Jump height was measured simultaneously by three devices: a) My Jump 2 application recorded from iPhone 14 Pro Max, b) My jump 3 application recorded from an iPhone 15 Pro (both devices were positioned at a horizontal distance of 1.5 meters from the participant and elevated 30 cm from the ground, as recommended in previous validation studies (Merino Fernández et al., 2021), and c) K-Deltas system was employed to collect vertical ground reaction force data and jumping metrics as a gold standard. This system was integrated with the Kinvent Physio software (version 2.17.4) via Bluetooth and operated on a MacBook equipped with an Apple M3 chip. The video recordings from both My Jump applications were analyzed post-session to extract jump height metrics, which were subsequently compared against jumping measurements from the force plates to assess the validity and reliability of the mobile applications. Intra-rater reliability was assessed for both My Jump 2 and My Jump 3 applications. The rater reanalyzed a subset of 10 recorded jump videos after a two-week interval and the intra-rater reliability analyses revealed excellent agreement across all models ($ICC \geq .993$, $CV_{MyJump2} = 2.18\%$, $CV_{MyJump3} = 1.33\%$).

Research Tools

K-Deltas Portable Force Platform System

The K-Deltas (Kinvent, Montpellier, France) is a portable force platform system designed to assess lower limb strength, inter-limb symmetry and postural control and to support rehabilitation and balance training. The system is validated against laboratory-grade platforms (e.g., Bertec FP4060-08) and has been shown to provide reliable data for clinical and field-based biomechanical assessments (Bagchi et al., 2024; Mylonas et al., 2023). Specifically, the Kinvent K-Deltas portable force platforms have demonstrated high validity and reliability in measuring countermovement jump (CMJ) height and ground reaction force (GRF) parameters in both athletic and clinical settings. Recent studies have shown excellent test–retest reliability for CMJ height ($ICC = 0.981$), comparable to established tools such as contact mats and video-based applications, with strong inter-device correlations ($r = 0.987$) and minimal measurement differences (Bagchi et al., 2024). Furthermore, Mylonas et al. (2023) validated the kinetic output of the K-Deltas against laboratory-standard force plates, reporting 94.6% of Bland–Altman plot points within limits of agreement, confirming strong concordance in measuring vertical ground reaction forces. Weight calibration tests across multiple loads (0 to 82.18 kg) revealed minimal deviation from known masses (e.g., 0.01 ± 0.05 kg at 40.06 kg), indicating excellent measurement precision. In postural stability assessments, mean differences between the K-Deltas and laboratory-standard force plates ranged from 0.01 to 0.68 cm for displacement and 0.06 to 0.93 N for force, with less than 7.7% of data points falling outside agreement limits. Similarly, in jump-based tasks, impulse, peak force and rate of force development values showed strong agreement between devices (Mylonas et al., 2023).

K-Deltas consist of two independent platforms, each equipped with four high-precision electronic force transducers, capable of measuring vertical ground reaction forces. Each platform can capture vertical force data with an acquisition frequency of 1000 Hz and can handle a maximum load of 2000 kg per platform with a measurement accuracy of 0.1%. In this study, the K-Deltas system was employed to capture biomechanical variables such as force and jump metrics during jump-based tasks. The data were recorded through the Kinvent Physio application installed on a MacBook (macOS, Apple M3 chip) running the Kinvent Physio software (version 2.17.4) connected via Bluetooth, which provided real-time visual and acoustic biofeedback. The platforms were powered by internal 3.7V Li-Po batteries providing approximately 20 hours of autonomy. Each platform was covered with an anti-slip R11 surface film to ensure user safety and weighs 8.8 kg per platform.

My Jump 2

The application My Jump 2, is a mobile tool designed to assess vertical jump performance through video analysis. It is available for smartphones, iPads and tablets and enables users to accurately estimate jump height by

analyzing flight time, based on manually marking the moments of takeoff and landing. My Jump 2 was developed to offer a portable and cost-effective alternative to traditional force platforms and has gained popularity among coaches, athletes and researchers for its user-friendly interface, affordability and scientific credibility for a range of jumping techniques. Recent studies have demonstrated that it is a valid and reliable application (Balsalobre-Fernández et al., 2015; Haynes et al., 2019; Soares et al., 2023), showing excellent agreement when compared to force plates (Balsalobre-Fernández et al., 2015) and other infrared platforms (Bogataj et al., 2020b).

My Jump Lab App (My Jump 3)

My Jump 3 is the newer-generation (ex My Jump 2) mobile application developed to evaluate vertical jump performance through advanced video analysis. Using a smartphone's high-speed camera, it calculates jump height by identifying and analyzing the frames corresponding to takeoff and landing, based on flight time. It accommodates a range of jumping techniques, including the CMJ, squat jump (SJ) and drop jump (DJ). It offers a user-friendly interface that enables coaches, athletes and researchers to collect reliable data without requiring specialized technical skills. Additionally, it provides immediate feedback and allows for data storage and export for extended analysis. According to Balsalobre-Fernández and Varela-Olalla (2024) and Puljić et al. (2024), My Jump 3 demonstrates excellent validity when compared to traditional force plates, with correlations as high as 0.93, thereby confirming its reliability as a tool for assessing vertical jump height in both general and elite-level athletes.

Statistical Analysis

All statistical procedures (R Core Team, 2024; Wickham et al., 2018; Patil, 2018; Fox & Weisberg, 2023; Lenth, 2023; Caldwell, 2021; The Jamovi project, 2024) were performed using Jamovi software (Version 2.6; The Jamovi Project, 2024). Descriptive statistics (mean $\pm$ SD) were calculated for all measures. Validity was assessed with Pearson's correlation coefficient (r) and Spearman's rank correlation coefficient (ρ) to evaluate linear and rank-order associations between measurement methods. Graphical displays (scatterplots and correlation heatmaps) were created using ggplot2 (Wickham et al., 2018) and ggstatsplot (Patil, 2018). Agreement between the Kinvent K-Deltas Portable Force Platform System and My Jump applications (My Jump 2 and My Jump 3) was examined using Bland–Altman analyses to determine mean bias, limits of agreement (LoA), and concordance correlation coefficients (CCC). Reliability analyses were conducted with SimplyAgree module in Jamovi (Caldwell, 2021). Simple linear regression analyses were used to evaluate predictive validity of the smartphone applications, with model diagnostics via the car package (Fox & Weisberg, 2023) and estimation/visualization of marginal means via emmeans (Lenth, 2023). Model predictive accuracy was quantified by reporting the coefficient of determination (R^2), slope coefficients, and standard errors (SE). Test–retest reliability was assessed using the intraclass correlation coefficient (ICC; two-way random-effects model), standard error of measurement (SEM), and coefficient of variation (CV%). Reliability analyses were conducted with SimplyAgree in Jamovi. Confidence intervals (CI) were calculated at 95%, and statistical significance was set at $p < .05$.

Results

The purpose of this study was to examine the validity and reliability of My Jump 2 and My Jump 3 smartphone applications compared to the Kinvent K-Deltas Portable Force Platform (FP). The results for validity and reliability analysis are presented below.

Validity

For the validity analyses, both Pearson's r and Spearman's ρ were calculated to assess the association between measurement methods. The correlation analyses showed excellent relationships between the Kinvent FP and both My Jump 2 and My Jump 3 at test time points. Specifically, Pearson's correlation coefficients between the Kinvent FP and My Jump 2 ($r = .98$, $p < .001$) and Kinvent FP and My Jump 3 ($r = .98$, $p < .001$) indicated very strong linear relationships. Similarly, Spearman's ρ correlations were very high between the Kinvent FP and My Jump 2 ($\rho = .96$, $p < .001$) as well as between the Kinvent FP and My Jump 3 ($\rho = .97$, $p < .001$), suggesting that the rank-ordering of participants was nearly identical across these measurement systems.

Additionally, correlations between My Jump 2 and My Jump 3 were nearly perfect (Pearson's $r = .999$, Spearman's $\rho = .997$, $p < .001$), confirming exceptionally close correspondence between these two smartphone apps (Table 1-2 and Figure 1-2).

Table 1. Correlation Matrix Comparing Kinvent FP, My Jump 2 and My Jump 3 (Test).

		K-Deltas FP	MY JUMP 2
MY JUMP 2 [test]	Pearson's r	.981***	—
	Spearman's ρ	.964***	—
MY JUMP 3 [test]	Pearson's r	.981***	.999***
	Spearman's ρ	.968***	.997***

*** $p < .001$

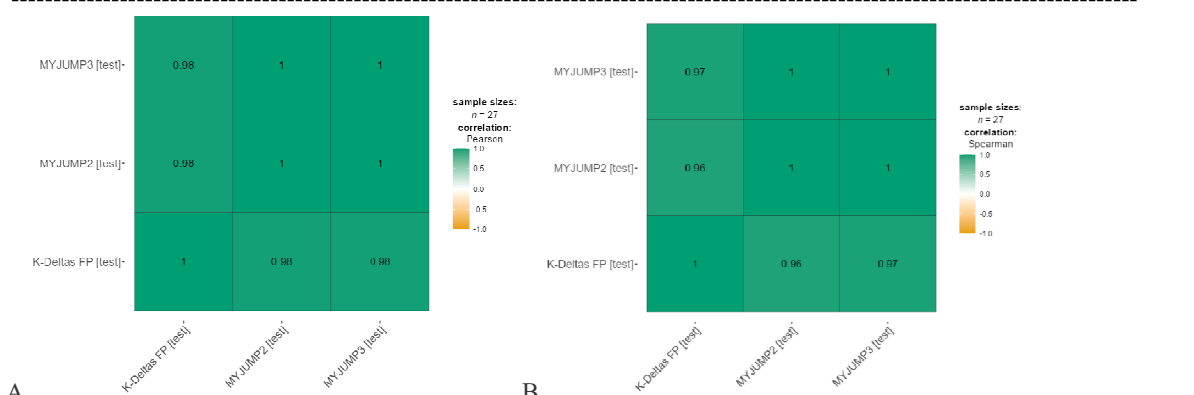


Figure 1. Heatmap Visualization of Pearson (A) and Spearman (B) Correlations Among Kinvent FP, My Jump 2 and My Jump 3 (Test).

At the re-test measurement, significantly strong correlations were also observed between the Kinvent FP and the smartphone applications My Jump 2 and My Jump 3. Pearson correlation coefficients demonstrated high associations between the Kinvent FP and My Jump 2 ($r = .97$, $p < .001$), as well as My Jump 3 ($r = .97$, $p < .001$). Similarly, Spearman correlations also showed strong rank-order consistency between the Kinvent FP and My Jump 2 ($\rho = .97$, $p < .001$) and between the Kinvent FP and My Jump 3 ($\rho = .97$, $p < .001$). Furthermore, My Jump 2 and My Jump 3 continued to exhibit near-perfect correlations (Pearson's $r = .995$, Spearman's $\rho = .991$, both $p < .001$), reinforcing the very close consistency between these two mobile applications during repeated assessments.

Table 2. Correlation Matrix Comparing Kinvent FP, My Jump 2 and My Jump 3 (Re-Test).

		K-Deltas FP	MY JUMP 2
MY JUMP 2 [re-test]	Pearson's r	.970***	—
	Spearman's rho	.971***	—
MY JUMP 3 [re-test]	Pearson's r	.968***	.995***
	Spearman's rho	.969***	.991***

*** $p < .001$

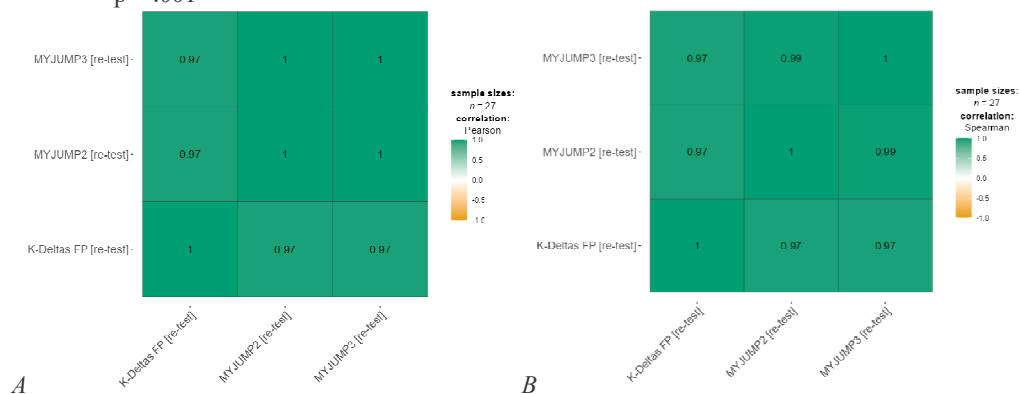


Figure 2. Heatmap Visualization of Pearson (A) and Spearman (B) Correlations Among Kinvent FP, My Jump 2 and My Jump 3 (Re-Test).

Subsequently, agreement between the Kinvent FP and MyJump smartphone applications (My Jump 2 and My Jump 3) at both test and re-test time points (Table 3-6 and Figure 3-10) was examined using Bland-Altman analyses to determine mean bias, limits of agreement (LoA) and concordance correlation coefficients (CCC), using the SimplyAgree module in Jamovi. At initial testing, the mean bias between Kinvent FP and My Jump 2 was minimal (0.35 cm; 95% CI [-0.41, 1.11]), with narrow limits of agreement (LoA) ranging from -3.41 to 4.11 cm. The CCC indicated excellent agreement (CCC = .979; 95% CI [.956, .990]). Similarly, the initial comparison of Kinvent FP to My Jump 3 demonstrated minimal bias (0.34 cm; 95% CI [-0.43, 1.11]) and tight LoA (-3.44 to 4.13 cm), with an equally strong CCC of .979 (95% CI [.956, .990]).

Table 3. Bland-Altman Limits of Agreement between K-Deltas FP [test] and MY JUMP 2 [test].

	Estimate	Lower C.I.	Upper C.I.
Mean Bias	0.351	-0.41	1.11
Lower Limit of Agreement	-3.407	-4.27	-2.55
Upper Limit of Agreement	4.109	3.26	4.97

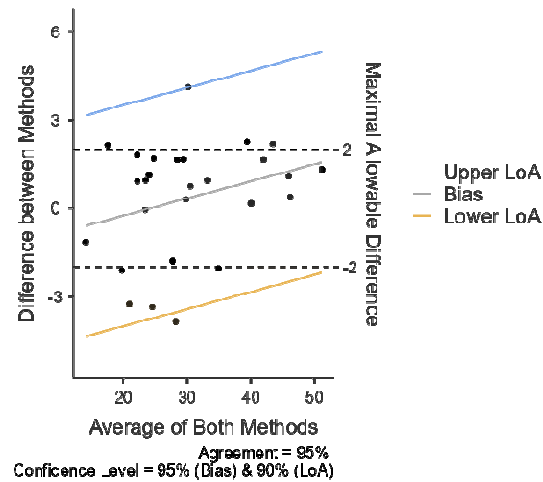


Figure 3. Bland-Altman Limits of Agreement between K-Deltas FP [test] and MY JUMP 2 [test].

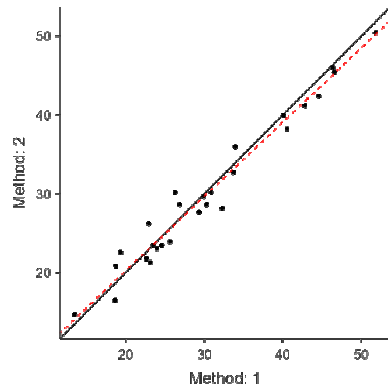


Figure 4. Correlation Plot of K-Deltas FP (Method:1) [test] and MY JUMP 2 (Method:2) [test].

Table 4. Bland-Altman Limits of Agreement between K-Deltas FP [test] and MY JUMP 3 [test].

	Estimate	Lower C.I.	Upper C.I.
Mean Bias	0.341	-0.43	1.11
Lower Limit of Agreement	-3.444	-4.39	-2.58
Upper Limit of Agreement	4.126	3.26	4.99

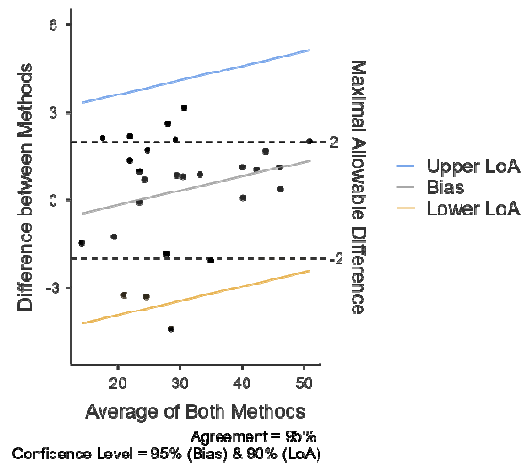


Figure 5. Bland-Altman Limits of Agreement between K-Deltas FP [test] and MY JUMP 3 [test].

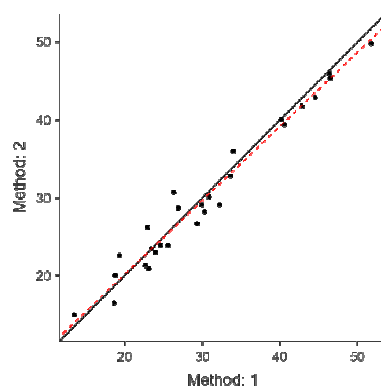


Figure 6. Correlation Plot of K-Deltas FP (Method:1) [test] and MY JUMP 3 (Method:2) [test].

At re-testing, slight increases in mean bias were observed. Kinvent FP and My Jump 2 showed a mean bias of 0.59 cm (95% CI [-0.30, 1.48]), with LoA slightly widening (-3.79 to 4.98 cm). However, agreement remained excellent, as indicated by the high CCC of .968 (95% CI [.932, .985]). The comparison between Kinvent FP and My Jump 3 at re-test revealed a mean bias of 0.46 cm (95% CI [-0.47, 1.39]), with LoA ranging from -4.12 to 5.04 cm and a strong CCC of .966 (95% CI [.928, .984]). Despite minor proportional biases indicated by the analysis, these results collectively demonstrate robust agreement, showing that both My Jump 2 and My Jump 3 smartphone applications may provide highly valid and practically interchangeable measures relative to the Kinvent FP.

Table 5. Bland-Altman Limits of Agreement between K-Deltas FP [re-test] and MY JUMP 2 [re-test].

	Estimate	Lower C.I.	Upper C.I.
Mean Bias	0.592	-0.295	1.48
Lower Limit of Agreement	-3.794	-4.796	-2.79
Upper Limit of Agreement	4.978	3.976	5.98

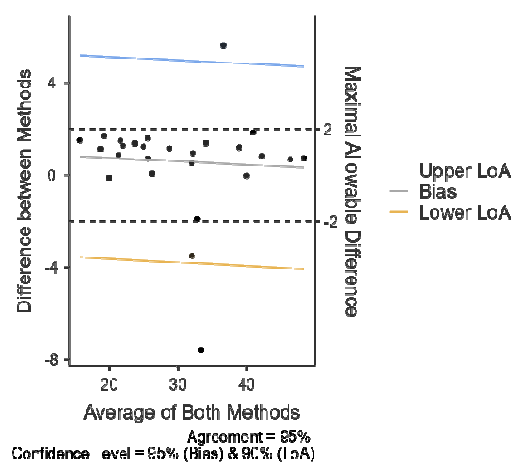


Figure 7. Bland-Altman Limits of Agreement between K-Deltas FP [re-test] and MY JUMP 2 [re-test].

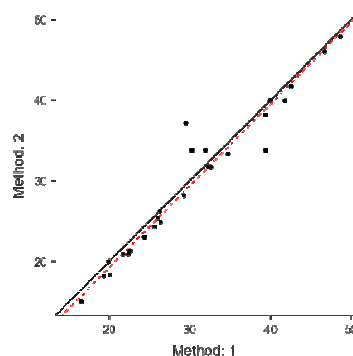


Figure 8. Correlation Plot of K-Deltas FP (Method:1) [re-test] and MY JUMP 2 (Method:2) [re-test].

Table 6. Bland-Altman Limits of Agreement between K-Deltas FP [re-test] and MY JUMP 3 [re-test].

	Estimate	Lower C.I.	Upper C.I.
Mean Bias	0.459	-0.47	1.39
Lower Limit of Agreement	-4.123	-5.17	-3.08
Upper Limit of Agreement	5.041	4.00	6.09

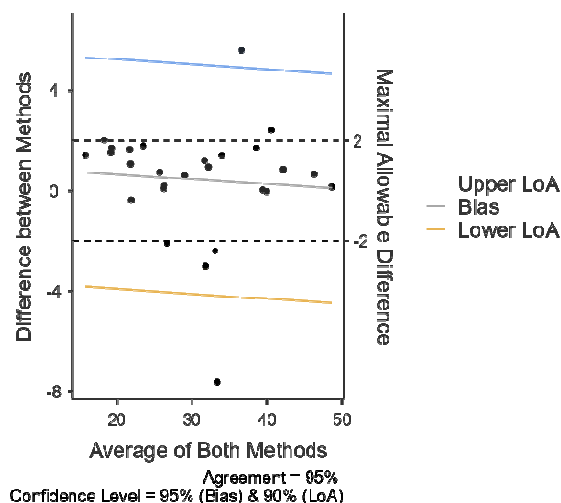


Figure 9. Bland-Altman Limits of Agreement between K-Deltas FP [re-test] and MY JUMP 3 [re-test].

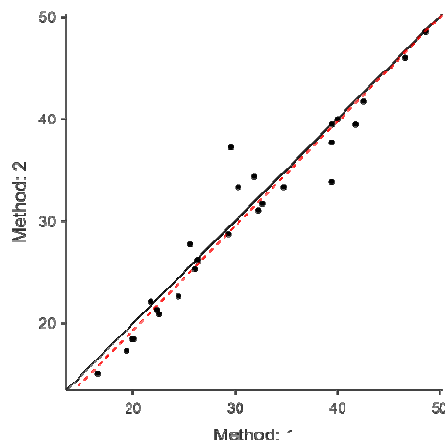


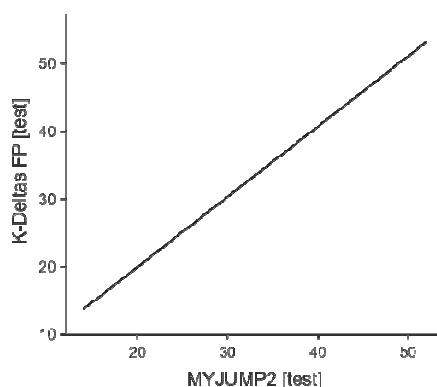
Figure 10. Correlation Plot of K-Deltas FP (Method:1) [re-test] and MY JUMP 3 (Method:2) [re-test].

Linear regression analyses were conducted to evaluate how accurately the smartphone applications My Jump 2 and My Jump 3 (Table 7-10 and Figure 11-14) predicted the vertical jump height measured by the Kinvent FP. At initial testing, My Jump 2 demonstrated excellent predictive capability, explaining approximately 96.3% of the variance in Kinvent FP scores, $F(1, 25) = 644$, $p < .001$, $R^2 = .963$. The regression equation indicated a slope coefficient (β) of 1.039 (95% CI [0.955, 1.123], $p < .001$). Similarly, My Jump 3 also showed strong predictive validity at initial testing ($R^2 = .962$, $F(1, 25) = 640$, $p < .001$), with a slope coefficient of 1.030 (95% CI [0.946, 1.114], $p < .001$).

Table 7. Regression Analysis Summary for Predicting K-Deltas FP [test] from MY JUMP 2 [test].

Predictor	Estimate	SE	Model Coefficients* - K-Deltas FP [		t	p	95% CI		
			Low	Upper			Stand. Estim	Low	Upper
Intercept	-0.836	1.2907	-3.45	1.82	-0.64	.523			
MY JUMP 2 [test]	1.039	0.0410	0.95	1.12	25.37	.001	0.981	0.90	1.06

* $R^2 = .963$, $F(1, 25) = 644$, $p < .001$



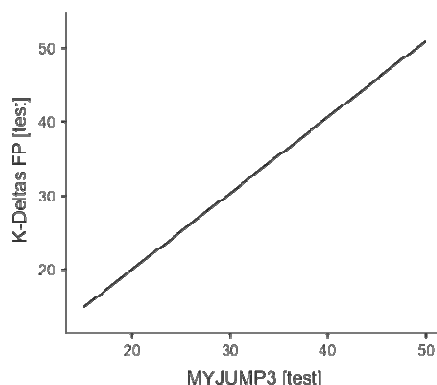
Note: Estimated marginal means were calculated at MY JUMP 2 values of -1 SD ($M = 25.7$), mean ($M = 30.5$) and $+1$ SD ($M = 40.2$), with 95% confidence intervals ranging from 19.6 to 41.4.

Figure 11. Estimated Marginal Means of K-Deltas FP [test] Predicted by MY JUMP 2 [test].

Table 8. Regression Analysis Summary for Predicting K-Deltas FP [test] from MY JUMP 3 [test].

Model Coefficients* - K-Deltas FP [test]			95% CI		t	p	Stand. Estimate	95% CI	
Predictor	Estimate	SE	Lower	Upper				Lower	Upper
Intercept	-0.565	1.2837	-3.209	2.08	-0.440	.664			
MY JUMP 3 [test]	1.030	0.0407	0.946	1.11	25.306	.001	0.981	0.901	1.06

* $R^2 = .962$, $F(1, 25) = 640$, $p < .001$



Note: Estimated marginal means of K-Deltas FP [test] were calculated at MY JUMP 3 values corresponding to -1 SD ($M = 20.7$, 95% CI [19.6, 21.8]), mean ($M = 30.5$, 95% CI [29.7, 31.3]) and $+1$ SD ($M = 40.2$, 95% CI [39.1, 41.4]).

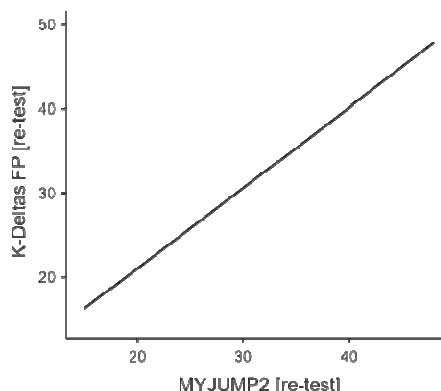
Figure 12. Estimated Marginal Means of K-Deltas FP [test] Predicted by MY JUMP 3 [test].

At re-testing, My Jump 2 maintained a high level of predictive accuracy, accounting for 94.2% of the variance in Kinvent FP measures ($R^2 = .942$, $F(1, 25) = 404$, $p < .001$), with a slope coefficient of 0.956 (95% CI [0.858, 1.054], $p < .001$). Similarly, My Jump 3 exhibited high predictive capability at re-testing, explaining approximately 93.7% of the variance ($R^2 = .937$, $F(1, 25) = 370$, $p < .001$), with a slope coefficient of 0.949 (95% CI [0.848, 1.050], $p < .001$). All intercepts were nonsignificant, suggesting negligible systematic offset.

Table 9. Regression Analysis Summary for Predicting K-Deltas FP [re-test] from MY JUMP 2 [re-test].

Model Coefficients* - K-Deltas FP [re-			95% CI		t	p	Stand. Estim	95% CI	
Predictor	Estima	SE	Low	Upp				Low	Upp
Intercept	1.910	1.4966	-1.17	4.99	1.28	.214			
MYJUMP2 [re-test]	0.956	0.0476	0.858	1.05	20.0	.001	0.970	0.87	1.07

* $R^2 = .942$, $F(1, 25) = 404$, $p < .001$



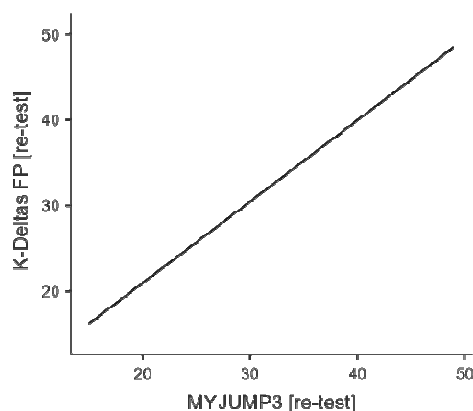
Note: Estimated marginal means of K-Deltas FP [re-test] were calculated at MY JUMP 2 [re-test] values of -1 SD ($M = 22.1$, 95% CI [20.8, 23.3]), mean ($M = 30.7$, 95% CI [29.9, 31.6]) and $+1$ SD ($M = 39.4$, 95% CI [38.2, 40.7]).

Figure 13. Estimated Marginal Means of K-Deltas FP [re-test] Predicted by MY JUMP 2 [re-test].

Table 10. Regression Analysis Summary for Predicting K-Deltas FP [re-test] from MY JUMP 3 [re-test].

Predictor	Model Coefficients - K-Deltas FP [re-		95% CI			p	Stand. Estim	95% CI	
	Estim	SE	Low	Upp	t			Low	Upp
Intercept	1.993	1.5586	-1.21	5.20	1.28	.213			
MY JUMP 3 [re-test]	0.949	0.0494	0.84	1.05	19.2	.001	0.968	0.86	1.07

* $R^2 = .937$, $F(1, 25) = 370$, $p < .001$



Note: Estimated marginal means of K-Deltas FP [re-test] were calculated at MY JUMP 3 [re-test] values of -1 SD ($M = 22.1$, 95% CI [20.8, 23.4]), mean ($M = 30.7$, 95% CI [29.8, 31.6]) and $+1$ SD ($M = 39.4$, 95% CI [38.1, 40.7]).

Figure 14. Estimated Marginal Means of K-Deltas FP [re-test] Predicted by MY JUMP 3 [re-test].

Reliability

Test-retest reliability analyses were conducted separately for the Kinvent FP and both smartphone applications (Table 11—13 and Figure 15-17), My Jump 2 and My Jump 3, using intraclass correlation coefficients (ICC), standard error of measurement (SEM) and coefficient of variation (CV%).

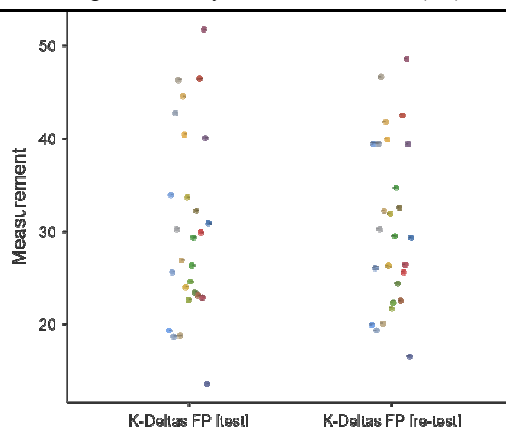
The Kinvent FP exhibited excellent reliability across test sessions (ICC = .957, 95% CI [.920, .978]), with the lowest SEM among devices/applications, SEM of 1.95 cm and a CV% of 6.39%, indicating high consistency and minimal measurement error. Similarly, My Jump 2 demonstrated strong reliability (ICC = .947, 95% CI [.900, .972]), accompanied by a SEM of 2.13 cm and CV% of 7.08%, reflecting robust repeatability across sessions. My Jump 3 also showed excellent reliability (ICC = .954, 95% CI [.914, .976]), with an SEM of approximately 2.00 cm and a CV% of 6.62%, further highlighting its consistent measurement capability.

Variance component analyses confirmed minimal residual variances for all devices, with approximately 95% or more of the total variance attributable to true differences among participants, underscoring the reliability of the

measures. Collectively, these results support the robust reliability of the Kinvent FP, My Jump 2 and My Jump 3 for assessing vertical jump height across repeated sessions.

Table 11. Intraclass Correlation Coefficients (ICC) for K-Deltas FP [test] and [re-test].

Model	Measures	Type	95% CI (Lower–Upper)
One-way random	Agreement	ICC(1,1)	0.920 – 0.978
Two-way random	Agreement	ICC(2,1)	0.920 – 0.978
Two-way fixed	Consistency	ICC(3,1)	0.919 – 0.978
One-way random	Avg. Agreement	ICC(1,k)	0.958 – 0.989
Two-way random	Avg. Agreement	ICC(2,k)	0.958 – 0.989
Two-way fixed	Avg. Consistency	ICC(3,k)	0.958 – 0.989

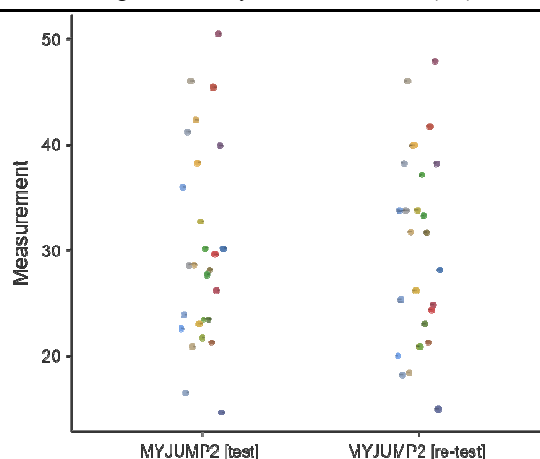


Note: Variance component analysis from the reliability model indicates that 95.7% of the total variance is attributable to subject differences, while residual error accounts for only 4.3% and no variance was observed due to test item. This supports excellent relative reliability.

Figure 15. Plot of Reliability Data for K-Deltas FP [test] and [re-test].

Table 12. Intraclass Correlation Coefficients (ICC) for MY JUMP 2 [test] and [re-test].

Model	Measures	Type	95% CI (Lower–Upper)
One-way random	Agreement	ICC(1,1)	0.900 – 0.972
Two-way random	Agreement	ICC(2,1)	0.900 – 0.972
Two-way fixed	Consistency	ICC(3,1)	0.900 – 0.972
One-way random	Avg. Agreement	ICC(1,k)	0.948 – 0.986
Two-way random	Avg. Agreement	ICC(2,k)	0.948 – 0.986
Two-way fixed	Avg. Consistency	ICC(3,k)	0.947 – 0.986

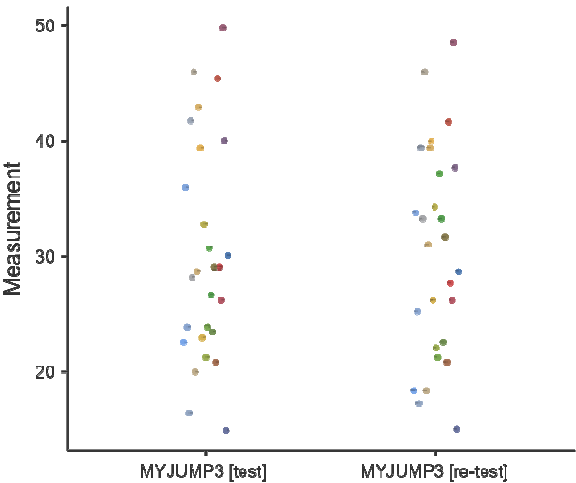


Note: Variance components from the reliability model indicate that 94.66% of the total variance was attributable to differences between subjects, with only 5.34% due to residual error and a negligible contribution from items. This distribution supports the high ICC values and excellent test–retest reliability.

Figure 16. Plot of Reliability Data for MY JUMP 2 [test] and [re-test].

Table 13. Intraclass Correlation Coefficients (ICC) for MY JUMP 3 [test] and [re-test].

Model	Measures	Type	95% CI (Lower–Upper)
One-way random	Agreement	ICC(1,1)	0.914 – 0.976
Two-way random	Agreement	ICC(2,1)	0.914 – 0.976
Two-way fixed	Consistency	ICC(3,1)	0.913 – 0.976
One-way random	Avg. Agreement	ICC(1,k)	0.955 – 0.988
Two-way random	Avg. Agreement	ICC(2,k)	0.955 – 0.988
Two-way fixed	Avg. Consistency	ICC(3,k)	0.954 – 0.988



Note: Variance component analysis revealed that 95.39% of the total variance was attributable to participant differences, with only 4.61% due to residual error. No variance was attributable to item-level differences. This supports the interpretation of excellent test–retest reliability in the observed measurements.

Figure 17. Plot of Reliability Data for MY JUMP 3 [test] and [re-test].

Discussion

This study aimed to evaluate the concurrent validity and test–retest reliability of My Jump 2 and My Jump 3 applications in comparison with the Kinvent K-Deltas force platform (FP) for assessing CMJ height in college students with diverse athletic backgrounds. The findings of the study support that both My Jump applications may be valid and reliable alternatives for measuring vertical jump height, closely aligning with earlier validation studies (Bagchi et al., 2024; Dias et al., 2025; Gençoğlu et al., 2023; Stafylidis et al., 2025a; Şentürk et al., 2024; Wang et al., 2024).

Validity

In terms of validity, both Pearson and Spearman correlation coefficients between the Kinvent FP and My Jump 2 and My Jump 3 applications were consistently high (r and ρ values ≥ 0.96 , $p < .001$) at both testing and retesting time points. These results mirror previous studies that reported nearly perfect associations between My Jump 2 and laboratory-based equipment such as contact mats and force platforms (Cruvinel-Cabral et al., 2018; Gençoğlu et al., 2023; Şentürk et al., 2024). The exceptionally high correlation between My Jump 2 and My Jump 3 ($r = .999$, $\rho = .997$) further supports prior findings indicating equivalency in their performance across various conditions (Bishop et al., 2022; Şentürk et al., 2024). Notably, the minimal mean bias (0.34 to 0.59 cm) and narrow limits of agreement observed in Bland–Altman analyses are consistent with earlier findings reporting small systematic differences between My Jump and reference systems. Similar agreement ranges and minimal biases between My Jump and force plates, were observed in previous studies, despite some reports of slight overestimation in automated AI-assisted modes (Bridgeman et al., 2025). In the present study, the biases remained low and within practically acceptable thresholds, demonstrating the suitability of both applications in settings where laboratory-grade equipment may be unavailable. The results from linear regression analyses further confirmed the predictive validity of both My Jump applications. Both models explained more than 93% of the variance in vertical jump height recorded by the Kinvent FP, with slope coefficients very close to 1.0. These findings correspond closely to those of Bishop et al. (2022), who

found no significant difference in CMJ height between My Jump Lab and force platforms and strengthen the conclusions drawn from meta-analytic reviews for My Jump applications (Gençoğlu et al., 2023).

Importantly, this study contributes to the limited body of literature directly comparing My Jump applications with the Kinvent K-Deltas platform. The observed correlation between My Jump and K-Deltas ($r = .968$ to $.981$) and the near-identical CCC values ($\geq .966$) reflect the strong agreement reported by Bagchi et al. (2024), who found that K-Deltas force plates yielded results closely matching both contact mats and My Jump applications. This confirms the status of K-Deltas as a suitable criterion reference for portable vertical jump testing and supports its use in field and laboratory contexts alike.

Reliability

In this study, the Kinvent K-Deltas FP was used as the criterion reference for evaluating the concurrent validity and test–retest reliability of My Jump 2 and My Jump 3 smartphone applications. Findings from the current study demonstrated excellent test–retest reliability for CMJ height measured via the K-Deltas FP, with intraclass correlation coefficients (ICC) of 0.957 to 0.978. The standard error of measurement was at 1.95 cm, indicating a high degree of measurement consistency and minimal random error. The variance component analysis further revealed that 95.7% of the total variance was attributable to true inter-individual differences, with only 4.3% due to residual error, underscoring the instrument’s high measurement stability. These results are consistent with prior validation studies reporting excellent agreement between the K-Deltas and laboratory-standard force plates, such as the Bertec FP4060-08. For instance, Mylonas et al. (2023) reported that 94.6% of Bland–Altman plot points between the K-Deltas and reference platforms fell within the limits of agreement for ground reaction force variables. Additionally, earlier work has confirmed the device’s accuracy in jump height estimation, showing ICC values up to 0.981 and inter-device correlations exceeding $r = 0.98$ across various populations and performance conditions (Bagchi et al., 2024). These findings could confirm its suitability as a criterion-valid and reliable biomechanical assessment tool.

Overall, all three measurement systems – My Jump 2, My Jump 3 and the Kinvent FP – demonstrated excellent test–retest consistency. ICC values for My Jump 2 (.947), My Jump 3 (.954) and K-Deltas (.957) all exceeded the threshold of .90, indicating strong repeatability. These findings align with prior work by Gallardo-Fuentes et al. (2016) and Balsalobre-Fernández et al. (2015), who reported similar ICC values and low coefficients of variation for My Jump 2 and its earlier iterations. Moreover, the low SEM and CV% observed in this study ($SEM \leq 2.13$ cm; $CV\% \leq 7.08\%$) are within the range of previously reported values for both smartphone-based and force plate systems (Cruvinel-Cabral et al., 2018; Şentürk et al., 2024).

The consistency of results across different sessions and measurement platforms also confirms the conclusion drawn by Lake et al. (2018), who reported that portable systems could produce quite reliable force–time metrics when compared to traditional laboratory platforms. Additionally, the minimal residual error components and high proportion of variance attributable to participant differences ($> 94\%$) further support the internal consistency and sensitivity of these systems to true inter-individual performance differences, rather than random measurement error.

Practical Implications and Considerations

The findings of this study hold significant practical value for sport scientists, strength and conditioning coaches and practitioners involved in athlete monitoring and performance diagnostics. The high test–retest reliability demonstrated by the Kinvent K-Deltas FP (ICC = .957) supports its utility as a gold-standard tool for repeated assessment of CMJ height. Simultaneously, the strong validity and reliability metrics demonstrated that My Jump 2 and My Jump 3 applications support their use as a cost-effective and portable alternatives for field-based CMJ assessments. Given their minimal measurement bias (< 1 cm), strong correlation with force plate outputs ($r > .96$) and excellent predictive accuracy ($R^2 > .93$), these applications may be effectively used by coaches and educators to evaluate jump performance across various settings, such as schools, amateur clubs and professional environments—particularly where force platforms are unavailable due to cost or other constraints. Practitioners are advised to maintain standard protocols regarding video capture and frame analysis, as emphasized in previous methodological reports (Bishop et al., 2022).

Limitations and Future Directions

This study involved a relatively small sample of 27 participants with diverse athletic backgrounds, which, although adequate for correlational and reliability analyses, may limit the generalizability of the findings to broader populations across various age groups, competitive levels, or sport-specific contexts. Additionally, measurements were confined to a controlled laboratory setting, which may not fully reflect field-based conditions. It is important to note that the final test–retest reliability analysis was conducted by the same rater across both sessions, to ensure consistency in frame selection and measurement procedures for both My Jump 2 and My Jump 3 applications. Although intra-rater reliability was evaluated, the manual identification of take-off and landing frames within My Jump applications remains an inherently subjective process. Even when performed by a trained and experienced observer, this frame-by-frame selection is susceptible to minor inconsistencies, potentially introducing human error and subtle measurement bias. Therefore, while manual video analysis offers a practical and accessible approach to jump performance assessment, particularly in field or applied settings, its limitations should be acknowledged,

especially in contexts where maximal precision and objectivity are required. Further research with larger samples, investigating other types of athletic movements and validating additional smartphone-based measurement tools would also extend practical applications of these devices (e.g. testing under alternative conditions such as post-fatigue states, different surface types, or using alternative jump modalities like Squat Jump, Drop Jump, RSI). Future research may offer further insights into these tools' usability and better define the place of these tools within the broader framework of digital performance monitoring and field-based athletes' performance evaluation.

Conclusions

Assessing the validity and reliability of smartphone-based jump measurement applications in comparison with traditional laboratory equipment is essential for practitioners seeking cost-effective and reliable tools for performance assessment in field settings. This study demonstrated strong validity and excellent reliability of both My Jump 2 and My Jump 3 applications compared to the Kinvent K-Deltas FP. High correlations (Pearson's $r \geq .97$; Spearman's $\rho \geq .96$) and agreement ($CCC \geq .966$; mean bias ≤ 0.59 cm) confirmed that smartphone applications could be highly accurate and a practical alternative. Reliability analysis yielded high test-retest ICC values ($\geq .947$) with low SEM (≤ 2.13 cm), underscoring measurement consistency ($SEM_{Kinvent \text{ K-Deltas FP}} = 1.95$ cm; $SEM_{MyJump2} = 2.13$ cm; $SEM_{MyJump3} = 2.00$ cm). These findings may support the practical use of My Jump 2 and My Jump 3 applications for reliably assessing vertical jump performance. Furthermore, the Kinvent K-Deltas FP demonstrated excellent test-retest reliability for assessing CMJ height, with an ICC of 0.957 to 0.978. It also demonstrated the lowest SEM among all measurement tools (1.95 cm), indicating high consistency and minimal random error. These results support the use of Kinvent K-Deltas FP as a criterion-valid and reliable biomechanical assessment instrument. Overall, applications like My Jump 2 and My Jump 3 offer valid, reliable, cost-effective and user-friendly alternatives for accurate vertical jump assessment, effectively bridging the gap between laboratory precision and field accessibility.

Conflicts of interest - None.

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