教育部補助國內大學校院博士班研究生出席國際會議報告

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會議名稱	(中文) 國際體育與運動科學研討會 (英文) International Conferences of Physical Education & Sport Science		
發表論文題目	(中文) 不同預備姿勢之排球魚躍起跳下肢段力學分析 (英文) A comparison of the lower extremities mechanical effect of 3 knee angles of squat preparation postures in volleyball-diving starts.		

心得報告

1. 會議前

5 月 26 日零晨 3 點 15 分，搭乘小黃前往桃園中正機場，預備搭長榮的飛機飛新加坡，原想在機上補個眠，事實上左鄰右舍用完餐後也都呼呼大睡，真的聽見呼呼二聲，但一想到即將面臨新環境，不知道是興奮還是焦慮，卻怎麼也睡不著。從隨身行李抽出預擬的答詢稿與印好的 hand-out，心理是矛盾的，既希望能派上用場，又希望不要用上，學術交流應該也要有些收穫，如何能從一群有興趣但不瞭解自己研究的學術同好，藉由闡述自己的經驗，提供他人參考，有別於之前在國內研討會的展示，是我此行的目的。

直到台北時間中午 12 點才抵達新加坡的樟宜國際機場，我至今從未參加過大陸地區以外所舉辦的國際會議，第一次即將踏上新加坡的心情自然是興奮。機場規模不如我想像中的「受歡迎」，感覺上比較像是整修中的國內機場，後來一問旁邊一個講福州話的新加坡人，才知道是舊航廈。剛下飛機，列日直射下透著我火旺旺的汗水，為了怕西裝放在行李托運會皺，頂著 35 度的天氣穿著外套的我，再加上背後一管長長的海報護套，畫面還真不協調！

在海關檢查哨等了很久，效率不若傳說中的高。發現前面很多操國語口音與綠色車輪牌護照的旅客，在問話完便被要求補填資料。輪到我時，心中早有準備 Q &A，例如為什麼你的國籍寫的是台灣而不是「支那 China」、打算待多久、住哪兒等，結果啥也沒問，只笑笑的給我一個糖果就讓我過了，同機有另一位理著小平頭、短褲、帶著金項鍊的斯文年輕人，被找去抽檢行李，可見西裝熱歸熱，還是有些幫助。

第一天的我的行程預定是安頓行李後，要出去冒險一下坐公車轉捷運，因新加坡

的大眾捷運系統相當發達。叫了計程車，從新加坡的東岸到西岸的會場學校宿舍，到了住宿地原先約好的訂房接待人員用餐去了，這老大一等快一個小時，室外沒有冷氣，後來快 3 點鐘了，終於出現一群穿著大會工作服的大學生，與我確認後，才知道大部份與會的代表都住市區，只有 12 個人住在學校內，因為早上已安置妥一批香港來的代表，剩餘的就屬散客比較難預料時間，之後他們還開車帶我繞校園熟悉環境，就親和度上可說是滿分的接待人員。

安頓好，已經是下午 6 點鐘了，太陽仍然很大。換了零錢，上了部有綁頭巾的中東司機開的公車，在他講的我聽不懂，我說的他猜不著的狀況下，回到原始的本能，我把所有零錢攤在手中讓他挑，之後告訴司機我要到捷運站，請他提醒我。結果，終點站就在捷運站，省得提醒，我就隨著人潮方向前進，開始我所謂的冒險之旅。第 2 天早上，腳起了泡，註定無法趴趴走，就專心在每場的交流活動上。

2. 會議經過

這個會議除了人特別多之外，另有其他幾項過人之處。首先，隆重的開幕式不會籠罩在沉悶的學術氛圍中，帶有教育意涵。相反的，在開、串場與活動帶領下，學者都相當活潑與放鬆，彷彿參加奧運會前的選手之夜；由於，這次研討會也是新加坡八月份將首次舉辦青年奧運會的暖身系列活動，可以看到新加坡當局努力地要將他們的教育行銷給全世界的企圖心。

其次，第一位 keynote speaker (Neil Armstrong)探討運動科學在青少年

的研究-從遊戲場到講臺經驗分享，在時間掌控得宜下，讓學者們有意猶未盡之感；此次 session 所討論的主題分類眾多，運動力學、生理、心理、動作學習、體育課程教學、運動教練與管理等；活動種類有 invited speech, workshop, symposia,orel& poster presentation 等，學者可以在平時專精領域外，聽聽其他領域學者最新的研究成果報告,學者們可直觀地以不同的角度給與報告學者們修正的意見，效果出乎意料的棒。

特別一題的是 symposia，在一場 2 小時的 course 內，接續安排 4 位同主題但不同研究的學者報告，雖然偶爾有部分 slide show 會重疊，對於剛入門或不熟悉該研究領域的學者，可以於短時間內掌握多面向的思考刺激，收穫遠大於單篇講座。

第三天，我報告當天，心情相當興奮，並沒有特別的緊張，可能是因為前幾天與同好們結識後，已適當地融入環境，於是中午 1145-1345 的報告相當順利，雖然有一位日本的學者以頗重的日本口音問了一個問題，不過豎起耳朵認真聆聽下，終究還是逐一地完成回答，而鄰近的另一位來自台灣的女研究生，則被幾位印度或中東口音的人，輪番詢問，老實說如果以那種口音問我，可能就得比手畫腳。另外一個小發現，有口音的人並不會像我們幾個從台灣來的慌張，很自在的講著他認為的對的單字，旁人此時就會有人試圖去瞭解他的意思。也就是說，常擔心會發音不正確是多餘的，應藉參加這樣的會議練習口條與發言的膽量。

第四天，我覺得最充實的一天。由於同行台灣來的同學，有些提議因只剩一天，想多利用時間到處走走或補眠。我因為腳痛也無法出門，於是在前一天就先把第四天所有的講座、工作坊、專題討論及 oral & poster presentation 的動線、場地與時間規劃好，充分運用時間。除了用相機拍下重要的 slide，我還試著分別在 oral 及 invited speech 中，發言提問。感覺真是興奮，特別是當所問問題有所回應與共鳴時，那種「我懂你」的感覺，正是參加這種會議的收穫，

扣掉前後兩天的航程，僅有短短的三天時間，真是太短促，下次還有機會應要多一些時間，遊歷多一點，體驗當地生活，藉機深入了解當地多面向之總體環境。

3. 結論與建議

總結此次學術之旅，共可歸結出幾點重要結論與建議：

(1)新加坡的校園規劃擴大了學生的國際觀，有助於增廣未來研究的國際視野，包括生活態度、價值觀、交通的體驗與考察…等。

(2)語言交流的啟發：新加坡地區的英文流通性未如想像中高，操持混有英國腔與馬來腔，對單字辨識上增加困難。即使如此，路旁賣沙爹的小販、裝修窗戶的印籍工人，當你以英文與其對談都能溝通，因此，學英文不只要能看會說，更要能辨識各地口音，才足以面對未來國際化之需求。

(3)新加坡人民對生活品質與重視法規與自律的堅持：生活品質維繫是一貫的堅持，體育教師會主動把握機會吸收新知，適度取得工作壓力與學術能力之平衡才是王道；而對於法令，奧地利採信任原則，從停車到搭乘交通工具都是由民眾自律管理為主，從小建立起的基礎法律遵從觀念讓社會井然有序且有條不紊。

(4)新加坡補助選派當地體育教師與會與國際研究學者的交流，可作為國內借境。

4. 攜回資料名稱與內容

(1)會議議程

(2)研討會相關書面報告資料

發表論文全文：

Paper presented at conference: “International Conferences of Physical Education & Sport Science”, National Institution of Education Singapore, May 25-28, 2010

A comparison of the lower extremities mechanical effect of 3 knee angles of squat preparation postures in volleyball-diving starts

A comparison of the lower extremities mechanical effect of 3 knee angles of squat preparation postures in volleyball-diving starts

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Introduction: Volleyball diving movement can improve and enlarge players' efensive range of receiving. The key element of this skill is moving quickly and accurately in whole directions. What is the best preparation diving-start posture to make diving quickly? What is the lower extremity kinetic mechanism of diving, especially referring to work-energy theorem? Since there are few literatures concerning about volleyball diving, these two questions all need more studies to devote.

Volleyball diving can reach a 3-4 meters horizontal jumping distance, regarding to velocity and power of performance. Generally, the volleyball coaches instruct their athletes to do volleyball diving in ambiguous prescription with their knee 90^{o} flexion. The discovery of base area of preparation posture, joint angles of lower predominant onset extremity, joint force and joint moments can make improvement to know the kinetic mechanism of diving.

Diving start is like some sort of swimming free-style start. The kinetical analysis will focus on lower extremity. The pursuit of movement efficiency with lower energy consuming in joints, quicker and longer horizontal jumping is what we call a successful diving movement. Therefore, the maximum voluntary contraction and power of lower extremity muscle by means of executing countermovement jump(CMJ) on a plateform and their jumping height(Kramer,1983;Paasuke,2001; Thomas,1996;Tomioka,2001;Wisloff,1998) can provide us athletes' abilities of horizontal jumping.

Since the work and coordination of lower extremity muscle as they moving can not be known only by jumping height and force measurement, we also need to formu late the inverse dynamics to process those kinetic and kinematic parameters to acquire the joint total work, movement sequence and pattern of joints and muscles.

Methods: Four healthy, college level, male volleyball players(height:178 ±7 cm; weight:70±10.05 kg; age: 20±0.71yrs; athlete training background: 8.25±0.43 yrs.) participated in this study and all preferred to jump by using left leg(left-leg dominated).After providing informed consent, history, physical information and warm-up, each subject was well

instructed all experimental procedures. Reflected markers were attached to 6 bony landmarks. Each subjects was tested in our laboratory with a procedure previously described to confirm dominated jumping leg (Greenberger, 1994).Additionally, Each subjects had executed 3 successful CMJ on the forceplate with preparation posture of knee angle which used to.

After stretching and warming up, the subject executed 3 diving jumps with different knee flexion angles (80^o; 90^o; 100^o;in counterbalanced order) of pre-posture. The instruments and experiment arrangement were shown in Fig1.The stick figure which was represented as diving movement was shown in Fig2. Two-dimensional coordinates were determined with a CPL high speed camera 100Hz.Automatic digitizing system (Kwon3d) was set for kinematic parameters calculation. There were a trigger-led and two additional markers set on the forceplate as Fig3 to make kinetic and kinematic parameters connect for next inverse dynamics process. The force plate (AMTI) data were converted by DASY Lab6.0 analysis system from volt to Newton and the reaction forces expressed in multiples of bodyweight (BW). Three reaction forces (Fx, Fy and Fz) and two moments of torsion (Mx and My) were measured. Mx, My and the vertical ground reaction force were used to obtain the location of the center of pressure (COP) in both the lateral and the sagittal direction.

Anthropometric measurements preceded the experimental trials of each subject included body mass, foot length, shank length, thigh length. Segment mass, segment moments of inertia and joint center were estimated by using Ho (2002) Body Segmental Parameters.

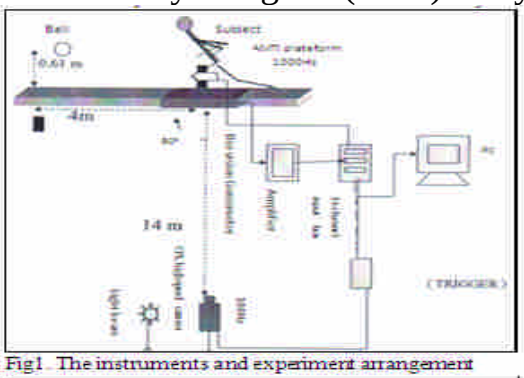

Fig1. The instruments and experiment arrangement


Fig2. The diving movement body CM & stick figure

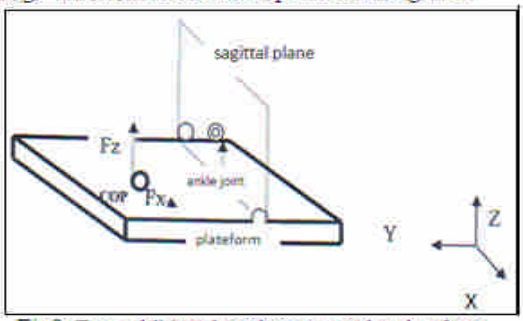

Fig3. Two additional markers set on the plateform

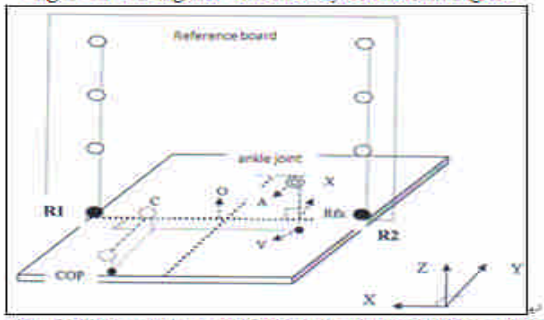

Fig4. Utilize cop data and 2 markers on plateform to connect kinetic and kinematic parameters.

Inverse dynamics calculation: hip kinetic and knee kinetic parameters were calculated as the force and torque applied by the foot(Winter,1990).

Twelve kinetic and three kinematic parameters were calculated for various instances and phases of the diving motion shown in Fig2.Three temporal variables were also calculated.

Kinematic, kinetic, and temporal data were averaged for the three divings analyzed of each subject (Fleisig,1995). A one-way Analysis of Variance was conducted for each parameters to identify difference among the three pre-posture of knee flexion angles(80^o; 90^o; 100^o). Differences at the $p < 0.05$level are reported. Because of the variability in group size, LSD significance test was performed.

Results And Discussion: Table1. showed duration of two phases(onset, push-off) and total foot contact time. Only the total foot contact time between 80^o v.s 100^o was significant. It means that volleyball diving with pre-posture of knee flexion angle 80^0 was faster than knee angle 100^o.

Table1. The duration of two phases(onset, push-off) and total foot contact time

Knee flexion angle	**80^o**	**90^o**	**100^o**
Onset(s)	1.14±0.05	1.22±0.17	1.26±0.11
Push-off(s)	0.46±0.09	0.43±0.06	0.45±0.07
Total foot contact(s)	1.73±01.4*	1.76±0.19	1.82±0.12*

Table2. showed the smallest hip joint angle of dominated leg as total foot contact duration. As we known $\underline{W} = \int M d\underline{\theta}$, if we can enlarge $d\theta$ we can gain more Work. Since each subject was executing their diving from a torso neutral position. In other word, there were no diference among three pre-posture. The pre-posture of knee flexion angle 80^0 was the lager $d\theta$ than knee angle100^0. It told us pre-posture f knee flexion angle 80^0 could have more energy output.

Table2.the smallest hip joint angle of dominated leg as total foot contact duration.

Knee flexion angle	**80^o**	**90^o**	**100^o**
The smallest hip joint angle (^{o})	43.91± 8.17*	52.37± 2.33	52.19± 6.6*

Table3.showed the lower extremity joints output energy(work) value

& energy contribution percentage(%).This study had processed an intergration of the area under lower extremity power of joints to time diagraph. The area was called joints output energy(work).Summation of three joints of lower extremity was called total output energy(work).Each joint output energy as numerator and total output energy(work)as denominator, we got 3 energy contribution percentage(%) of lower extremity joints. The result of this study told us the energy contribution percentage(%) of:

1. Knee flexion angle was 80^o & 100^o : Hip > Knee > Ankle.
2. Knee flexion angle was 90^o : Knee > Hip Ankle.

Table3. The lower extremity joints output energy(work) value & energy contribution percentage(%).

Knee flexion angle	**80^o**	**90^o**	**100^o**
Ankle joint(joules;%)	107.71(19.4%)	109.6(21.4%)	101.91(19.5%)
Knee joint(joules;%)	215.39(38.8%)	206.01(40.1%)	208.69(40%)
Hip joint(joules;%)	232.1(41.8%)	197.56(38.5%)	211.15(40.5%)

Conclusion: In this present study, we found jump-start posture with knee angle degree 80 is better in quick movement time and large vertical ground reaction force than the others(knee angle degree 90 and 100). The proportion of energy contribution from ankle joint is less than hip and knee joints.