



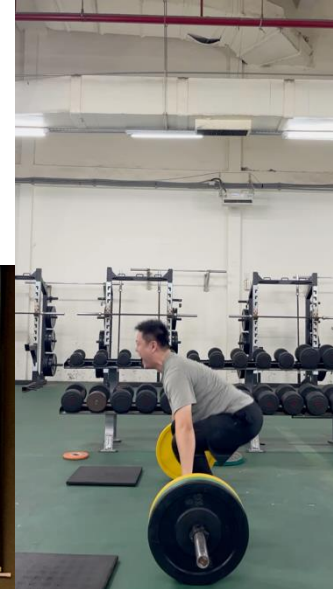
【借力使力】

測力板在運動表現和運動醫學上的應用

江杰穎 Ph. D., CSCS
國立體育大學

【自我介紹】

- 大學副教授（教練科學/技擊系/運保系）
- 國家運動科學中心副研究員
- 國家運動訓練中心運動表現顧問
- 肌力與體能教練
- 運動科學家



【優秀運動員】

肌力-爆發力越好的選手

- 跳的越高
- 越敏捷
- 反覆衝刺能力越好
- 越能抗疲勞
- 恢復越快



(Castagna et al., 2007; Hoffman, Tenenbaum, Maresh, & Kraemer, 1996; Johnston, Gabbett, Jenkins, & Hulin, 2014; Stojanovic, Ostojic, Calleja-Gonzalez, Milosevic, & Mikic, 2012)

【他是怎麼辦到的？】



ETSU Sport Science lab (Force Plate technologies)



Strength & Conditioning

【肌力】

肌力： 神經肌肉系統產生力量、對抗外在阻力的能力

力量 (Force)： 向量單位 (大小和方向)

力量的產生是借由特殊肌群的收縮

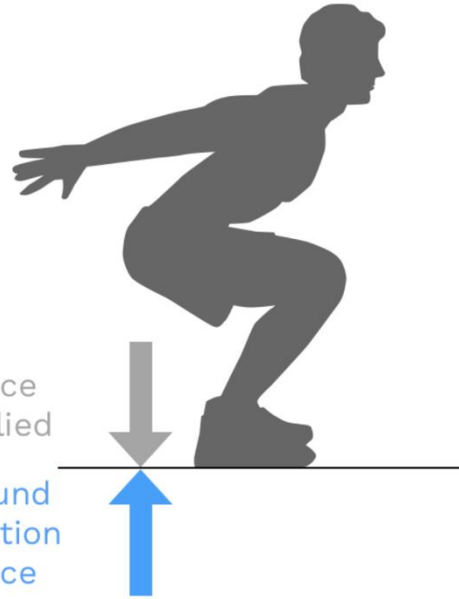
$F = m * a$ 力量 = 質量 * 加速度

**人體的移動是經由適當的施力所產生
(動作控制、運動技術、肌力表現)**

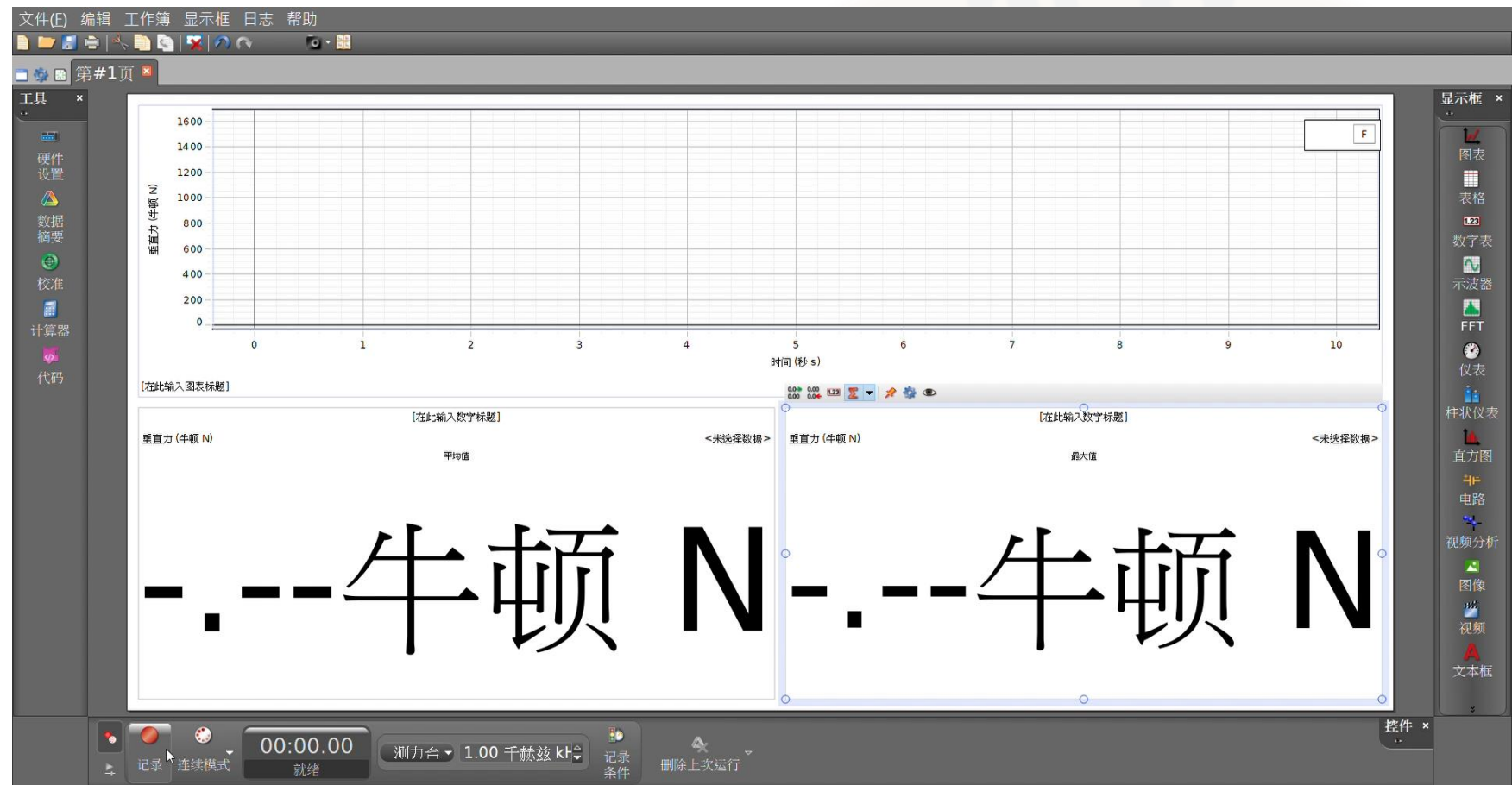
(Stone et. al, 2007)



【透過測力板測量力量(Force)】



直接量測地面反作用力(Ground Reaction Force, GRF) 作為肌力特質的診斷

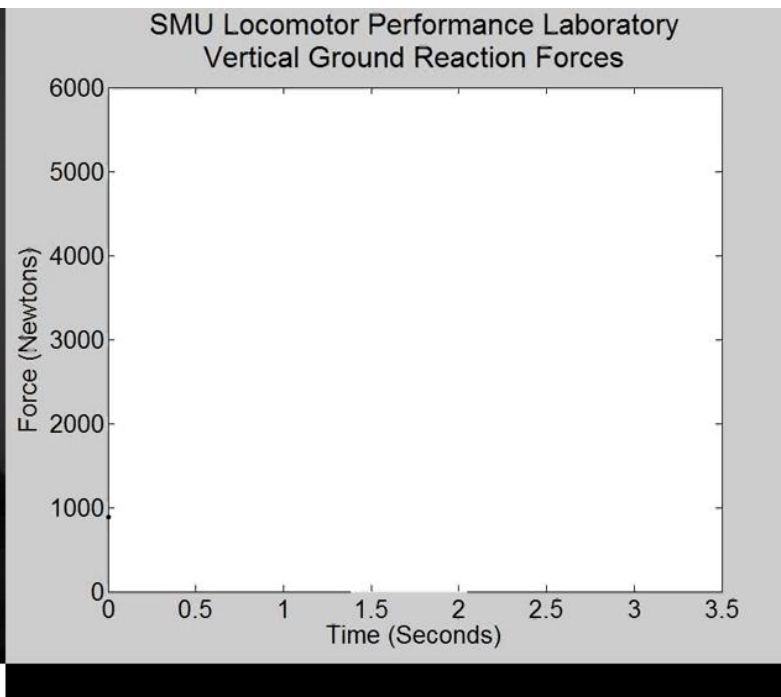


【Force-Time Curve 力量-時間曲線】

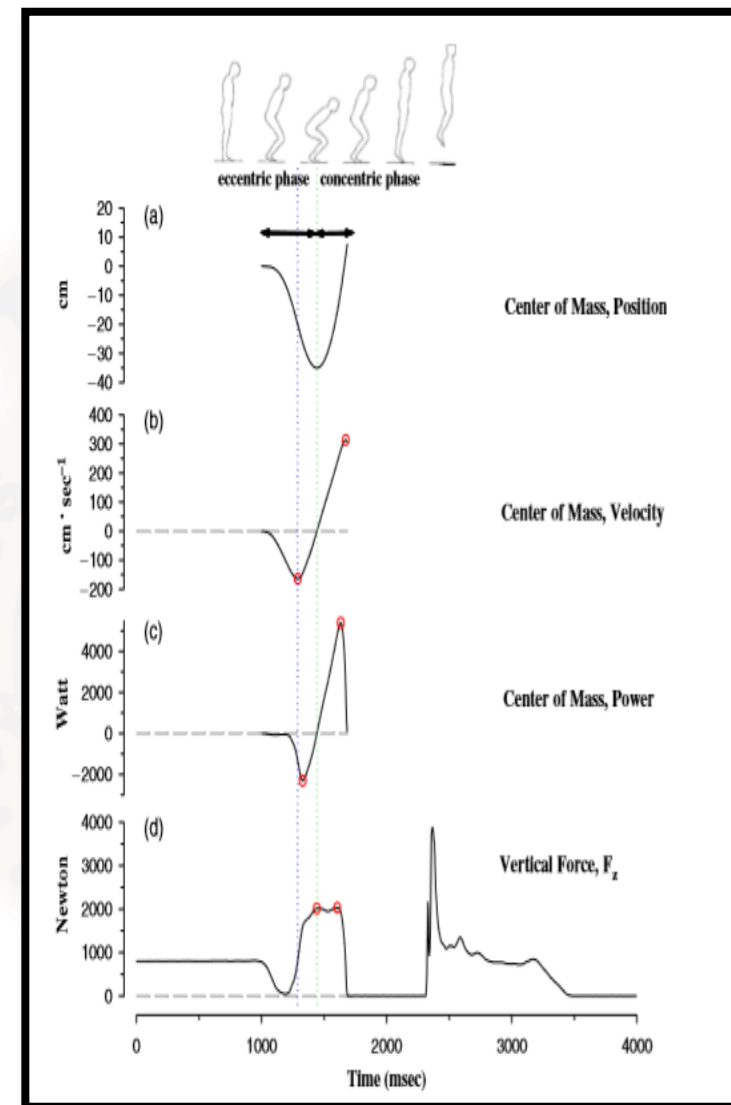
透過牛頓第二運動定律 $F = m \cdot a$ ，經由 F-t 曲線(直接量測) 推算出 Velocity-time, Power-time 曲線作為質心速度、功率等參數計算



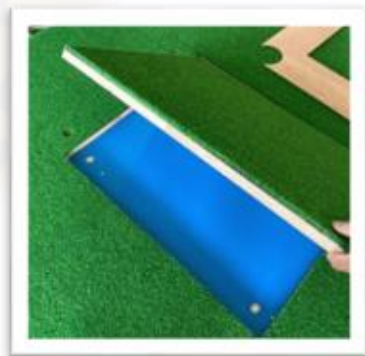
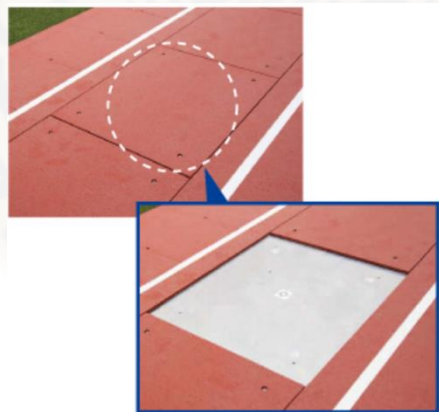
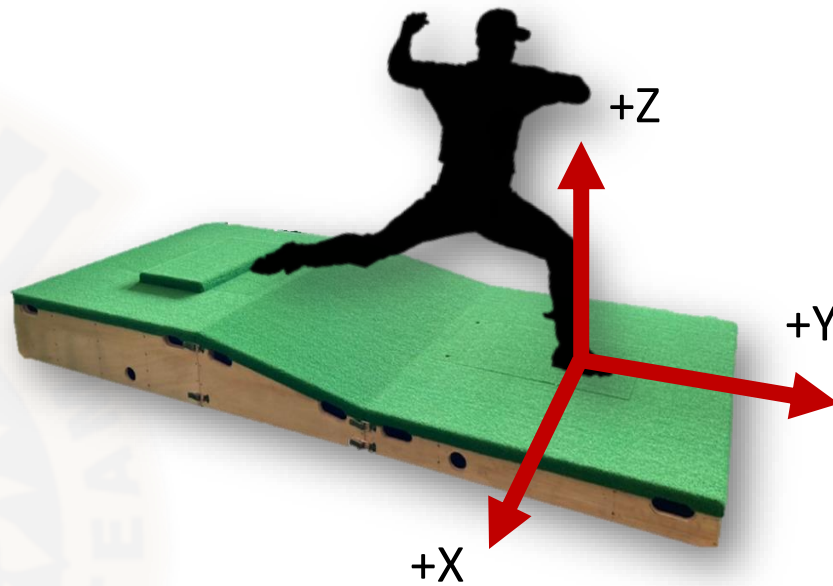
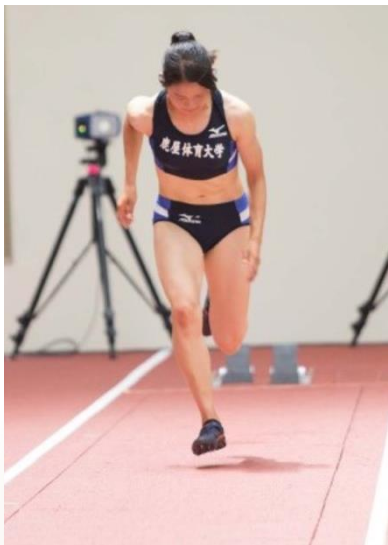
12:00:58 AM 0001 -1896.6[ms] 864x718, 1000 Hz, 500 μ s, *1, HiSpec #00304, V1.10.5



測力板可透過力量-時間曲線，得知不同階段(離心、向心階段)的運動學(時間、速度)與動力學(力量、發力)特徵作為肌力診斷，提供更明確的訓練方向



【量測工具：測力板】

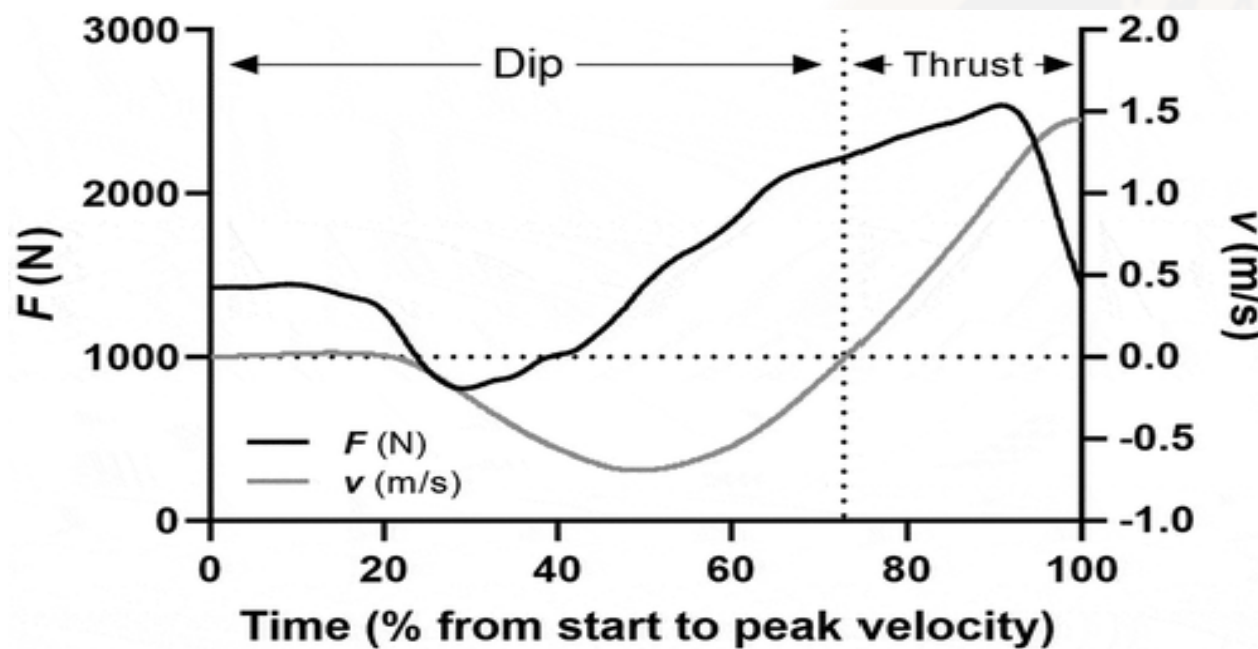


【儀器整合：線性換能計/測力板】

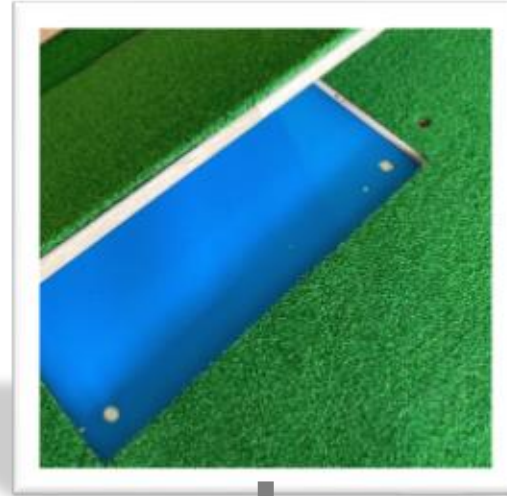


透過取樣頻率相同之儀器整合（同步）可經由測試動作取得力量（發力）、速度、位移、功率等運動學與動力學參數

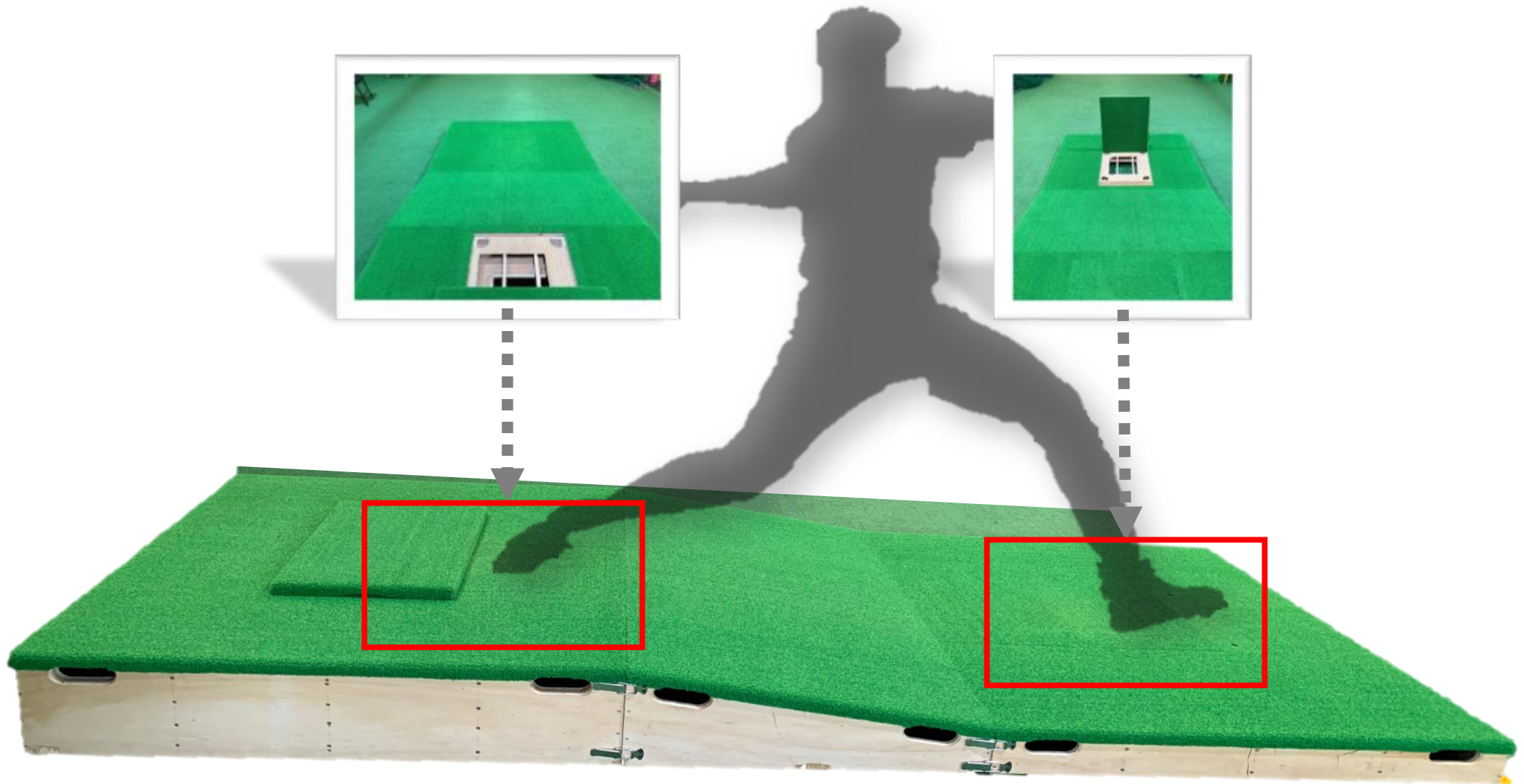
當前肌力診斷的王者設定，但使用上有諸多限制
研究（實驗室）、無法及時回饋、需要專業技術人員



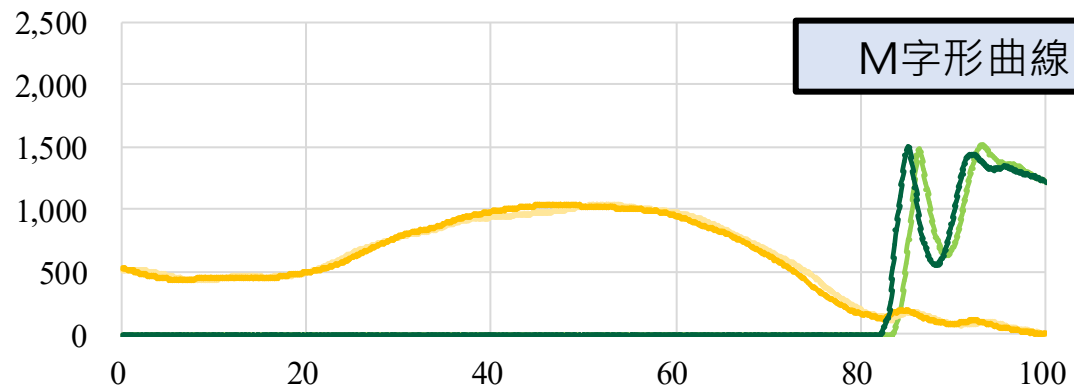
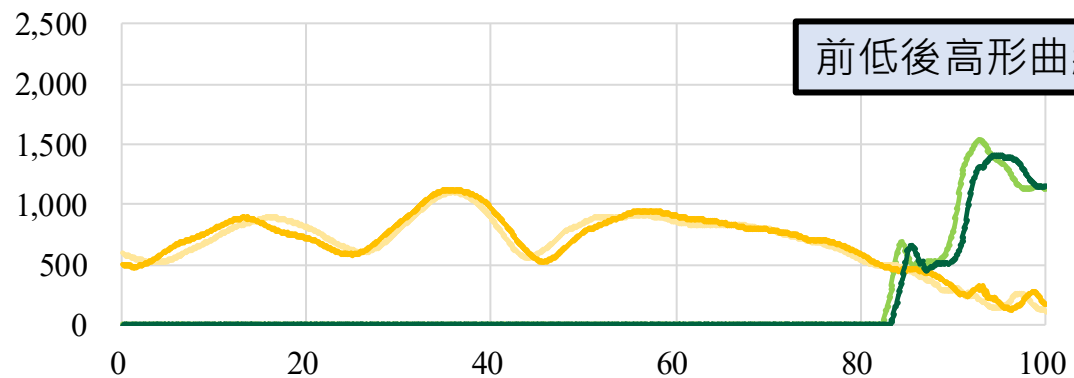
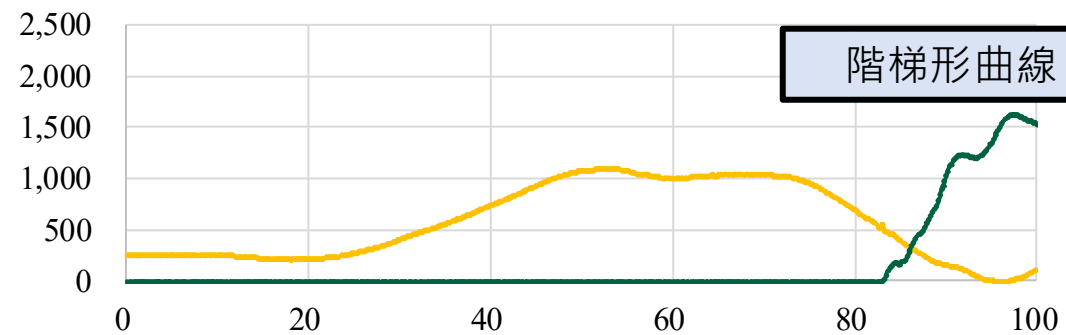
【客製化投手丘】



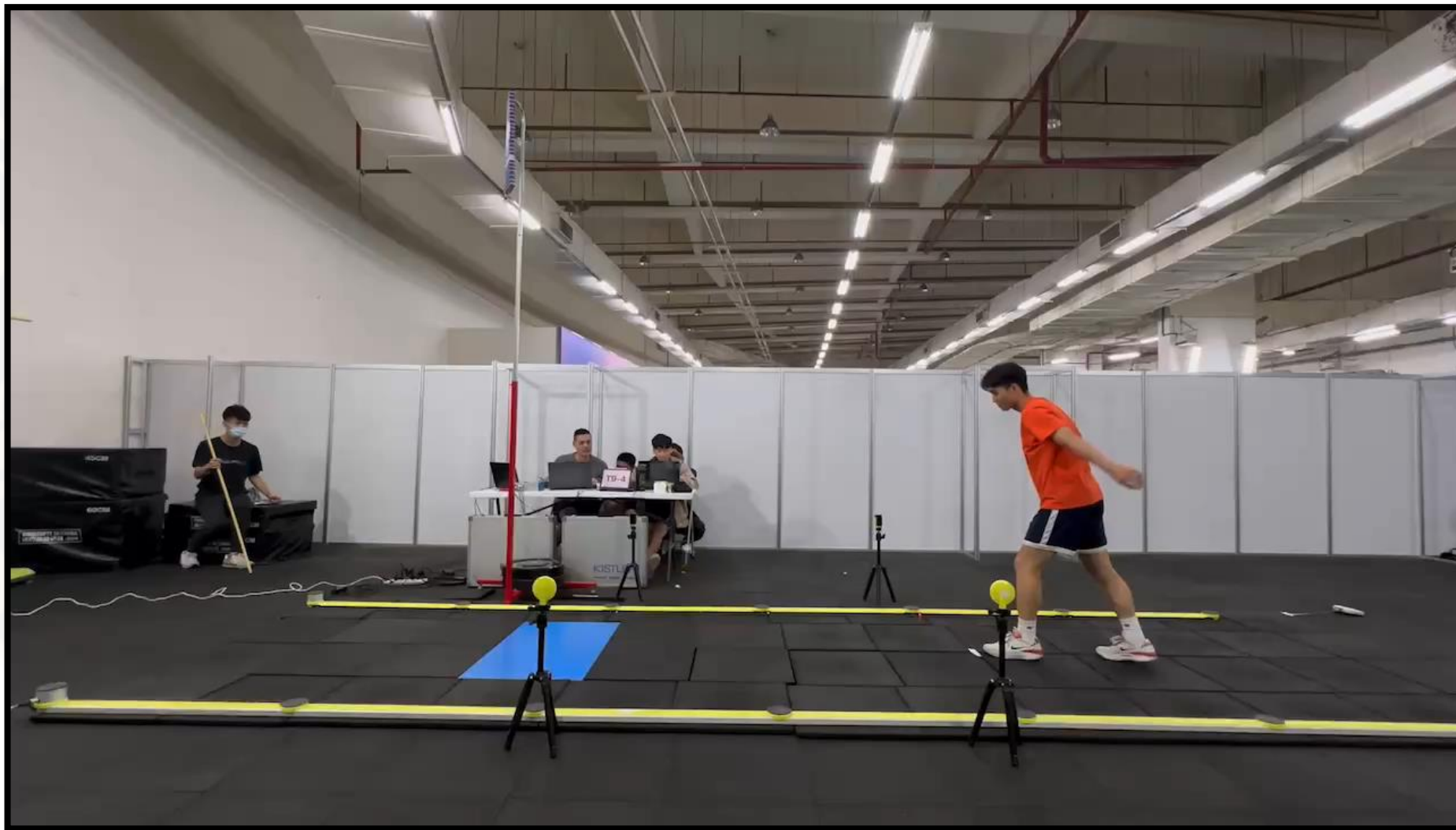
【客製化投手丘】



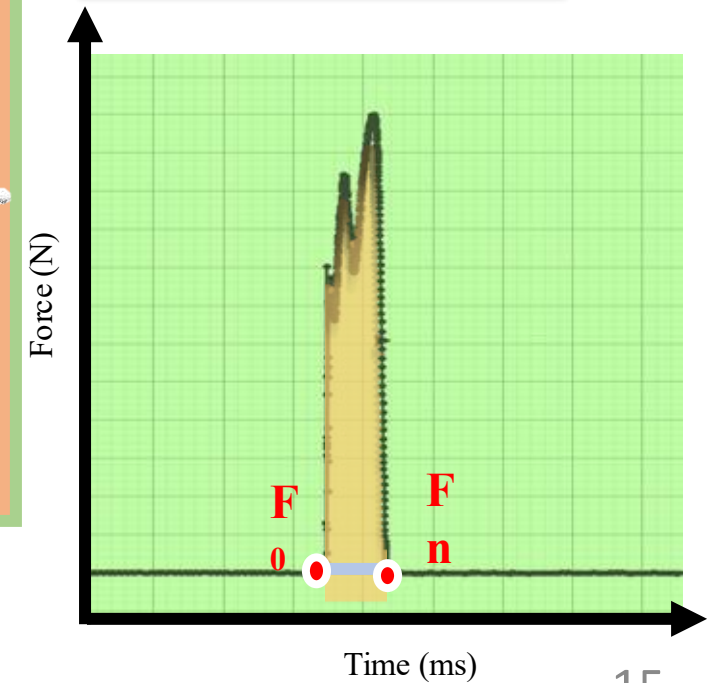
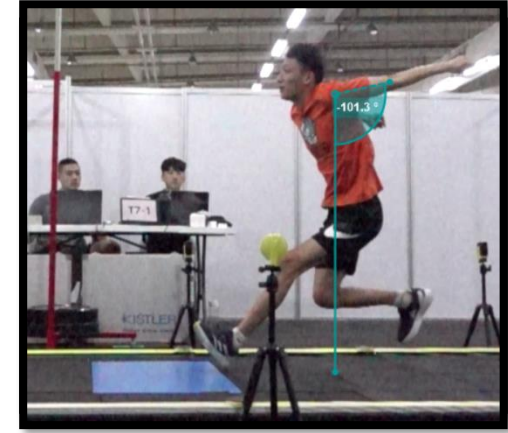
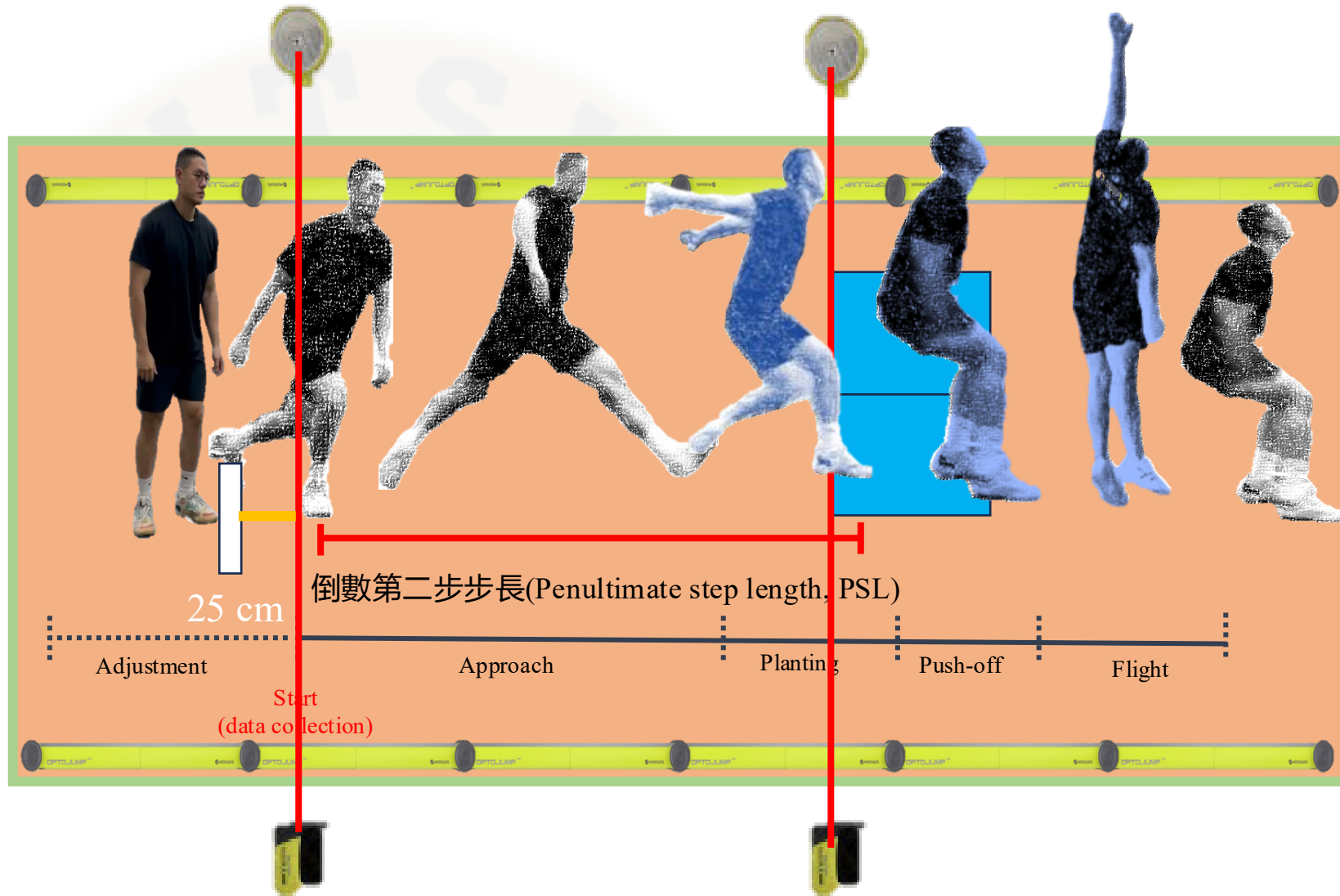
【投球地面反作用力特徵】



【助跑雙腳跳】



【助跑雙腳跳】



【助跑雙腳跳】



【肌力診斷：測力板科技】



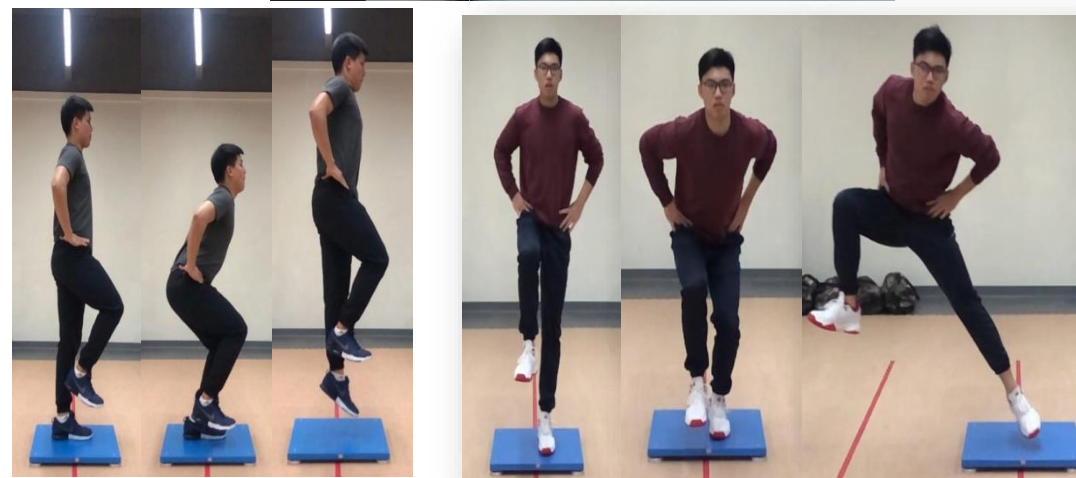
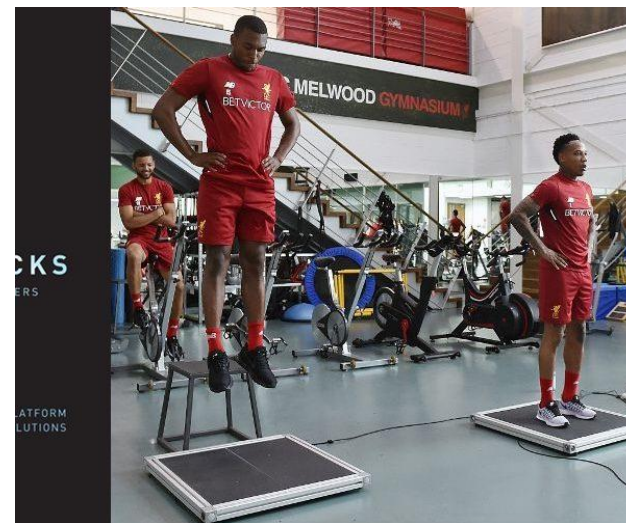
【肌力診斷：測力板科技】

閉鎖式動作鏈
伸張-收縮循環

針對各種特質執行實際情境評估

- 檢測器材相對昂貴，降低施測的便利與普遍性
- 資料分析與處理需要專業技術（費時）
- 可能是目前診斷動態離心肌力最有效率的方法

(Cheng & Chiang, 2022)



【肌力特質分類】

反應肌力

快速動態肌力

Reactive
Strength

Fast Dynamic
Strength

爆發力/發力率

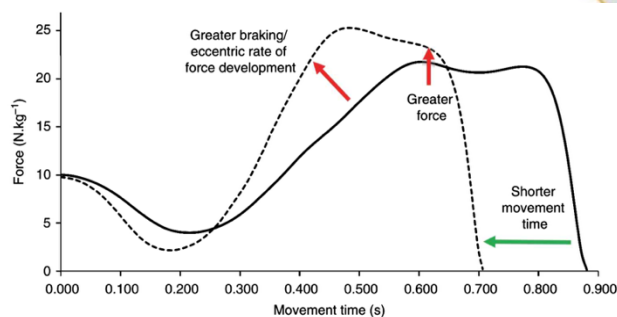
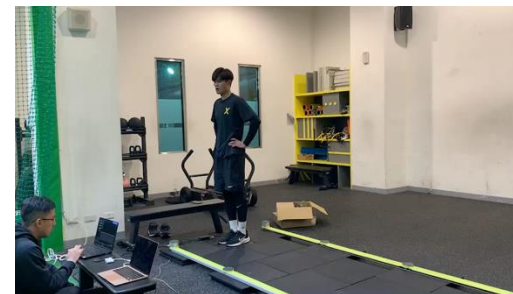
Explosive
Strength

Heavy Dynamic
Strength

重負荷動態肌力

Maximal Isometric
Strength

最大等長肌力



【肌力特質診斷方式】



反應肌力

快速動態肌力

Reactive Strength

Fast Dynamic Strength

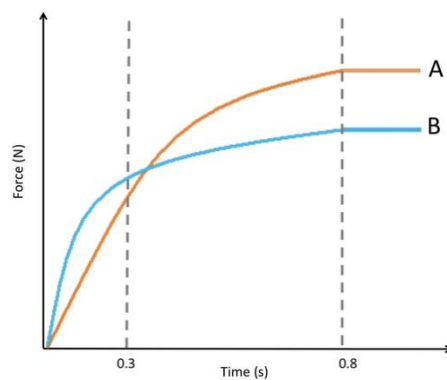


爆發力/發力率

Explosive Strength

Heavy Dynamic Strength

重負荷動態肌力



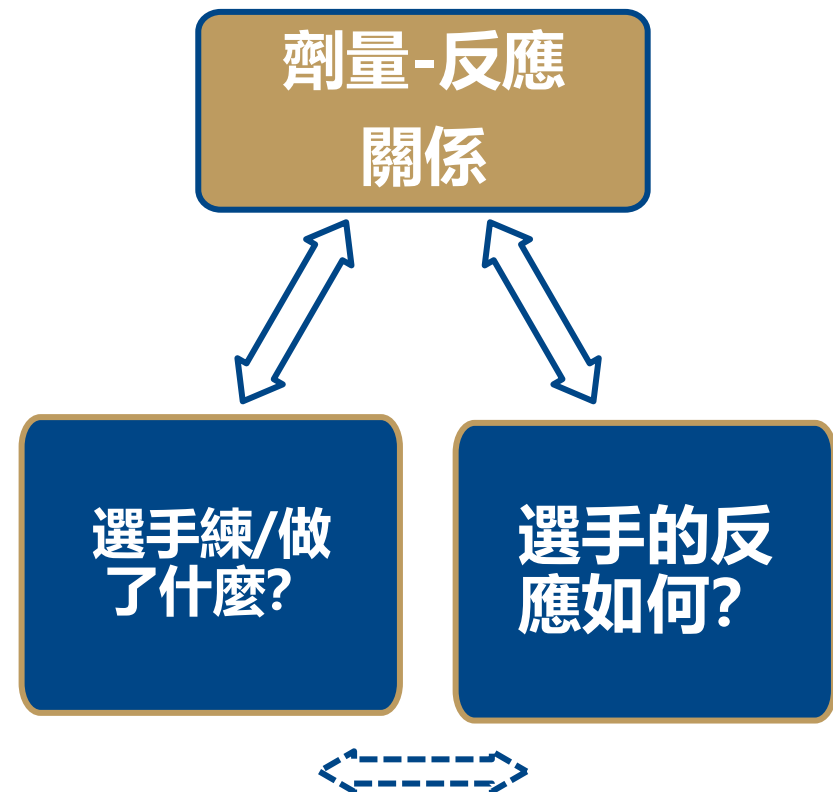
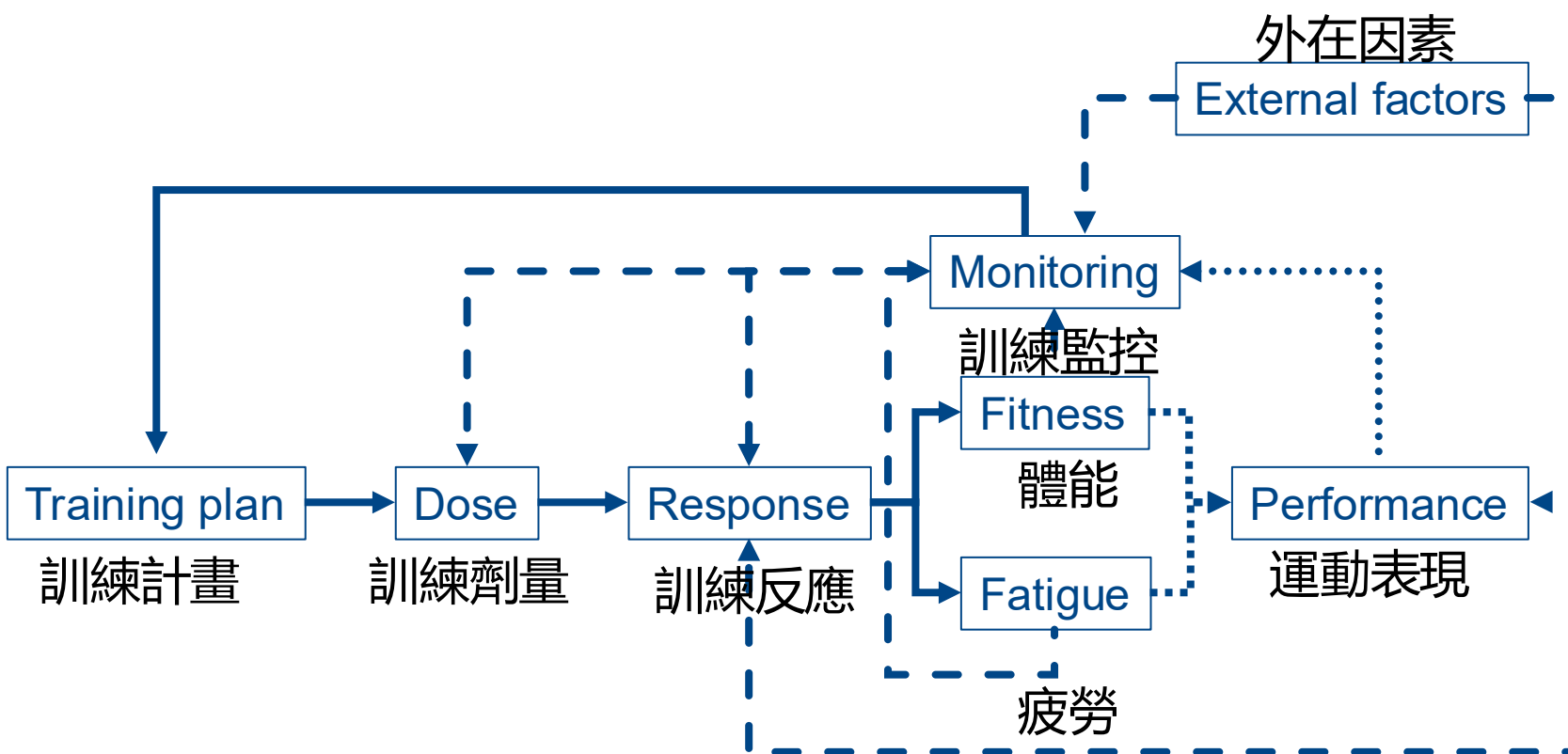
Maximal Isometric Strength

最大等長肌力



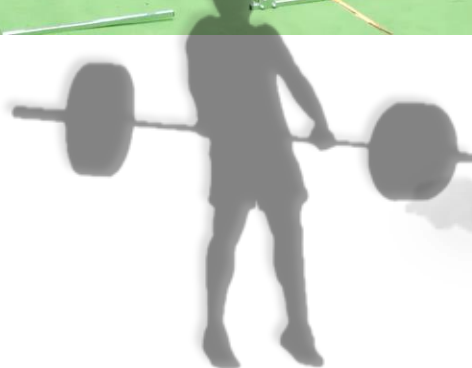
【訓練監控】

從問問題開始？

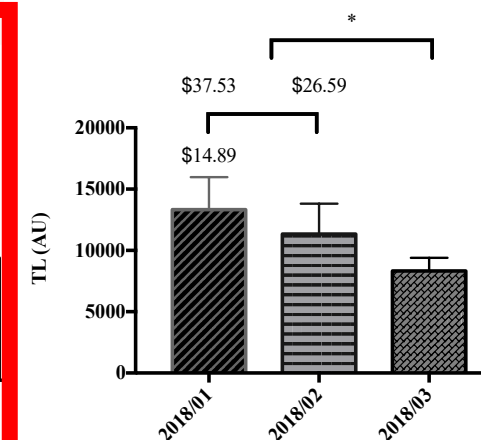
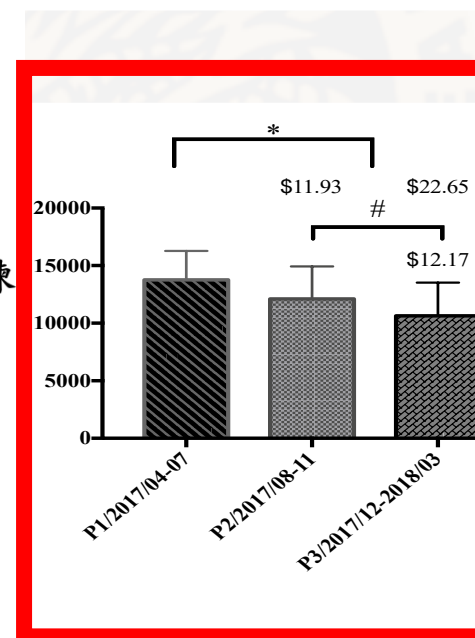
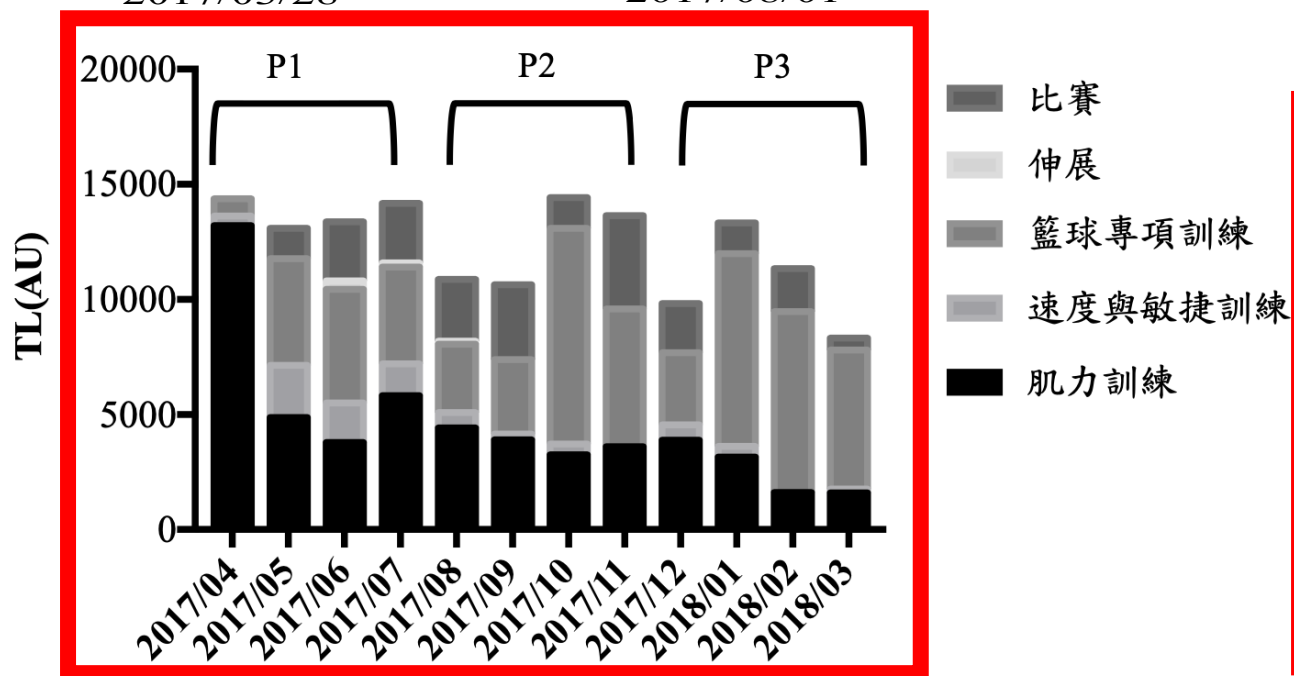
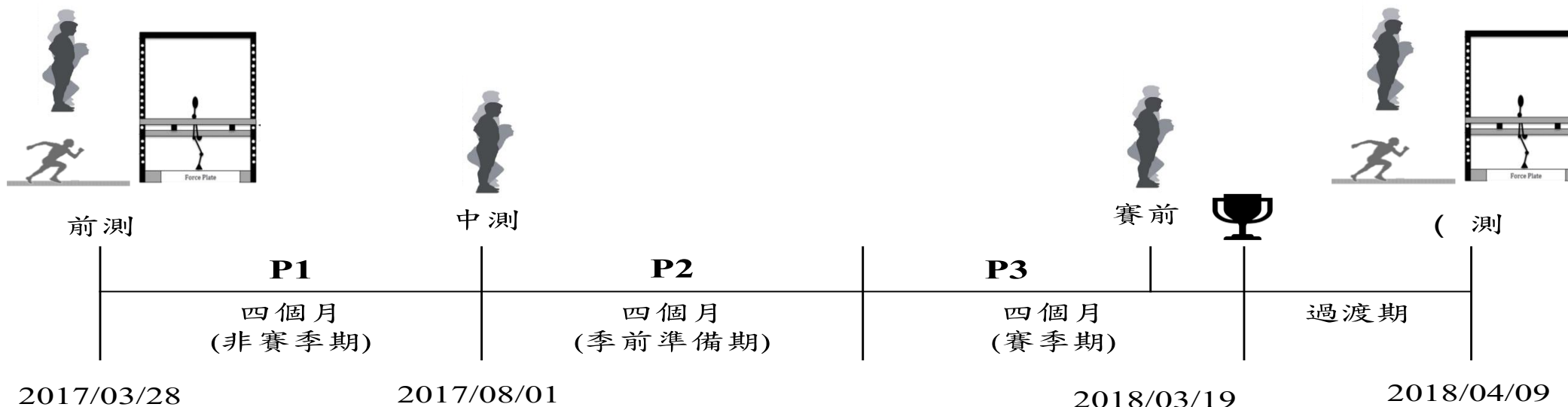


【力由地起：我的訓練有效嗎？】

Transfer force from the ground up



【肌力診斷在訓練監控之應用】



【肌力診斷在訓練監控之應用】

International Journal of Sports Physiology and Performance, 2025, 20, 1732-1738
<https://doi.org/10.1123/ijsp.2025-0167>
© 2025 Human Kinetics, Inc.

Human Kinetics
ORIGINAL INVESTIGATION

Annual Training Load and Jumping- and Sprinting-Characteristic Changes During a Periodized Training Plan in a Division I Male Championship Basketball Team

Chieh-Ying Chiang,^{1,2} Yi-Chien Chiang,³ Chien-Chun Chang,⁴ Matthew Morrison,⁵
and Jonathon Weakley^{6,7,8,9}

¹Department of Sports Training Science-Combats, National Taiwan Sport University, Taoyuan, Taiwan; ²Taiwan Institute of Sports Science, Kaohsiung, Taiwan; ³Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University, Taoyuan, Taiwan; ⁴Department of Sports Medicine, China Medical University, Taichung, Taiwan; ⁵Centre for Human Factors and Sociotechnical Systems, University of the Sunshine Coast, Sippy Downs, QLD, Australia; ⁶Sports Performance, Recovery, Injury and New Technologies (SPRINT) Research Centre, Australian Catholic University, Brisbane, QLD, Australia; ⁷School of Allied Health, Australian Catholic University, Brisbane, QLD, Australia; ⁸Carnegie Applied Rugby Research (CARR) Centre, Carnegie School of Sport, Leeds Beckett University, Leeds, United Kingdom; ⁹National Rugby Training Centre, Rugby Australia, Brisbane, QLD, Australia

Purpose: Optimizing performance while managing training load (TL) is a constant goal in high-performance sport. However, there is limited evidence on how year-long TL variations influence jumping and sprinting characteristics in collegiate basketball. This study aimed to analyze changes in TL and physical performance in a Taiwanese collegiate men's basketball team during a full year-long season. **Methods:** Ten male basketball players who participated in a collegiate basketball training program were assessed using the countermovement jump (CMJ) and 20-m sprint test before the off-season (T1) and after the season (T4). In addition to the pretest and posttest, CMJ was assessed after the preparation phase (T2) and the precompetition phase (T3) to understand training adaptations. Session rating of perceived exertion was collected after each training session to calculate TL. Monthly TL values were then compared with those of the preceding month. CMJ, sprinting, and TL differences between time points were compared. Significance level was set at $P < .05$. **Results:** CMJ height significantly increased at T2 ($P = .04$) and was maintained until T4. Twenty-meter sprint time did not significantly differ between T1 and T4. Monthly TL significantly decreased between off-season and preseason, as well as between off-season and precompetition phases ($P < .001$). **Conclusions:** These findings suggest that the athletes improved CMJ and maintained sprint performance throughout the training plan. Tapering achieved through the manipulation of TL may improve performance outcomes before important competitions.

Keywords: training monitoring, periodization, countermovement jump, tapering, strength and conditioning

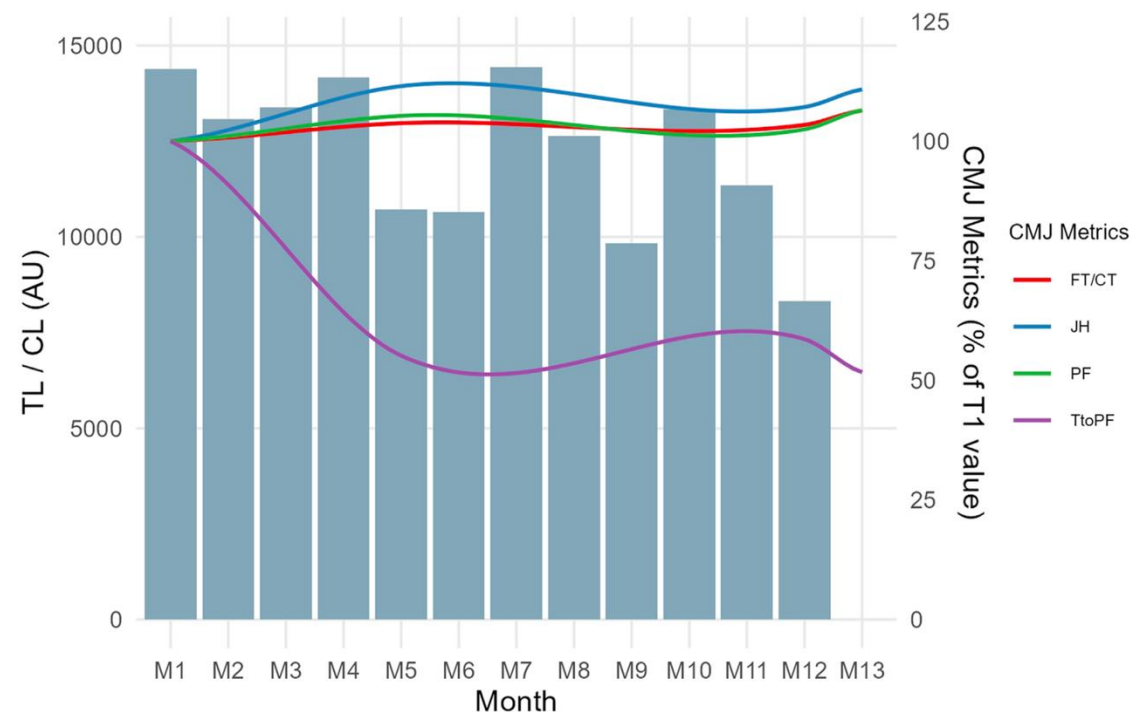


Figure 3 — Relationships between monthly TL, CL, and CMJ metrics. Note: CMJ metrics changes were described with percentages compared with the pretest (T1). AU indicates arbitrary units; CL, competition load; CMJ, countermovement jump; FT/CT, flight time/contact time ratio; JH, jump height; PF, peak force; TL, training load; TtoPF, time to peak force.



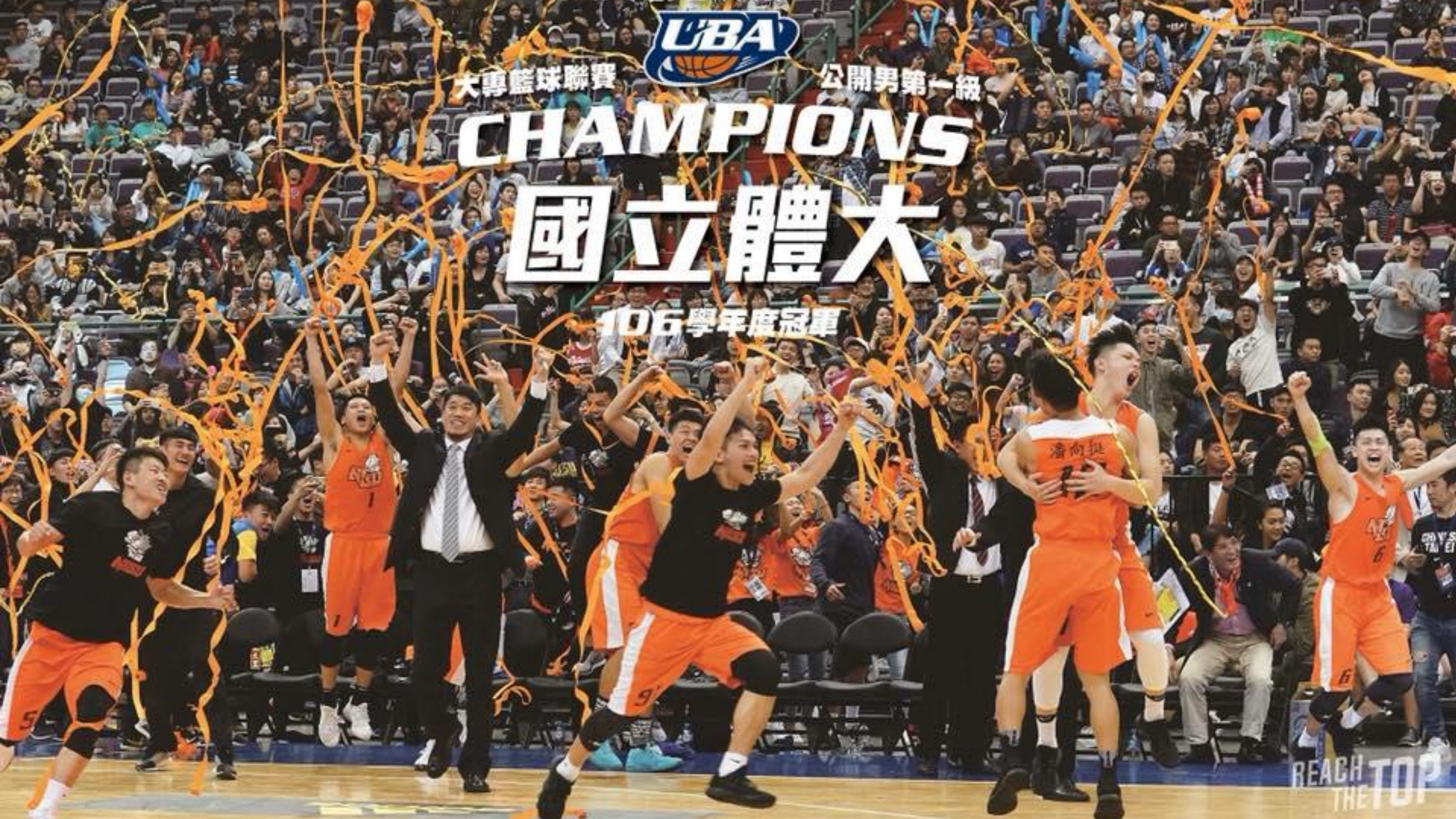
大專籃球聯賽

公開男第一級

CHAMPIONS

國立體大

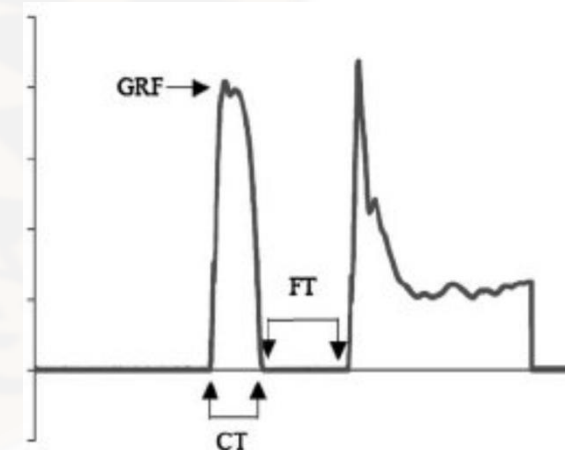
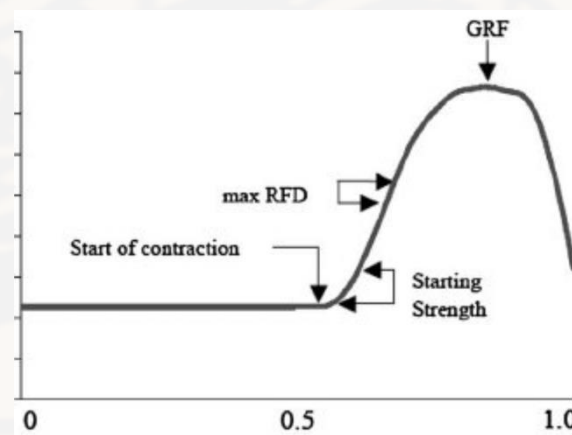
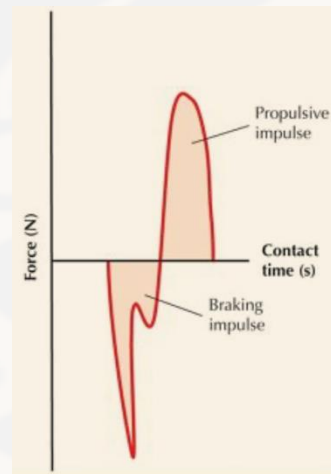
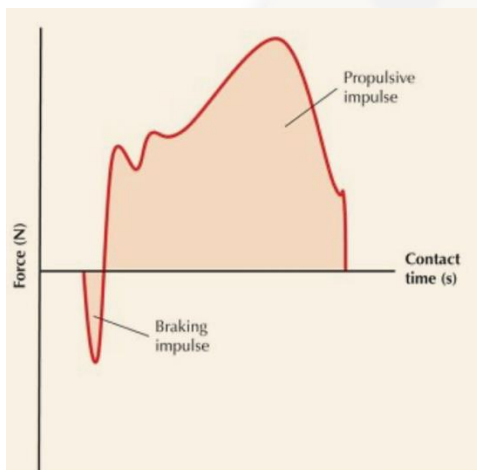
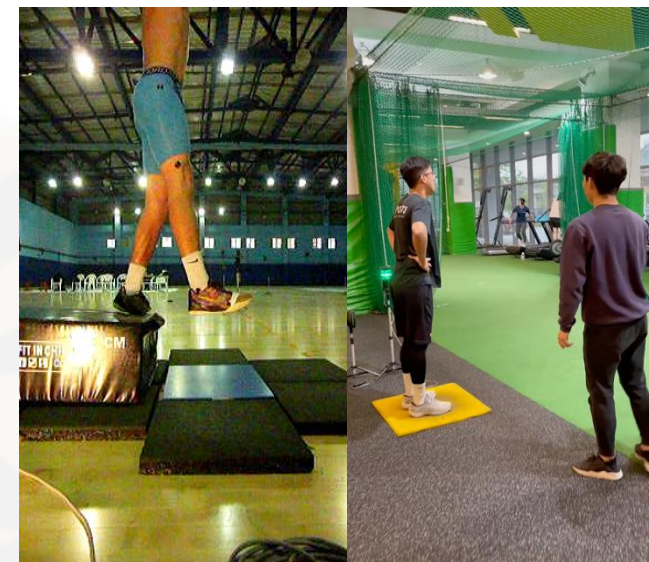
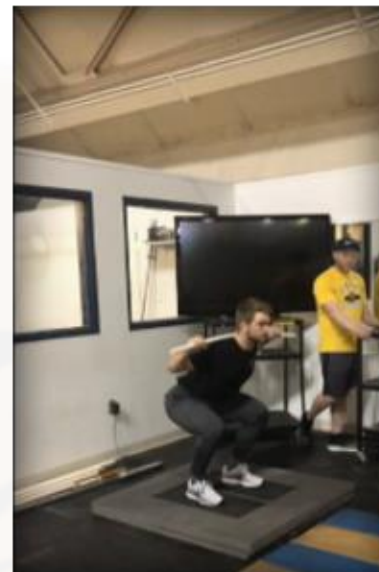
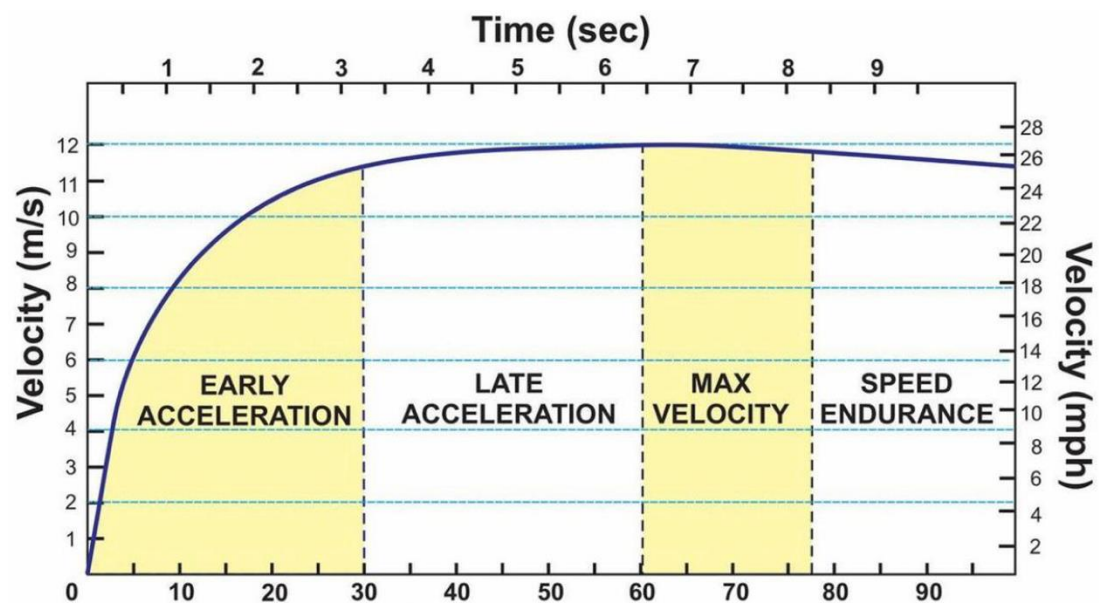
106學年度冠軍



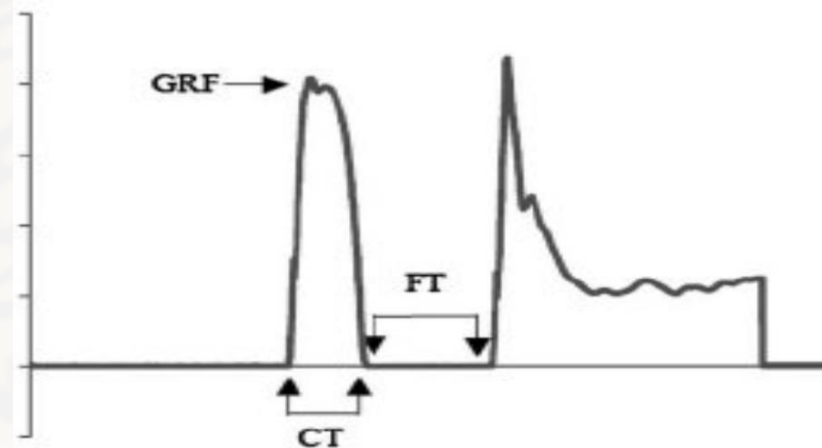
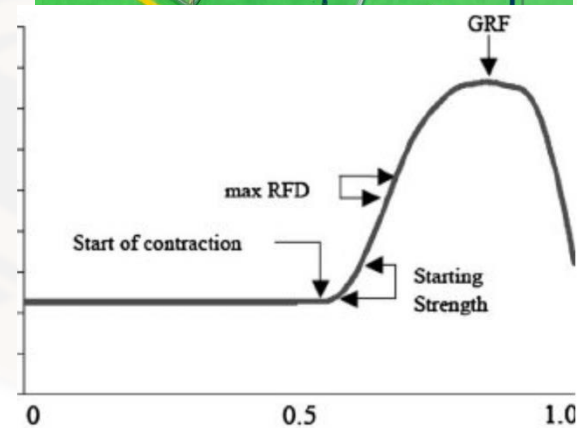
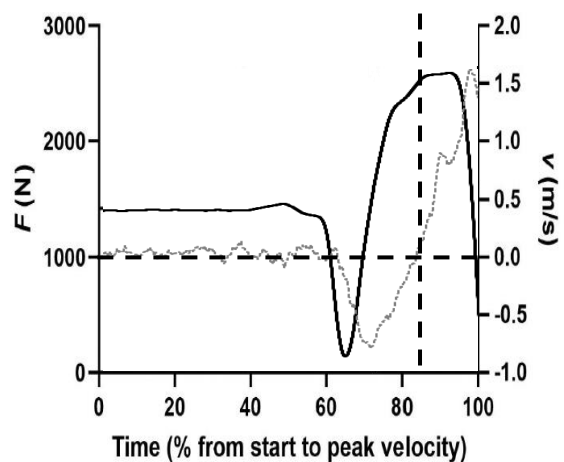
REACH THE TOP



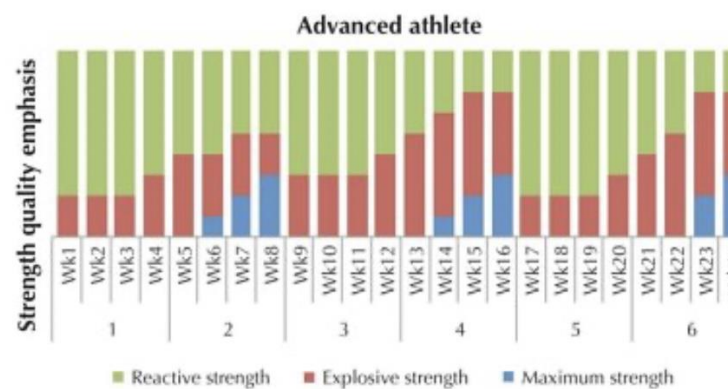
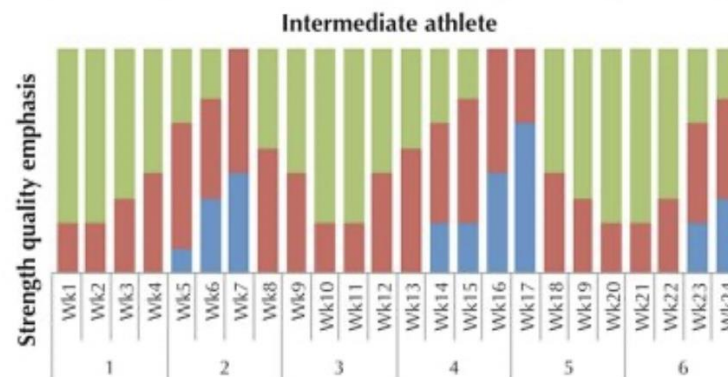
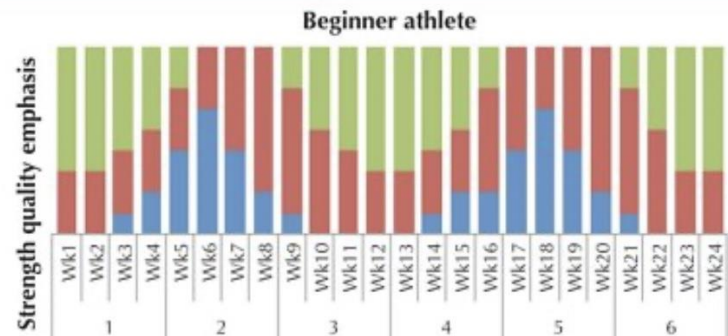
【肌力診斷引導訓練動作選擇】



【肌力診斷引導訓練動作選擇】



【肌力診斷引導訓練動作選擇】



【以測力板進行肌力診斷：還有誰需要？】

訓練評估
肌力/肉質量提升

體適能愛好者



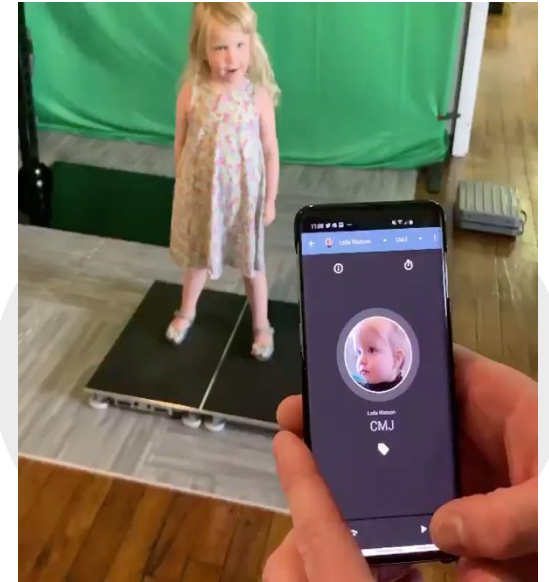
運動表現
疲勞監控
選材

運動員



傷害預防
傷後復健

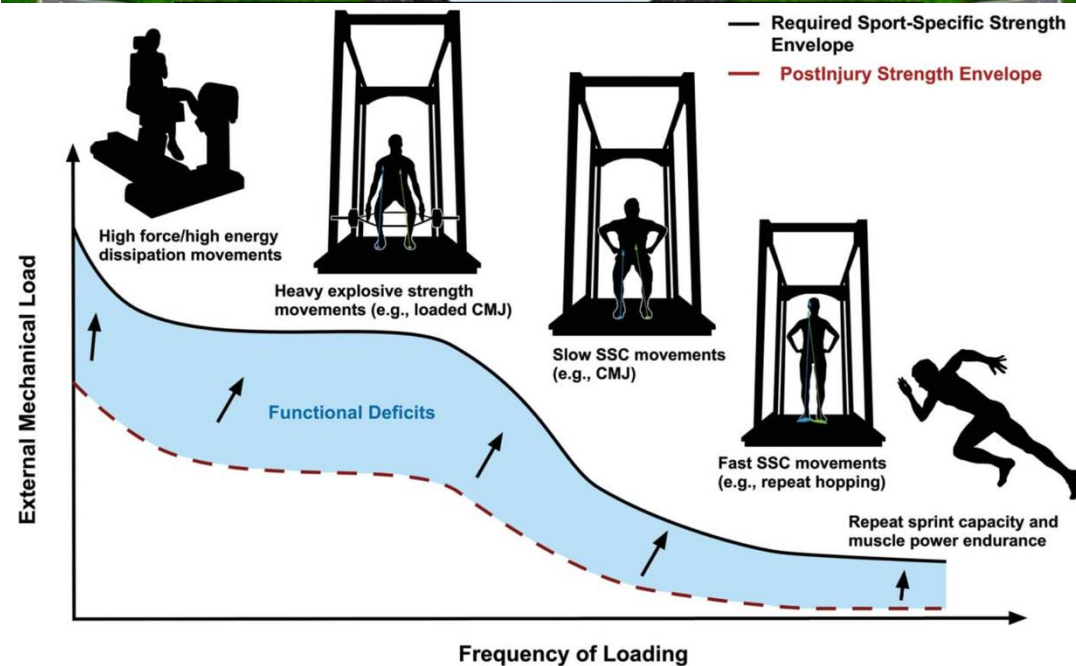
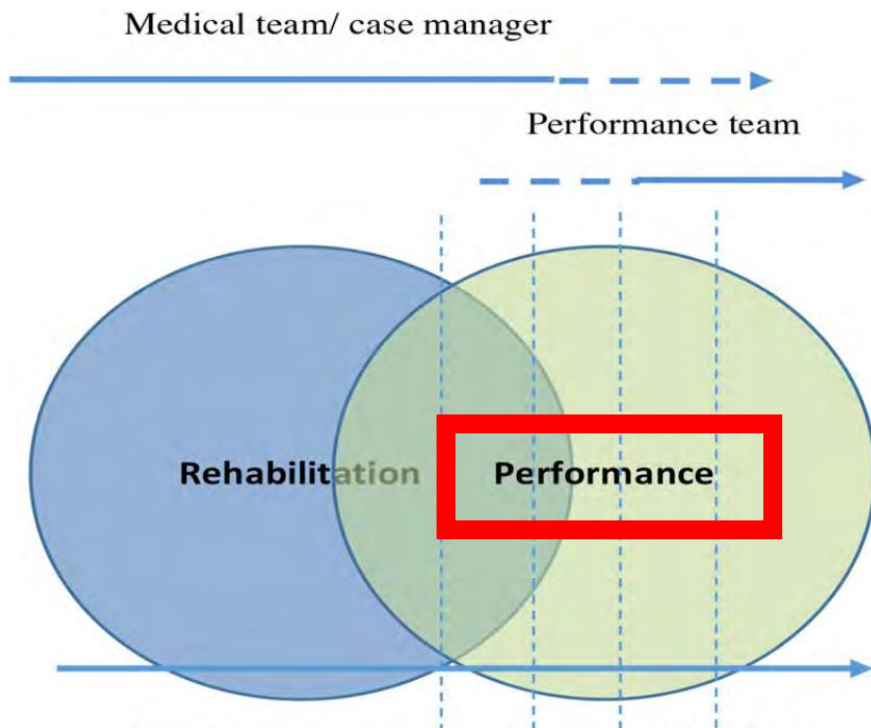
運動醫學專家



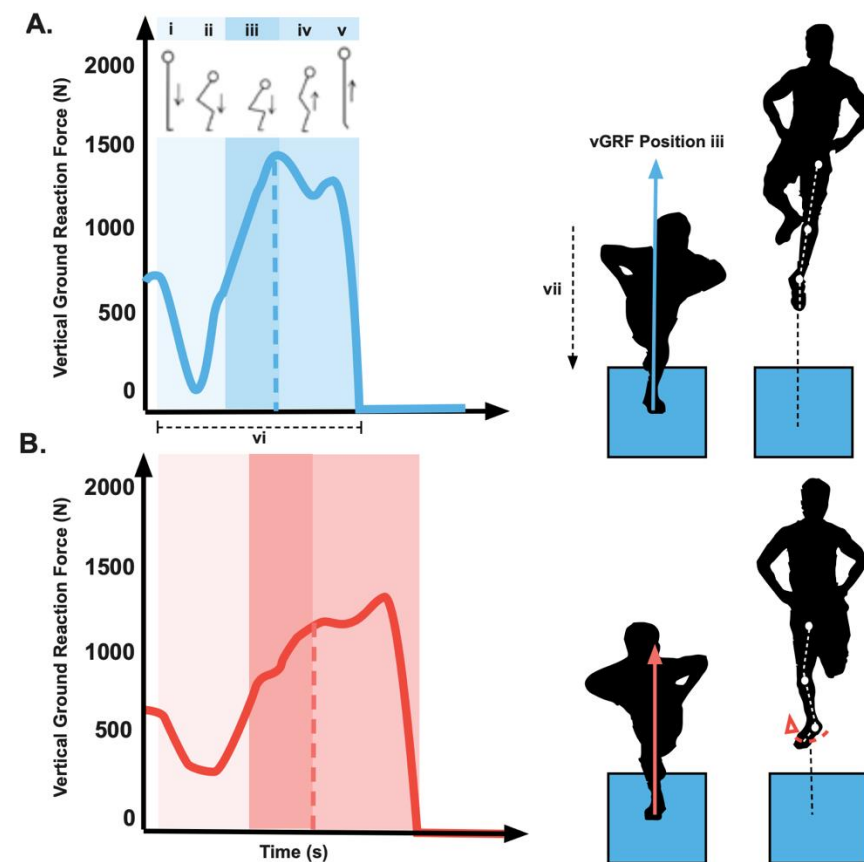
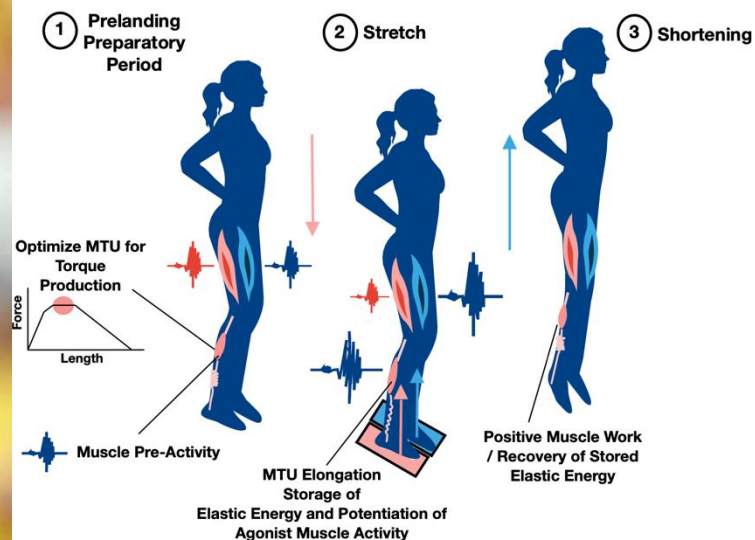
特殊族群



【最終目標：不只回場，還要突破表現】



【肌力診斷成為運動醫學的一環】



(Jordan et. al, 2023)

【肌力診斷成為運動醫學的一環】

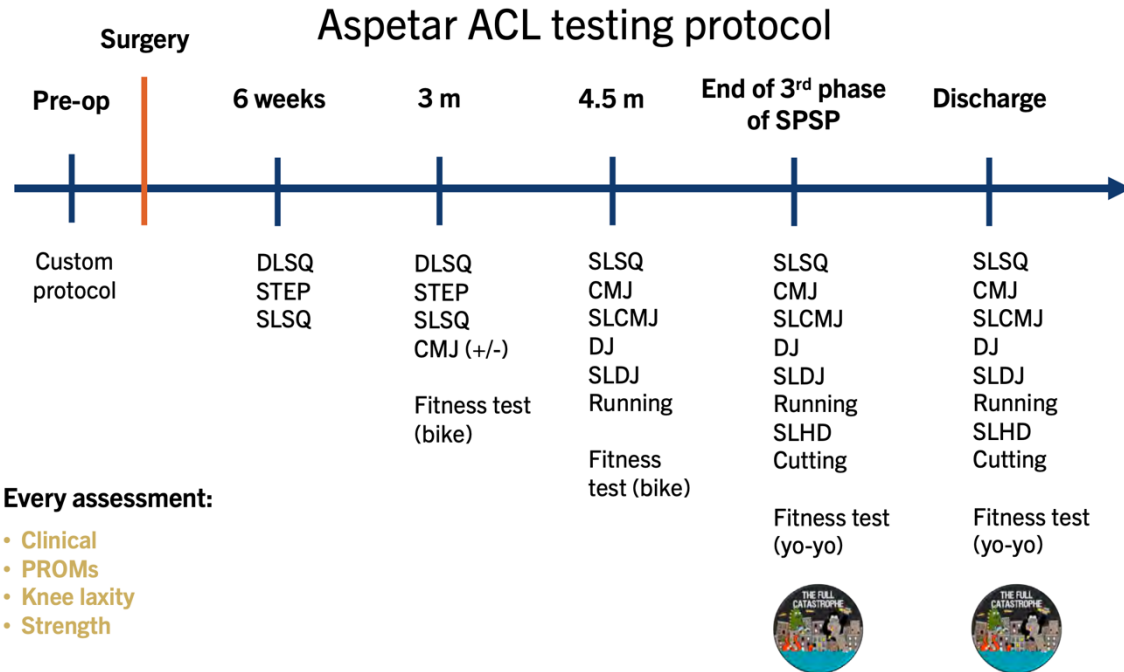


Figure 1: Summary of Aspetar ACLR testing battery. SPSP, sport-specific training; PROM, patient-reported outcome measures; DLSQ, double leg squat; SLSQ, single leg squat; STEP, step down; CMJ, countermovement jump; DJ, 2 leg drop jump; SLCMJ, single leg countermovement jump; SLDJ, single leg drop jump; SLHD, single leg hop for distance; CoD, change of direction.

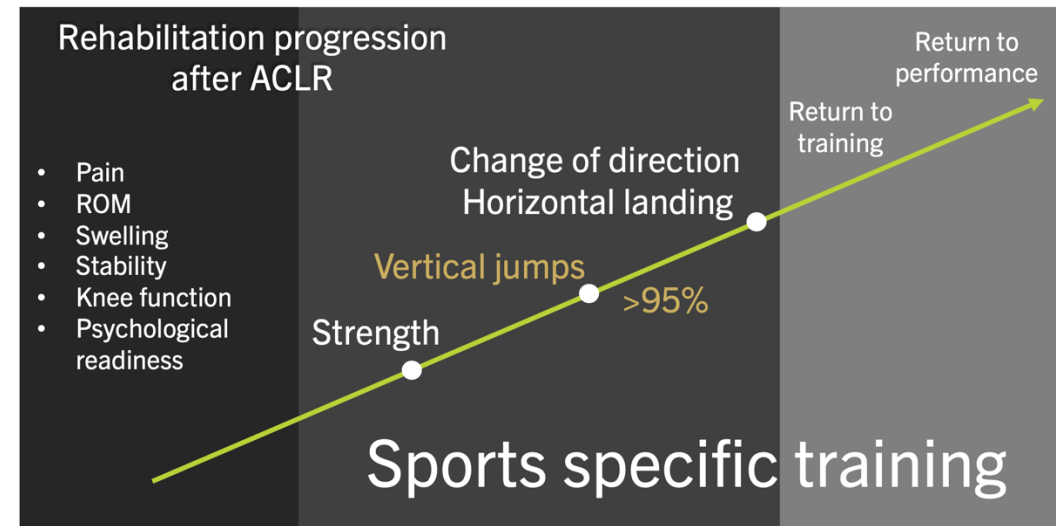
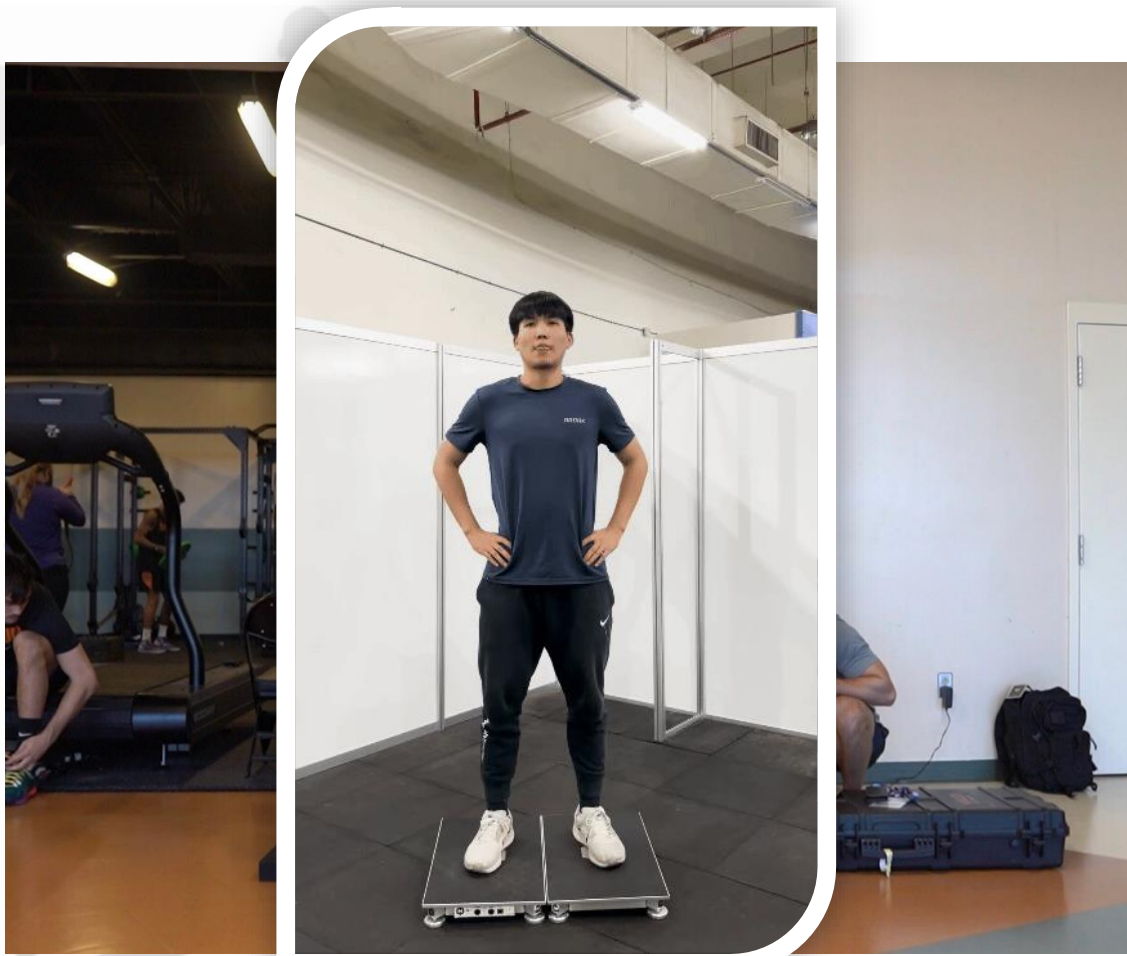


FIGURE 3. Injury-specific load planning considerations and associated strength and power "diagnostics" for phase progression during return to sport pathway. ISO = isometric; abd = abduction; add = adduction; IR = internal rotation; ER = external rotation; ECC = eccentric; CON = concentric; ext = extension; DL = double-leg; SL = single-leg; CMJ = countermovement jump; CM = countermovement; DYN = dynamic; DJ = drop jump; SJ = squat jump; quad = quadriceps. Please see TABLE 1 for more detail relating to strength and power "diagnostics."

【利用反向跳CMJ作為訓練監控的工具】



- 絕對跳躍高度
- 訓練適應檢視（肌力）
- 神經肌肉疲勞追蹤
 - 不只是『高度』
 - 發力速率（離心減速階段）
 - 整體動作時間
- 受傷復健到重回運動表現
- 長期運動員發展



【以垂直跳作為訓練監控的工具】

『跳高』不是唯一重點！是整體神經肌肉系統功能的呈現

Shorter 短期

Timescale

長期 Longer

Fatigue Management 疲勞管理

Balsalobre-Fernández, C., Tejero-González, C. M., & del Campo-Vecino, J. (2014). Relationships between training load, salivary cortisol responses and performance during season training in middle and long distance runners. *PloS one*, 9(8), e106066.

Gathercole, R., Sporer, B., Stellingwerff, T., & Sleivert, G. (2015). Alternative countermovement-jump analysis to quantify acute neuromuscular fatigue. *International journal of sports physiology and performance*, 10(1), 84-92.

Bell, D. R., Pennuto, A. P., & Trigsted, S. M. (2016). The effect of exertion and sex on vertical ground reaction force variables and landing mechanics. *Journal of Strength and Conditioning Research*, 30(6), 1661-1669.

Bromley, T., Turner, A. N., Read, P., Lake, J., Maloney, S., Chavda, S., & Bishop, C. (2018). Effects of a competitive soccer match on jump performance and interlimb asymmetries in elite academy soccer players. *Journal of Strength and Conditioning Research*.

Bishop, C., Read, P., Chavda, S., Jarvis, P., Brazier, J., Bromley, T., & Turner, A. (2020). Magnitude or Direction? Seasonal Variation of Interlimb Asymmetry in Elite Academy Soccer Players. *Journal of Strength and Conditioning Research*.

Kons, R. L., Orssatto, L. B. D. R., Sakugawa, R. L., da Silva Junior, J. N., Diefenthaler, F., & Detanico, D. (2020). Effects of stretch-shortening cycle fatigue protocol on lower limb asymmetry and muscle soreness in judo athletes. *Sports Biomechanics*, 1-16.

Stone, B. L., & Schilling, B. K. (2020). Neuromuscular Fatigue in Pitchers Across a Collegiate Baseball Season. *The Journal of Strength & Conditioning Research*, 34(7), 1933-1937.

Wu, P. P. Y., Sterkenburg, N., Everett, K., Chapman, D. W., White, N., & Mengersen, K. (2019). Predicting fatigue using countermovement jump force-time signatures: PCA can distinguish neuromuscular versus metabolic fatigue. *PloS one*, 14(7), e0219295.

Training Efficacy 訓練效益

Cohen, D. D., Restrepo, A., Richter, C., Harry, J. R., Franchi, M. V., Restrepo, C., ... & Taberner, M. (2020). Detraining of specific neuromuscular qualities in elite footballers during COVID-19 quarantine. *Science and Medicine in Football*, 1-6.

Cormie, P., McBride, J. M., & McCaulley, G. O. (2009). Power-time, force-time, and velocity-time curve analysis of the countermovement jump: impact of training. *The Journal of Strength & Conditioning Research*, 23(1), 177-186.

Mayberry, J. K., Patterson, B., & Wagner, P. (2018). Improving vertical jump profiles through prescribed movement plans. *The Journal of Strength & Conditioning Research*, 32(6), 1619-1626.

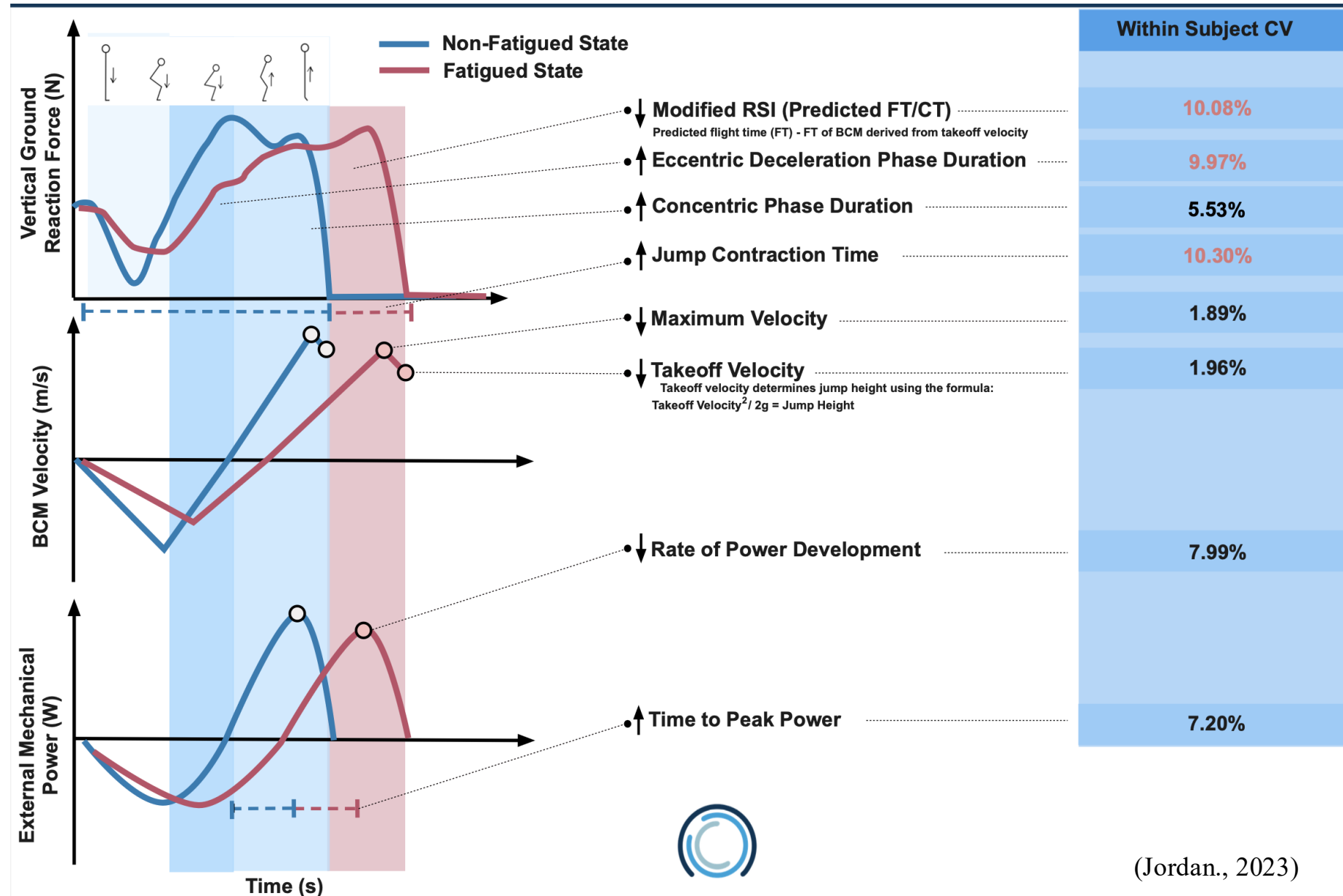
Pattison, K. J., Drinkwater, E. J., Bishop, D. J., Stepto, N. K., & Fyfe, J. J. (2020). Modulation of Countermovement Jump-Derived Markers of Neuromuscular Function With Concurrent vs. Single-Mode Resistance Training. *The Journal of Strength & Conditioning Research*, 34(6), 1497-1502.

Taylor, K. L., Hopkins, W. G., Chapman, D. W., & Cronin, J. B. (2016). The influence of training phase on error of measurement in jump performance. *International Journal of Sports Physiology and Performance*, 11(2), 235-239.

Malone, J. J., Murtagh, C. F., Morgans, R., Burgess, D. J., Morton, J. P., & Drust, B. (2015). Countermovement jump performance is not affected during an in-season training microcycle in elite youth soccer players. *The Journal of Strength & Conditioning Research*, 29(3), 752-757.

Toumi, H., Best, T. M., Martin, A., & Poumarat, G. (2004). Muscle plasticity after weight and combined (weight+ jump) training. *Medicine and science in sports and exercise*, 36(9), 1580-1588.

【Countermovement Jump(CMJ)在神經肌肉疲勞追蹤參數說明】



(Jordan., 2023)

【Countermovement Jump(CMJ)在神經肌肉疲勞追蹤】



International Journal of
Environmental Research
and Public Health



大專體育學刊
第23卷 第4期 · 419-431頁 (2021年12月)
DOI:10.5297/ser.202112_23(4).0006

419

Article

Effect of Acute Judo Training on Countermovement Jump Performance and Perceived Fatigue among Collegiate Athletes

Chien-Chun Chang ¹, Tzu-Yi Chen ², Chia-Luan Wu ³, Pi-Yen Ho ³ and Chieh-Ying Chiang ^{3,*}

- ¹ Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University, Taoyuan 333, Taiwan
 - ² Department of Athletic Training and Health, National Taiwan Sport University, Taoyuan 333, Taiwan
 - ³ Department of Sports Training Science-Combats, National Taiwan Sport University, Taoyuan 333, Taiwan
- * Correspondence: markchiang@ntsus.edu.tw

extremity (mRPE_{leg}) exhibited a low-to-moderate level of negative correlation with JH, PP, and PV in the CMJ_{unloaded} and CMJ_{loaded} ($r = -0.052$ to -0.391) (Table 3).

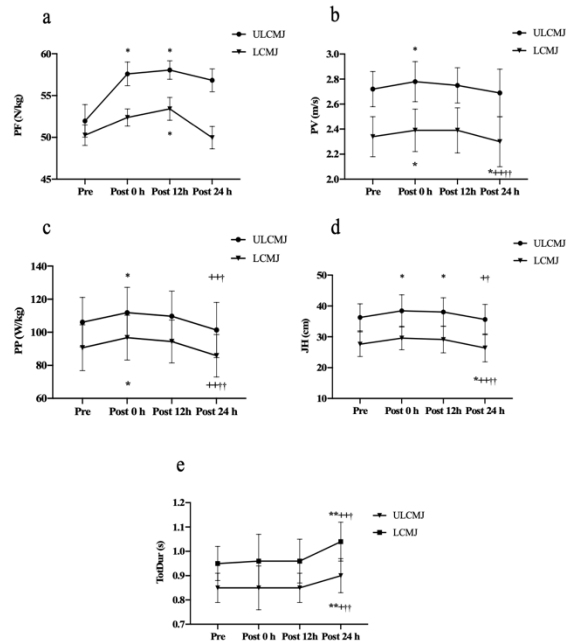


Figure 1. CMJ_{unloaded} and CMJ_{loaded} parameters at different points in time. **, Significant compared with pre-test, $p < 0.05$, $p < 0.001$; +, +, + Significant compared with post-test at 0 h, $p < 0.05$, $p < 0.001$; +, +, + Significant compared with post-test at 12 h, $p < 0.05$, $p < 0.001$. peak force, PF (a); peak power, PP (b); peak velocity, PV (c); jump height, JH (d); total duration, TotDur (e).

高負荷量肌耐力訓練對優秀女籃選手反向跳力量—時間曲線之影響

張建淳¹、鄭慧芸²、蔡佑達³、江杰穎⁴

¹ 臺灣 桃園市 333 國立體育大學競技與教練科學研究所

² 臺灣 臺北市 111 中國文化大學體育系

³ 臺灣 新北市 251 國泰人壽女子籃球隊

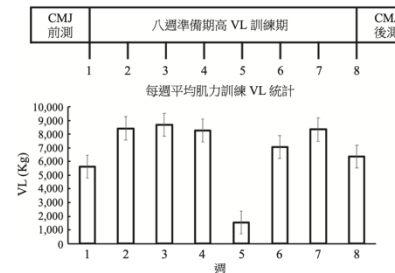
⁴ 臺灣 桃園市 333 國立體育大學技擊運動技術學系

通訊作者：江杰穎
通訊地址：333 桃園市龜山區文化一路 250 號
電話號碼：(03)328-3201 轉 2104
電子郵件：markchiang@ntsus.edu.tw
投稿日期：2020 年 10 月 11 日
接受日期：2021 年 5 月 5 日

表一 第 3 週選手肌耐力訓練課表相對強度與 VL 計算方式 (以其中 1 位選手為例)

訓練日	訓練動作	相對強度 (RI)	最大肌力 負荷 (kg)	反覆次數 (reps)	第 1 組 (kg)	第 2 組 (kg)	第 3 組 (kg)	總和 (kg)
一	懸垂上拉 (hang clean pull)	H = 90%	(1 RM = 35)	10	315	315	315	945
	地面上拉 (clean pull)	H = 90%	(1 RM = 35)	10	315	315	315	945
	直膝硬舉 (straight leg deadlift)	H = 90%	(1 RM = 35)	10	315	315	315	945
	站姿拉 (upright row)	H = 90%	(1 RM = 30)	10	270	270	270	810
	日總和							3,645
三	借力推 (push press)	H = 90%	(1 RM = 30)	10	270	270	270	810
	背蹲舉 (back squat)	H = 90%	(1 RM = 40)	10	360	360	360	1,080
	臥推 (bench press)	H = 90%	(1 RM = 30)	10	270	270	270	810
	日總和							2,700
五	地面上拉 (clean pull)	MH = 85%	(1 RM = 35)	10	297	297	297	891
	直膝硬舉 (straight leg deadlift)	MH = 85%	(1 RM = 35)	10	297	297	297	891
	站姿拉 (upright row)	MH = 85%	(1 RM = 35)	10	297	297	297	891
	日總和							2,673
	週總和							9,018

註：VL：負荷量 (volume load)；RI：相對強度法 (relative intensity)；H：XXXX (heavy)；MH：XXXXX (moderately heavy)；1RM：預估最大肌力 (one-repetition maximum)。每日 VL 計算方式：每個動作執行組數 × 反覆次數 × 重量總計為日總和。每週 VL 計算為 3 日總和 + VL 單位採公斤重 (kg) 統計。



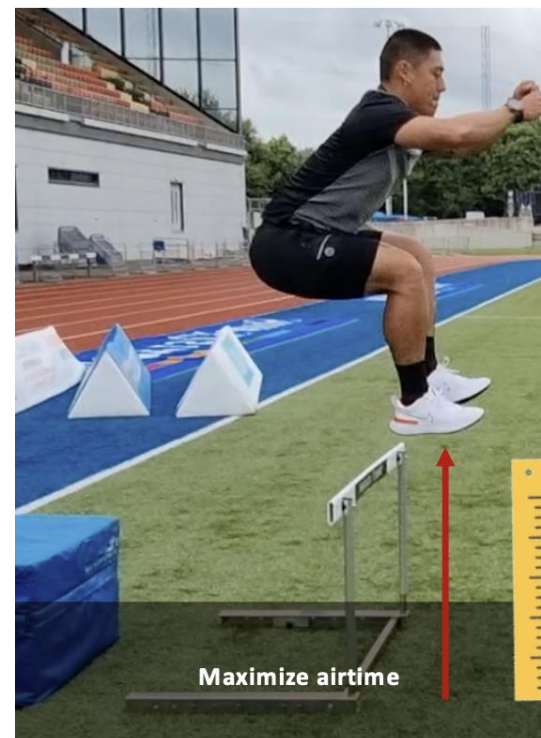
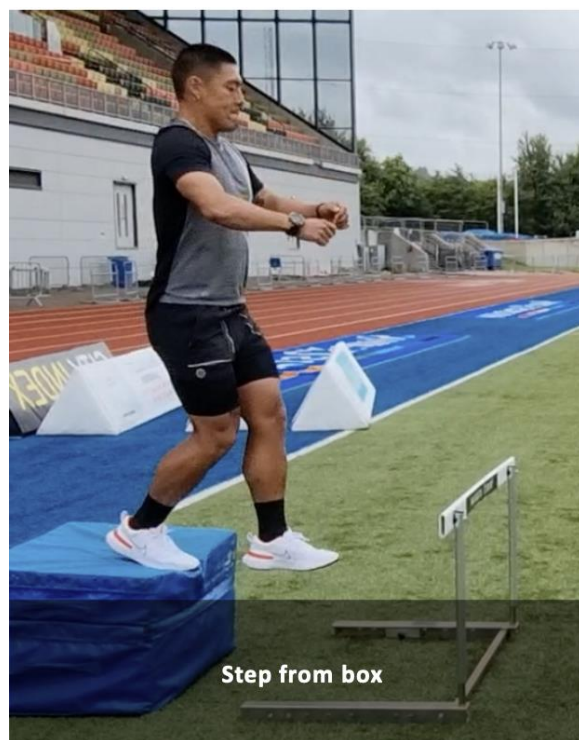
圖一 實驗設計架構與每週平均 VL 統計圖

註：CMJ：反向跳 (countermovement jump)；VL：負荷量 (volume load)。



【以垂直跳作為訓練監控的工具】

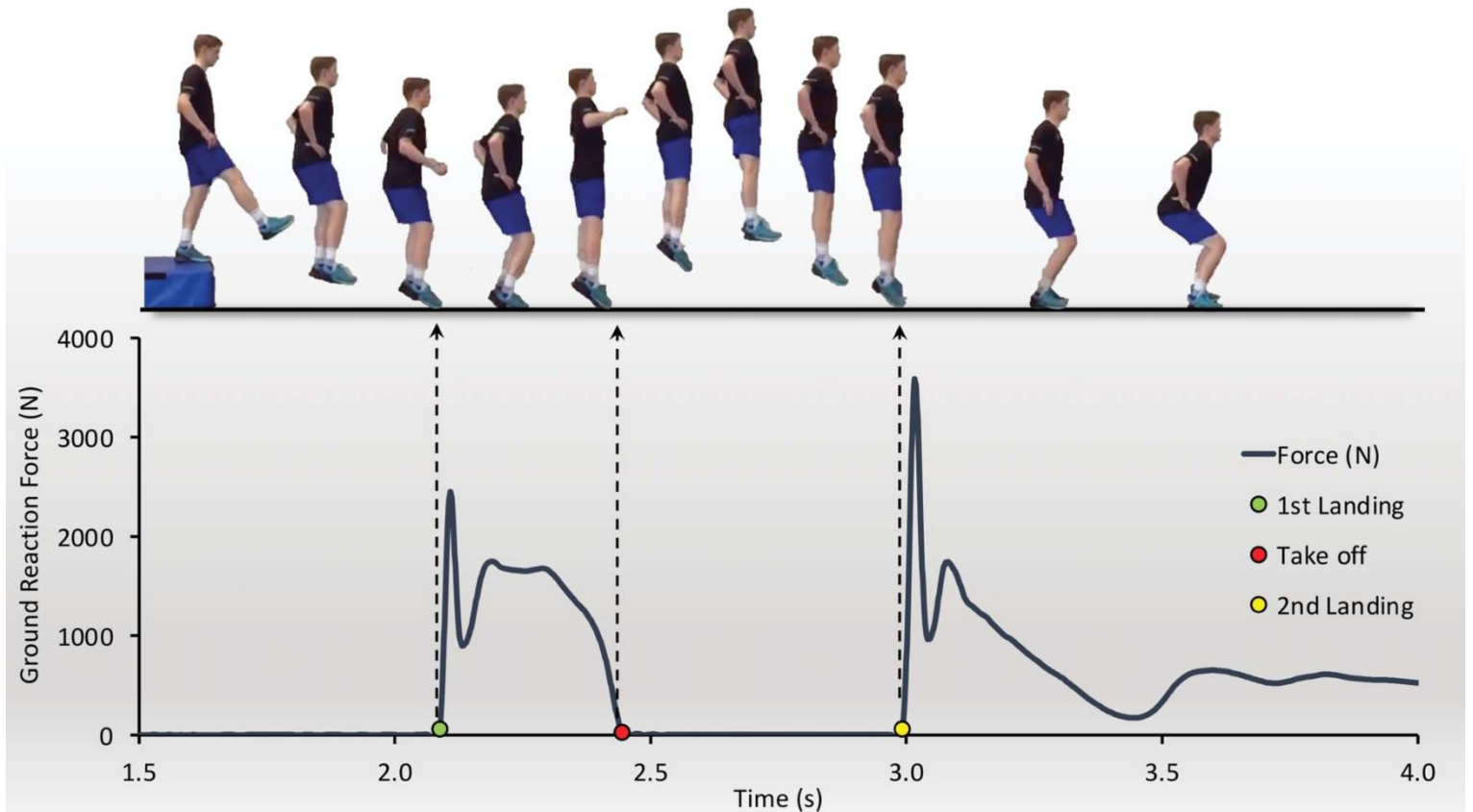
Reactive strength Index (RSI) 反應肌力指數



Drop jump

Reactive Strength Index (RSI)

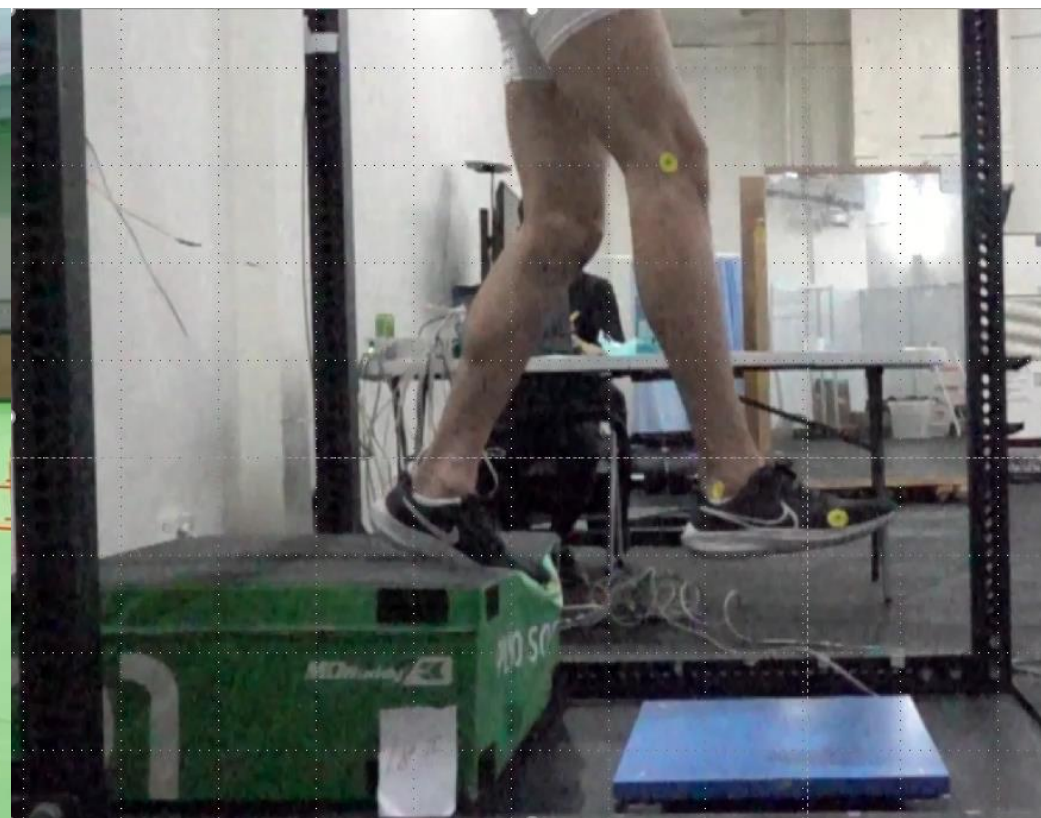
Fast Stretch and Shortening Cycling (Fast SSC) < 250ms



【以垂直跳作為訓練監控的工具】

腳踝勁度

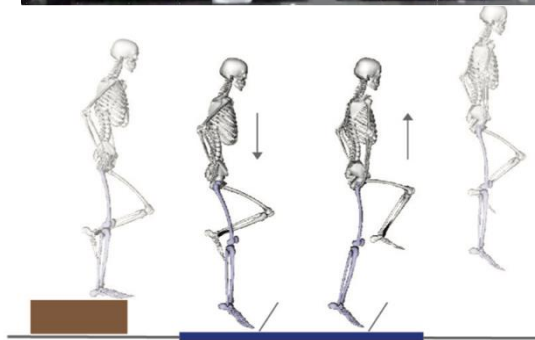
勁度: 落地時的反作用力和關節角度變化的比值



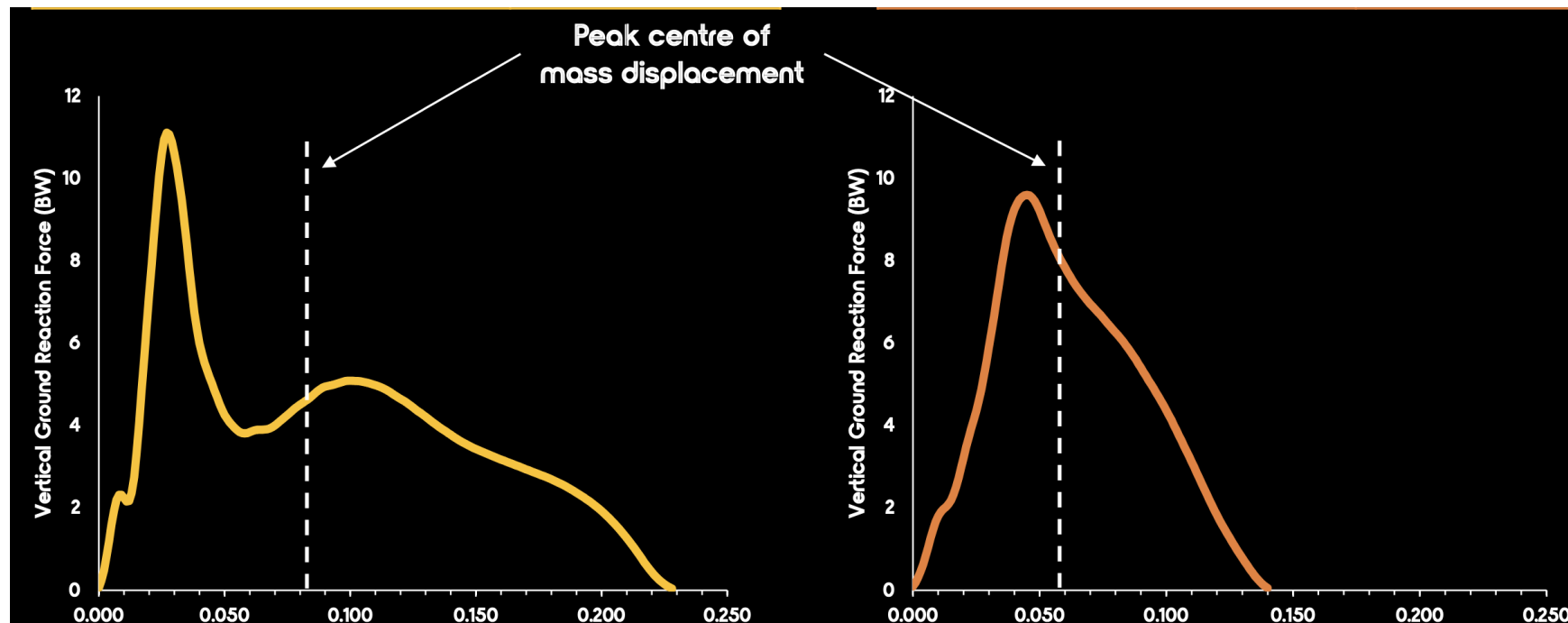
【以垂直跳作為訓練監控的工具】

腳踝勁度 Ankle stiffness

力量特徵: 高負荷率 (最高衝擊發生在前20%), 觸地時間長



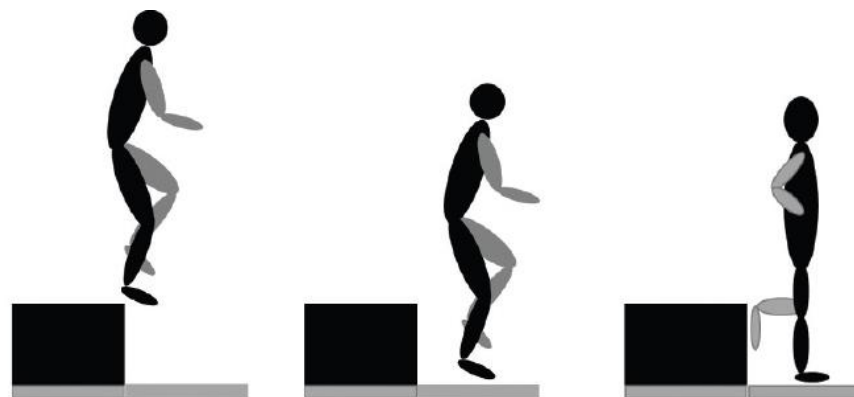
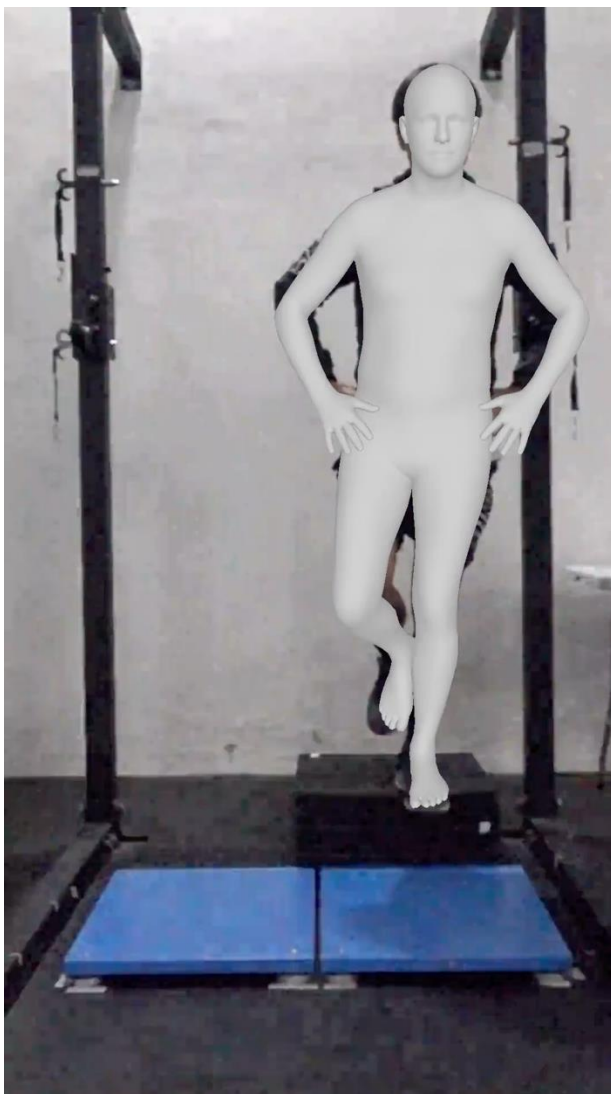
SLDJ



【以垂直跳作為訓練監控的工具】

腳踝動態穩定

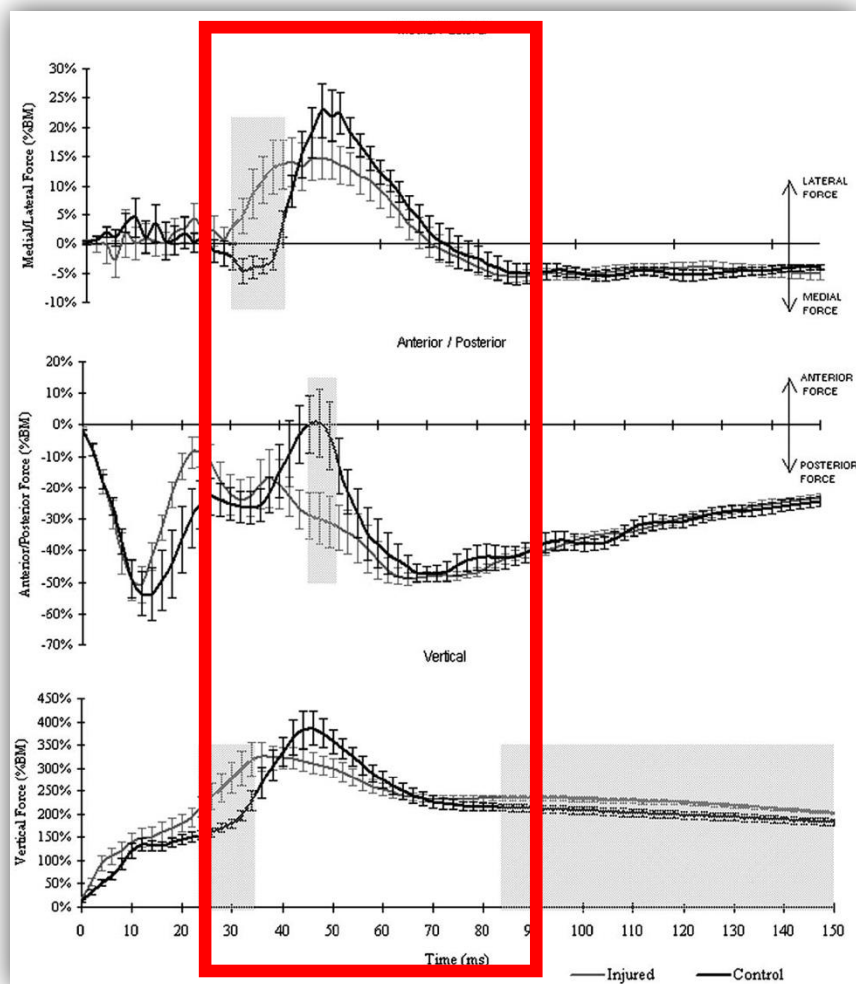
單腳落下穩定



(Dury et al., 2024)

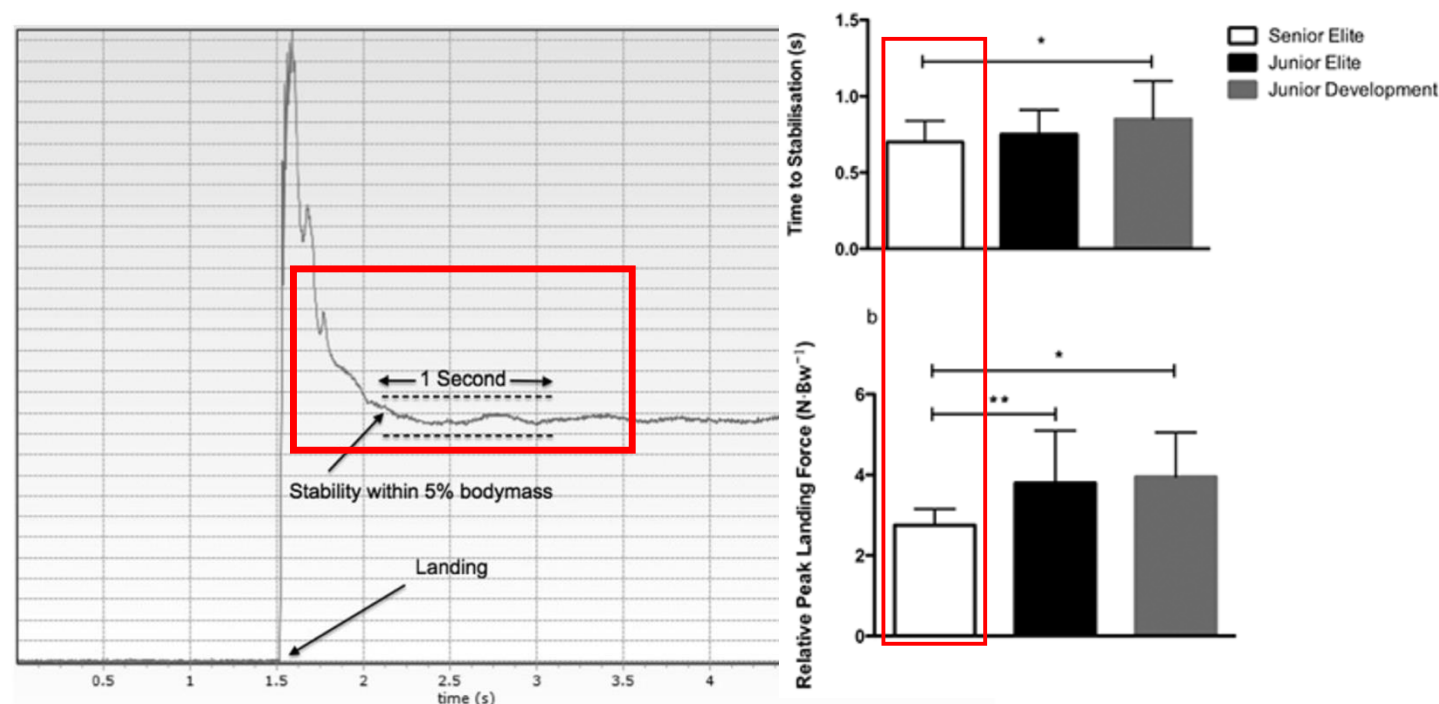
【以垂直跳作為訓練監控的工具】

CAI 慢性踝關節不穩定有更大的衝擊 (垂直/前後/左右) 需要達到穩定的時間更長(TTS)



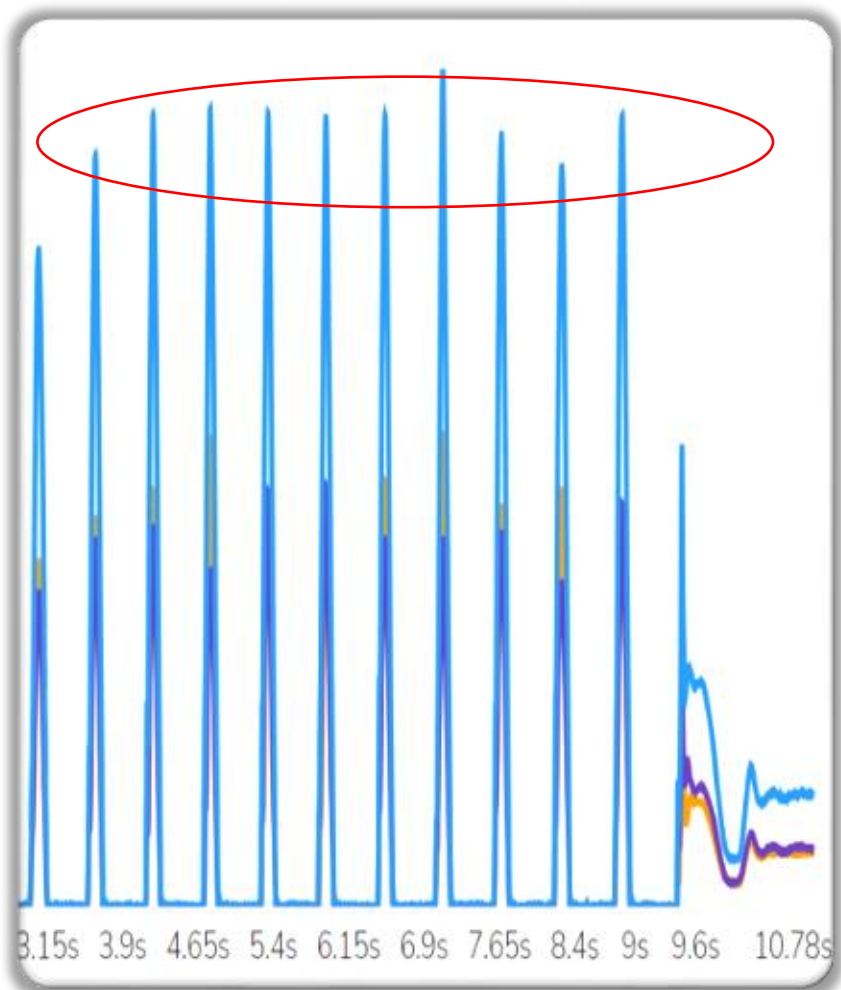
優秀運動員

- 更短的TTS
- 較低的衝擊 (落地技巧、變異性)



(Herb et al., 2018; Tran et al., 2015)

【Repeated jump/ 10/5 jumps 連續跳】



連續跳測驗可觀察

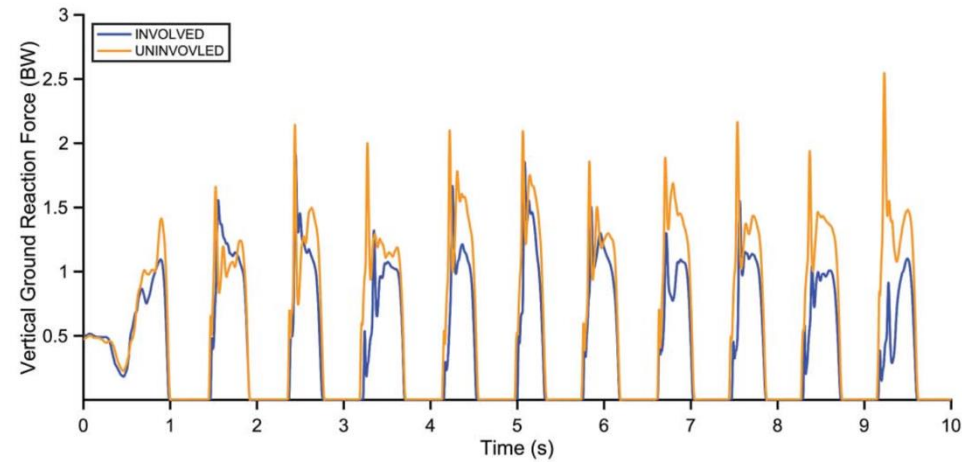
- 力量是否可以穩定產生
- 下肢型變程度（承重時）
- 落地策略（落地位置）
- 尚需要更多研究瞭解其應用

(Stratford et al., 2021; Southey et al., 2024)

【Tuck jumps收腳連續跳】



(Kember et al., 2025)



Variable	Involved mean (SD)	Uninvolved mean (SD)
Peak braking force (BW)	1.52 (0.28)	1.98 (0.16)
Peak propulsive force (BW)	1.17 (0.12)	1.44 (0.18)
Ground contact time (s)	0.41 (0.05)	0.44 (0.04)
Leg stiffness (kN·m ⁻¹)	4.93 (1.37)	6.35 (1.05)
Braking impulse (BW·s)	0.20 (0.03)	0.25 (0.04)
Propulsive impulse (BW·s)	0.16 (0.02)	0.24 (0.01)
Braking : propulsive ratio	1.31 (0.21)	1.06 (0.16)
Jump height (m)	0.21 (0.01)	
Displacement (m)	0.32 (0.04)	

收腳連續跳測驗可觀察

- 力量是否可以穩定產生（雙腳）、
- 觸地時間、煞車Braking/推進Propulsive的力量和比值

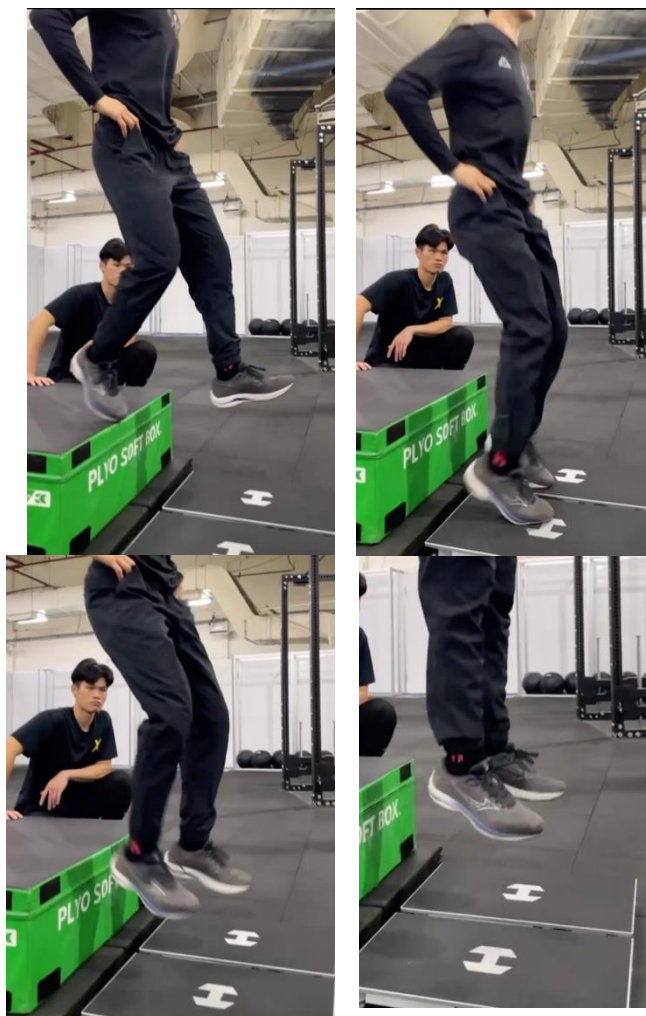
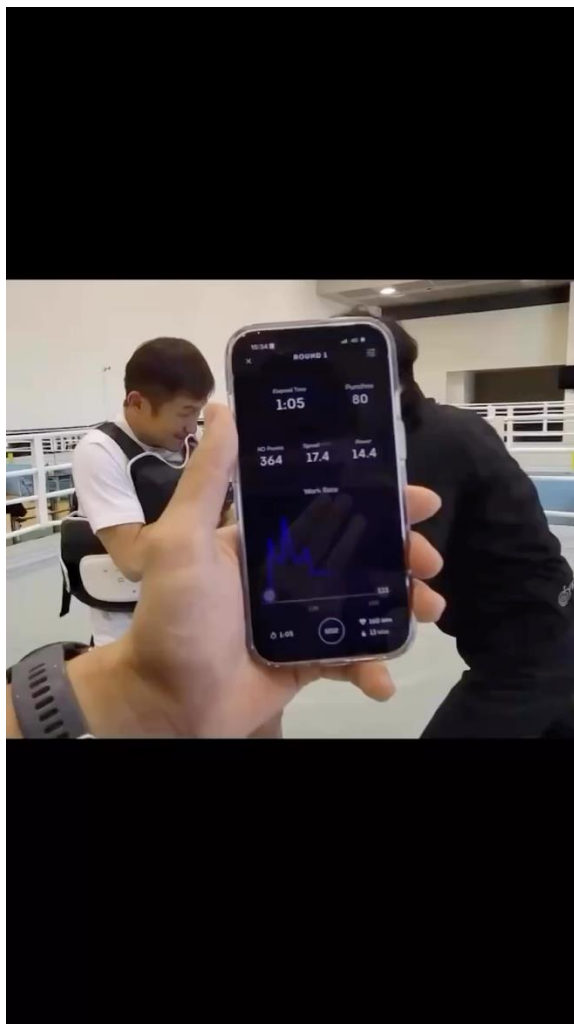
【其他診斷工具】



肌力表現量測

- 速度依循量測 (光學、位移計)
- 摸高
- 壓力地墊
- 影像
- Optojump 系統

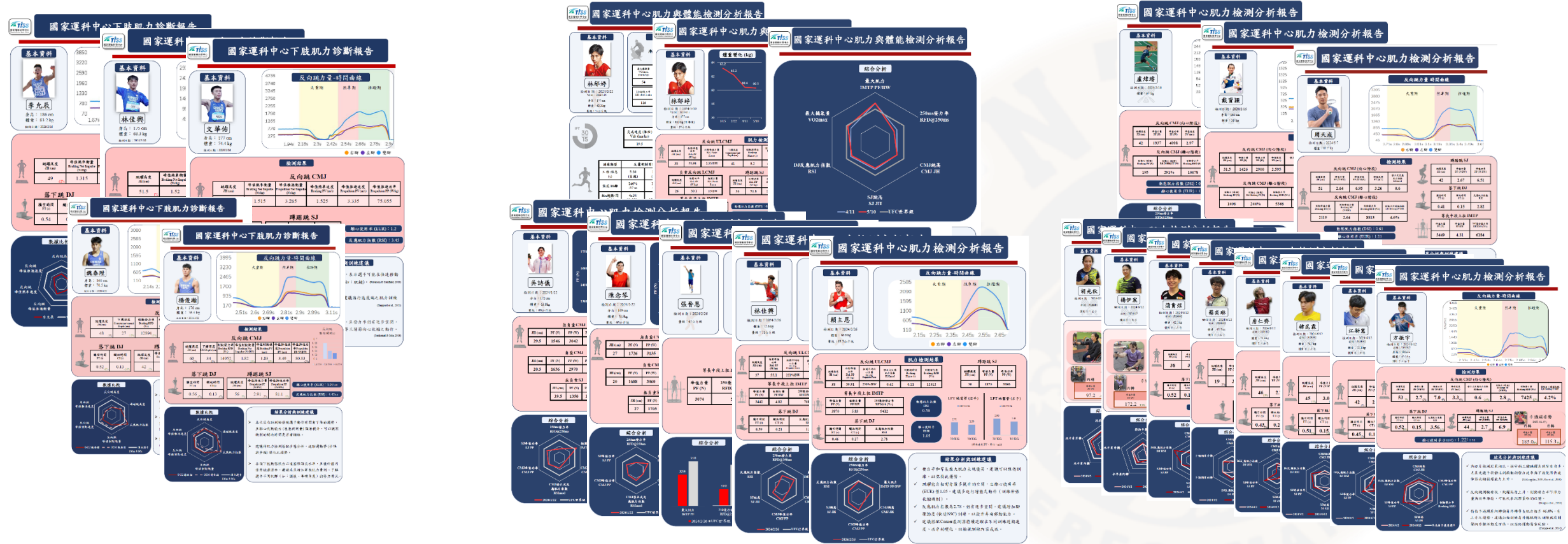
將測力板肌力檢測整合到整體訓練監控



恭賀林郁婷選手、曾自強教練
榮獲巴黎奧運女子拳擊 57 公斤級金牌！



【運動員個人能力剖析】



Track & Field

Boxing

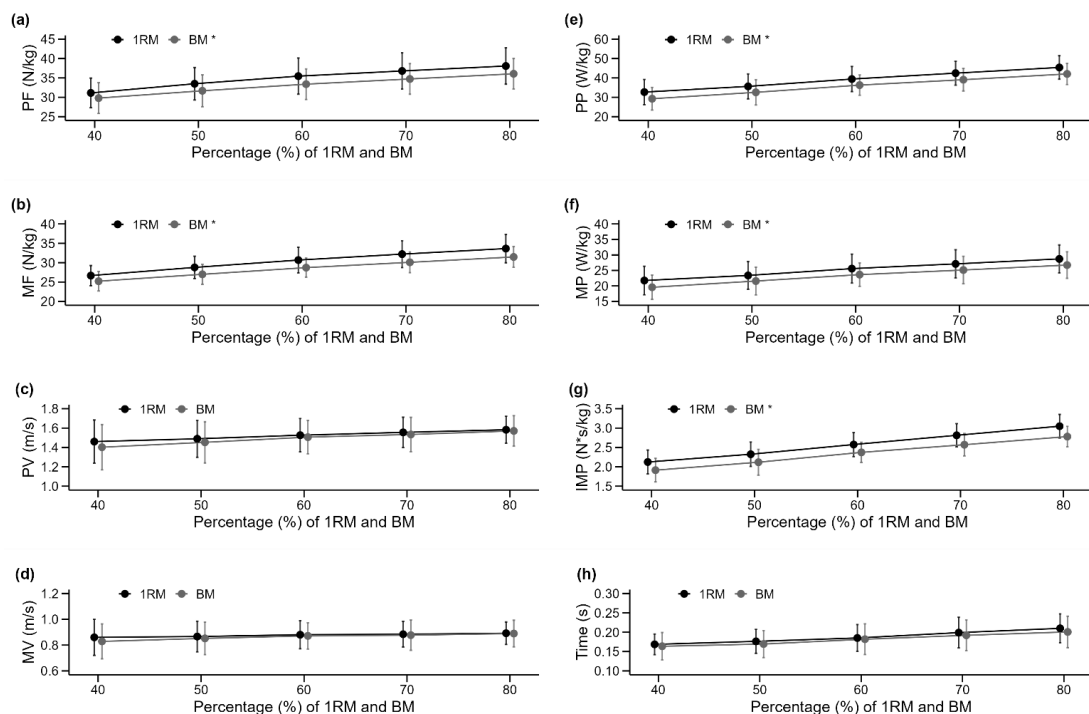
Badminton

【舉重衍伸動作負荷設定研究】

Differences in Mechanical Output between One Repetition Maximum- and Body Mass-Based Load Determination in The Behind-Neck Push Jerk

Yi-Chien Chiang¹, Chieh-Ying Chiang^{2,3} and Timothy J. Suchomel⁴

¹ Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University, Taiwan; ² Department of Sports Training Science-Combats, National Taiwan Sport University, Taiwan; ³ Taiwan Institute of Sports Science, Taiwan; ⁴ Department of Sports Medicine and Nutrition, University of Pittsburgh, Pittsburgh, Pennsylvania, USA



Weightlifting OH derivatives

【速度依循/速度流失在訓練上的應用】

International Journal of Sports Science & Coaching

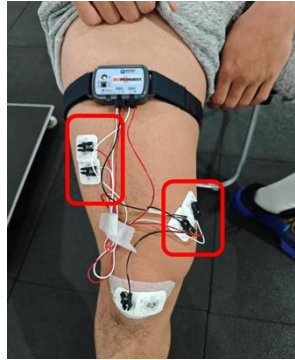
Impact Factor: 1.5
5-Year Impact Factor: 2.0

Restricted access | Research article | First published online May 14, 2025

“Which autoregulation strategy should we use?” the effects of velocity loss thresholds on RPE and their individual differences in the back squat

[Chieh-Ying Chiang](#) , [Yi-Chien Chiang](#) , [...], and [Jonathon Weakley](#)   [View all authors and affiliations](#)

[OnlineFirst](#) | <https://doi.org/10.1177/17479541251339905>



Original Paper

DOI:

© Institute of Sport – National Research Institute

uncorrected proof

Comparison of different load-velocity profiles and electromyography activity in the free-weight jump squat

AUTHORS: Yi-Chien Chiang¹, Chieh-Ying Chiang^{2,3}, Jonathon Weakley^{4,5,6,7}

¹ Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University, Taiwan

² Department of Sports Training Science-Combats, National Taiwan Sport University, Taiwan

³ Taiwan Institute of Sports Science, Taiwan

⁴ Sports Performance, Recovery, Injury and New Technologies (SPRINT) Research Centre, Australian Catholic University, Brisbane, QLD, Australia

⁵ School of Behavioural and Health Sciences, Australian Catholic University, Brisbane, QLD, Australia

⁶ Carnegie Applied Rugby Research (CARR) Centre, Carnegie School of Sport, Leeds Beckett University, Leeds, UK

⁷ National Rugby Training Centre, Rugby Australia, Brisbane, Queensland, Australia

ABSTRACT: Load-velocity profile (LVP) is an autoregulatory method in resistance training, yet the optimal LVP model for the free-weight jump squat (JS) remains unclear. This study therefore compared the accuracy of different LVP models and characterized their associated neuromuscular responses during the free-weight JS. In a cross-sectional, repeated-measures design, fifteen resistance-trained men first established their one-repetition maximum (1RM), and then performed free-weight JS at seven relative loads (20–80% 1RM). We compared generalized versus individualized, and linear versus polynomial LVP models. In addition, we measured mechanical outputs including peak and mean velocity, peak and mean power, and concentric phase time. Peak and mean neuromuscular activation of the vastus lateralis (VL) and medialis (VM) was measured using surface electromyography during the concentric phase. Individualized linear LVPs ($R^2 = 0.98\text{--}0.99$) demonstrated superior accuracy and less prediction error compared to generalized models ($R^2 = 0.76\text{--}0.90$), while polynomial models offered no advantage over linear models ($p = 0.49\text{--}0.50$). Peak and mean power was highest at 20% and 30% 1RM, respectively. Peak and mean muscle activation of the VL both peaked at 30% 1RM and decreased with increasing load. Practitioners should use individualized LVPs for accurate load prescription in the free-weight JS. Also, loads around 20–30% 1RM can induce high levels of acute mechanical power and VL muscle activation.

CITATION: Chiang Y-C, Chiang C-Y, Weakley J. Comparison of different load-velocity profiles and electromyography activity in the free-weight jump squat. *Biol Sport*. 2026;43:xx–xx.

Received: 2025-12-19; Reviewed: 2026-01-15 Re-submitted: 2026-02-19; Accepted: 2026-02-26; Published: 2026-02-xx.

Corresponding author:

Chieh-Ying Chiang
Department of Sports Training
Science-Combats
National Taiwan Sport University
No. 250, Wenhua 1st Rd.
Guishan, Taoyuan 33301
Taiwan
Tel.: +886-03-328-3201#2104
E-mail: markchiang@ntsus.edu.tw

ORCID:

Yi-Chien Chiang
0009-0000-3657-6181
Chieh-Ying Chiang
0000-0001-7522-7734
Jonathon Weakley
0000-0001-7892-4885

Key words:

Velocity-based training
Electromyography
Autoregulation
Ballistic exercise
Countermovement jump

Resistance Training / VBT

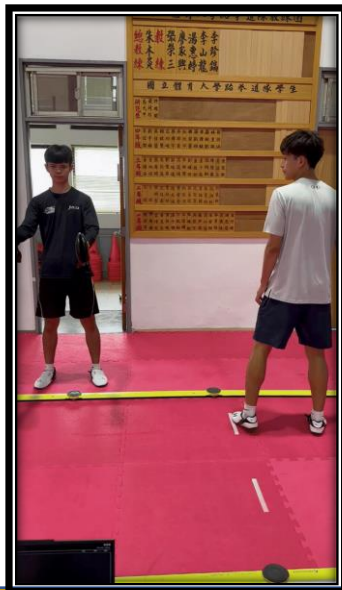
【運動員個人能力剖析】



Article

Lower Extremity Stretch-Shortening Cycle Performance in the Vertical and Horizontal Direction as Key Determinants of Success in Collegiate Male Taekwondo

Chieh-Ying Chiang ^{1,2,*}, Yi-Chien Chiang ³, Hsuan-Yu Lin ³, Hao-Che Tseng ³, Mu-Yen Chu ¹ and Jung-San Chang ¹



【未來趨勢：更簡便的動力學分析】



國家運動科學中心
Taiwan Institute of Sports Science



Contents lists available at ScienceDirect

Journal of Biomechanics

journal homepage: www.elsevier.com/locate/jbiomech



Automatic video analysis of countermovement jump performance using a single uncalibrated camera

Chuang-Yuan Chiu^{a,*}, Chien-Chun Chang^{b,c,*}, Yi-Chien Chiang^b, Chieh-Ying Chiang^{d,e}

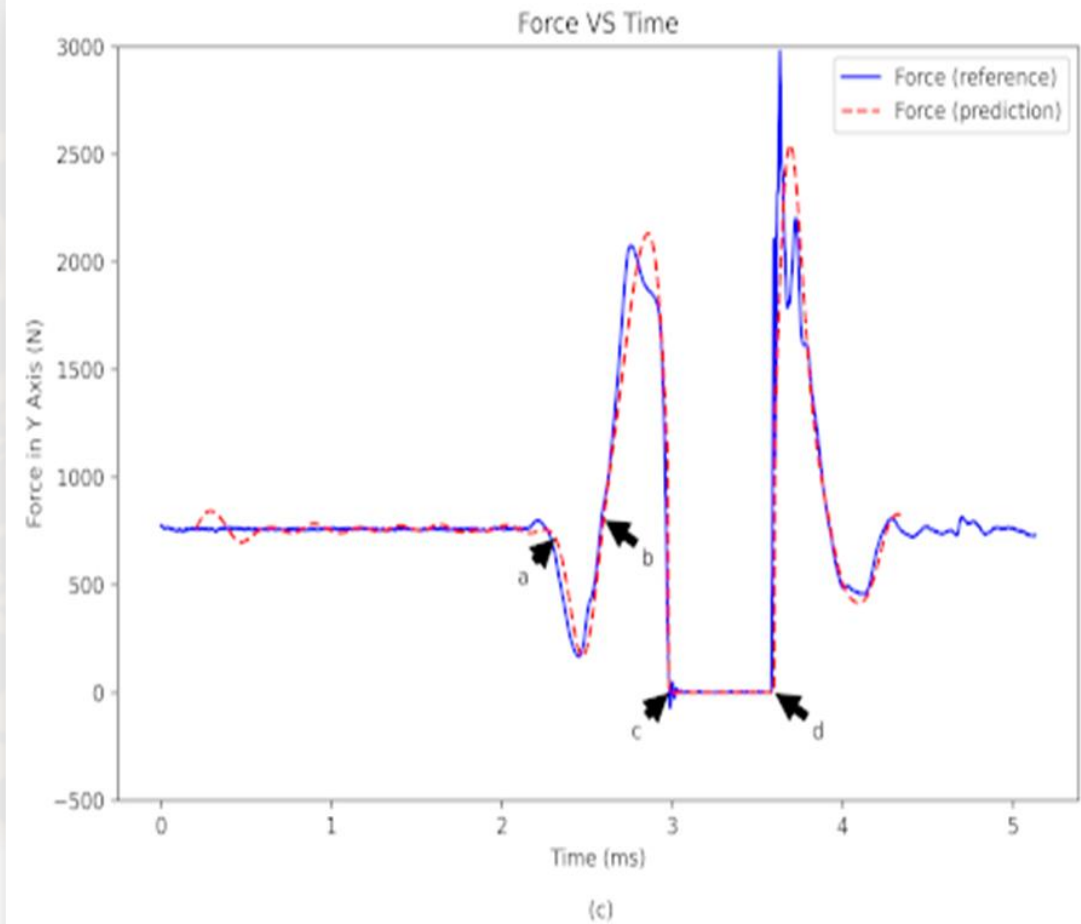
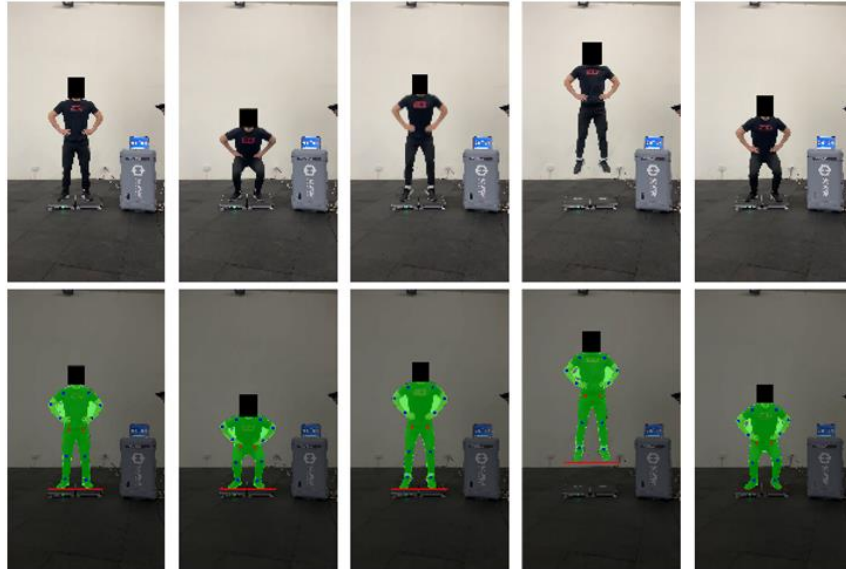
^a Sports Engineering Research Group, Sport and Physical Activity Research Centre, Sheffield Hallam University, Sheffield, UK

^b Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University, Taoyuan, Taiwan

^c Department of Sports Medicine, China Medical University, Taichung, Taiwan

^d Department of Sports Training Science-Combats, National Taiwan Sport University, Taoyuan, Taiwan

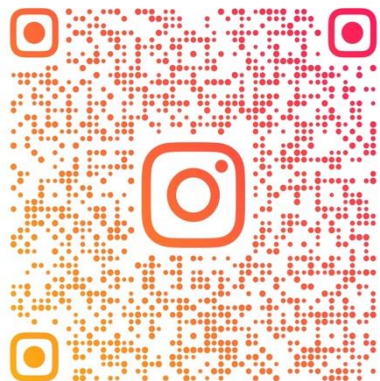
^e Taiwan Institute of Sports Science, Kaohsiung City, Taiwan



感謝您熱情的參與



NTSU.SPORT.PERFORMANCE.TEAM



AGERD666

