科技部補助專題研究計畫成果報告
期末報告

使用多項電子資訊處理器和骨骼肌肉系統症狀之關係（GM03）

計 畫 類 別 ：個別型計畫
計 畫 編 號 ：MOST 102-2629-B-006-001-
執 行 期 間 ：102年08月01日至103年10月31日
執 行 單 位 ：國立成功大學物理治療學系

計畫主持人：卓瓊鈺

計畫參與人員：碩士班研究生-兼任助理人員：張文琳
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報 告 附 件 ：出席國際會議研究心得報告及發表論文

處 理 方 式 ：
1.公開資訊：本計畫涉及專利或其他智慧財產權，2年後可公開查詢
2.「本研究」是否已有嚴重損及公共利益之發現：否
3.「本報告」是否建議提供政府單位施政參考：否

中 華 民 國 104年01月29日

中文摘要： 由於電子資訊的蓬勃發展，可以接受到資訊的媒介也日益更新，除了傳統電腦以外，現代人也使用各種不同的電子資訊處理器來傳送或是接受訊息，而現在最流行的電子資訊產品包括平版電腦和智慧型手機。根據台灣資策會的預估，在2015年智慧型手機普及率會達到52.5%。如此高頻率的使用智慧型手機雖然可以帶來生活的方便性，但也可能造成使用者身體的傷害。

前人的研究顯示：長期使用電腦可能會因為壓力的累積造成身體骨骼肌肉系統的傷害。同樣的，長期使用智慧型手機，因為長期維持同一姿勢不動(俗稱低頭族)，或是連續地使用身體特定部位，也可能會對身體造成骨骼肌肉系統的傷害。然而到目前為止，並沒有研究專注在使用多項電子儀器(包括智慧型手機)可能對身體造成的累積性傷害。

這個研究的主要目的乃在比較使用傳統電腦族和智慧型手機的愛好者，他們在使用這兩種工具時其肌肉活動與動態姿勢表現之差異。研究者也想比較這些使用者在姿勢控制系統上是否存在性別差異。

研究者隨機在附近大學與公司選取受試者。大約收取40為電子儀器使用愛好者，男女各半。受試者將隨機從事30分鐘的電腦工作以及30分鐘的觸控螢幕手機資料輸入工作，我們以六台紅外線攝影機與肌電圖在這兩項工作的前、中、後各收取一分鐘的肌電圖與身體姿勢資料。以多變數分析重複評量來做為分析方法，重複因子為使用情況與時間。

研究結果顯示，在不同的使用情況下，我們發現許多明顯的姿勢角度與角度範圍差異。大部份使用者在從事電腦工作時會使用較大的姿勢角度，但是頭、頸的彎曲角度卻是在使用手機時彎曲較大。在使用電腦時，所有的角度範圍都比使用手機時大。而男性在使用手機時，明顯比女性有較大的下頸部彎曲角度。而女性在使用電腦時，明顯比男性有較大的頭彎曲與腕尺側屈曲角度範圍。

本篇研究發現手機使用者在頭、頸的彎曲角度明顯比使用電腦大，對於手機使用者應該更注意他們頭頸部位的症狀。而男性手機使用者更明顯地增加了下頸部彎曲的角度，這可能造成此部位的骨骼肌肉系統症狀增加。女性則在頭彎曲與手腕尺側屈曲角度範圍增加，這意味著她們容易在此兩部位呈現較極端的姿勢。我們的研究結果建議在介入電子資訊處理器使用者的骨骼肌肉系統症狀時不但要注意他們在使用時的姿勢，同時也要考慮性別差異。

中文關鍵詞： 骨骼肌肉系統症狀、智慧型手機、姿勢、肌電圖

英 文 摘 要 ： Nowadays one of the major changes in the exposure profiles of people is the use of information technology （IT）, and the increasing number of devices available. Institute for Information Industry in Taiwan has estimated that the smartphone users will increase to 52.5% by the year of 2015. Previous studies have shown high prevalence of musculoskeletal symptoms among computer users. Past research studies have mainly focused on computer users only, to our knowledge, no study has examined the cumulative exposure of using multiple IT devices over a long period of time.

The present study aims to compare the muscle control, and working postures between touchscreen device use and traditional computer use. We also want to compare the gender difference when they are using different IT devices.

Participants were recruited from students or employees at local companies. About 20 men and 20 women would be included. Each subject performed one computer typing task for 30 mins or one phone texting task for 30 mins, and surface electromyography （EMG） and body posture of the upper quarter were recorded in the beginning, mid and end of the task. Three-way ANOVA with repeated measures on condition and time factors were used for data analysis. The significant level was set at $p<0.05$.

Our results revealed that there were significant main effects on conditions of angle mean （$p<0.05$） and angle range （$p<0.001$）. Large angles were mostly found during the computer task； however, more head and neck flexion were noted during smartphone task. Larger angle range was found for most of the angles during the computer task as compared to the phone task. Males had greater low-cervical angle than females only during the phone typing task. On the other hand, females had greater head flexion range （$p<0.01$） and wrist deviation range （$p=0.026$） as compared to males only during the computer task.

The result of the current study showed more neck and head flexion angle during smartphone texting as compared with computer texting, and that may led to more complaints of cervical discomfort for smartphone users. Gender differences were found for most of the variables. When considering the musculoskeletal symptoms among IT device users, gender issue cannot be neglected.

英文關鍵詞： musculoskeletal symptoms, smartphone, posture, electromyography

科技部補助專題研究計畫成果報告

（□期中進度報告/V期末報告）

（計畫名稱）

使用多項電子資訊處理器和骨骼肌肉系統症狀之關係

Use of multiple IT devices and musculoskeletal symptoms

計畫類別：v個別型計畫　　□整合型計畫
計畫編號：MOST　 102-2629-B-006-001-
執行期間： 102　年 8　月　1 日至 103　年 10　月　31 日

執行機構及系所：國立成功大學 醫學院 物理治療學系

計畫主持人：卓瓊鈺
共同主持人：
計畫參與人員：張文琳 凌萱

本計畫除繳交成果報告外，另含下列出國報告，共 _2__ 份：
□執行國際合作與移地研究心得報告
v出席國際學術會議心得報告

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2.「本研究」是否已有嚴重損及公共利益之發現：v否 □是
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中　華　民　國 104　年　1　月 30　日

中文摘要

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關鍵詞：骨骼肌肉系統症狀、智慧型手機、姿勢、肌電圖

Abstract

Nowadays one of the major changes in the exposure profiles of people is the use of information technology (IT), and the increasing number of devices available. Institute for Information Industry in Taiwan has estimated that the smartphone users will increase to 52.5% by the year of 2015. Previous studies have shown high prevalence of musculoskeletal symptoms among computer users. Past research studies have mainly focused on computer users only, to our knowledge, no study has examined the *cumulative exposure* of using multiple IT devices over a long period of time.

The present study aims to compare the muscle control, and working postures between touchscreen device use and traditional computer use. We also want to compare the gender difference when they are using different IT devices.

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Our results revealed that there were significant main effects on conditions of angle mean ($p<0.05$) and angle range ($p<0.001$). Large angles were mostly found during the computer task; however, more head and neck flexion were noted during smartphone task. Larger angle range was found for most of the angles during the computer task as compared to the phone task. Males had greater low-cervical angle than females only during the phone typing task. On the other hand, females had greater head flexion range ($p<0.01$) and wrist deviation range ($p=0.026$) as compared to males only during the computer task.

The result of the current study showed more neck and head flexion angle during smartphone texting as compared with computer texting, and that may led to more complaints of cervical discomfort for smartphone users. Gender differences were found for most of the variables. When considering the musculoskeletal symptoms among IT device users, gender issue cannot be neglected.

Key words: musculoskeletal symptoms, smartphone, posture, EMG

Background:

Musculoskeletal upper extremity symptoms of neck, shoulder and arms, are highly prevalent in the general population especially among computer users in many countries (Wahlstrom, 2005, Waersted, 2010, Eltayeb, 2007, Village, 2005). Previous study has shown significant time differences on the sitting postures of the trunk and upper extremities (Yang and Cho, 2012). However, past studies on working postures mainly focused on computer users only. To our knowledge, no study has examined the cumulative effect of time on postures when using smartphone.

Nowadays one of the major changes in the exposure profiles of people is the use of information technology (IT), and the increasing number of devices available. In particular, the touchscreen products such as iPhone, iPad and other smartphone devices have become a major communication tool around the world. In the USA, 85% of the adults own a cellular phone and they use it to send text messages. Institute for Information Industry in Taiwan also estimates that the smartphone users will increase to 52.5% by the year of 2015. Hence the smartphone technology with touchscreen devices is growing at high speed in Taiwan, and it may possibly affect users' health.

Due to differences in muscle strength, anthropometry, and hormones, females tend to have a higher rate of CTD than males (Lassen, 2005). There were also few studies conducted to compare the gender difference on postures for the computer users (Won, 2009; Yang, 2012). We believe that daily intensive use of the smartphone may contribute to a poor posture and increase the risk to obtain musculoskeletal symptoms.

Purpose:

The present study aims to compare the working postures between male and female workers when they were using different information technology devices. The researchers also want to evaluate the effect of working conditions on their postures.

Methods:

Twenty-one females and twenty males were recruited. The National Cheng Kung University Hospital IRB has approved this study, and all the participants signed a consent form before participation. During the experiment, the participants were requested to perform computer texting and smartphone texting with the adjusted chair and desk to match their anthropometry. Each task lasted for thirty minutes. Six motion capture cameras were used to catch head, neck and upper extremity postures during computer and smartphone tasks. Surface EMG data were recorded from the muscles of cervical erect spinae (RCES, LCES) bilaterally, upper trapezius (Rtra, Ltra) bilaterally, bilateral extensor digitorum (RED), and bilateral flexor digitorum superficialis (RFDS) muscles using Delsys (Bagnoli eight-channel EMG system, USA). Three-way ANOVA with repeated measures on condition and time factors were used for postural data analysis. The significant level was set at p<0.05.

Results:

Totally there were 41 subjects complete the experiment. The demographic data was shown as in Table 1.

Table 1. Demographic data for all subjects.

	All participants (N=41)		
	Male (N=20)	Female (N=21)	p value
Age (years)	29.5 (8.40)	30.4 (9.63)	0.744
Height (m)	173.5 (4.57)	159.6 (4.83)	<0.001*
Weight (kg)	67.7 (8.22)	53.9 (6.98)	<0.001*
BMI (kg/m^2)	22.6 (3.10)	21.2 (3.27)	0.195
Body fat (%)	14.8 (6.02)	28.4 (5.80)	<0.001*
Arm length (cm)	58.6 (2.71)	54.9 (2.52)	<0.001*
Shoulder width (cm)	44.9 (3.63)	39.1 (1.68)	<0.001*
Chair height (cm)	43.9 (1.63)	43.5 (5.32)	0.794
Desk height (cm)	67.6 (2.02)	65.0 (5.58)	0.064
Computer words (N)	1595 (607.939)	1342 (586.90)	0.189
Phone words (N)	607 (185.47)	593 (236.73)	0.838

Our results revealed that there were significant main effects on conditions of angle mean (p<0.05) and angle range (p<0.001). Large angles were mostly found during the computer task; however, more head and neck flexion were noted during smartphone task (Table 2). A larger angle range was found for most of the angles during the computer task as compared to the phone task (Table 3). Males had greater low-cervical angle than females only during the phone typing task (Table 4). On the other hand, females had greater head flexion range ($p<0.01$) and wrist deviation range ($p=0.026$) as compared to males only during the computer task (Table 5).

Table 2. Angle mean between two conditions.

Repeated measures	All participants (N=41)		
	computer	phone	P value
cc	165.56 (8.23)	159.19 (9.99)	*<0.001
low	67.65 (5.82)	62.637 (9.09)	*<0.001
e	112.00(11.92)	94.161(20.41)	*<0.001
w	166.97(5.61)	168.54 (5.37)	0.149
shoulder	27.15(7.95)	23.12(7.30)	*0.002
head	74.59(8.25)	82.60(5.77)	*<0.001
neck	59.55(6.70)	68.84(11.18)	*<0.001

Table 3. angle range between two conditions.

Repeated measures	All participants (N=41)		
	computer (SD)	phone (SD)	P value
cc	6.71(3.23)	2.91(1.81)	*<0.001
low	4.87(2.30)	3.00(2.56)	*<0.001
e	14.81(6.37)	4.52(3.83)	*<0.001
w	13.96(4.42)	15.44(7.79)	0.204
shoulder	14.24(5.02)	2.63(1.93)	*<0.001
head	7.79(3.87)	3.36(2.65)	*<0.001
neck	5.87(2.03)	2.45(1.80)	*<0.001

Table 4. Angle mean between genders in phone typing condition.

	All participants (N=41)		
	phone		
	male	female	P value
cc	159.44(9.94)	158.93(10.10)	0.860
low	65.04(9.65)	60.73(8.10)	*0.043
e	94.72(19.23)	90.53(21.42)	0.481
w	168.33(5.69)	167.73(5.05)	0.645
shoulder	22.51(6.82)	23.72(7.77)	0.549
head	82.75(5.31)	82.27(6.22)	0.681
neck	71.58(9.72)	67.39(12.09)	0.176

Table 5. Angle range between genders in computer typing conditions.

	All participants (N=41)		
	computer		
	male	female	P value
cc	6.60(2.94)	7.36 (3.45)	0.360
low	4.35(2.39)	5.23(2.21)	0.119
e	15.40(6.22)	14.50(6.57)	0.575
w	12.01(3.42)	15.47(4.73)	*0.010
shoulder	14.52(4.94)	14.13(5.13)	0.736
head	6.46(2.91)	9.02(4.36)	*0.026
neck	5.51(2.02)	5.47(2.06)	0.941

For the muscle control, our results showed that there was a significant main effect on conditions for most of the muscles except cervical extensors (Table6). The participants tended to have a higher muscle activity during computer task as compared to phone task. During computer task, females had higher EMG for both finger flexors as compared to males (Table 7). During phone use, females had higher EMG for right upper trapezius as compared to males (Table 8).

Table 6. EMG between two conditions.

	All participants (N=41)		
	Computer	Phone	P value
Rtra	0.074(0.106)	0.034(0.088)	*<0.001
Ltra	0.104(0.092)	0.037(0.022)	*<0.001
RCES	0.258(0.098)	0.250(0.107)	0.604
LCES	0.236(0.127)	0.241(0.098)	0.630
RED	0.087(0.039)	0.046(0.029)	*<0.001
RFDS	0.066(0.036)	0.032(0.021)	*<0.001
LED	0.106(0.043)	0.046(0.033)	*<0.001
LFDS	0.083(0.044)	0.043(0.029)	*<0.001

Table 7. EMG between genders in computer typing condition.

	All participants (N=41)		
	computer		
	male	Female	P value
Rtra	0.137(0.082)	0.133(0.125)	0.872
Ltra	0.102(0.114)	0.125(0.067)	0.327
RCES	0.252(0.087)	0.262(0.107)	0.679
LCES	0.231(0.123)	0.289(0.127)	0.104
RED	0.084(0.039)	0.106(0.037)	0.064
RFDS	0.056(0.026)	0.084(0.038)	*0.006
LED	0.108(0.044)	0.111(0.042)	0.832
LFDS	0.073(0.032)	0.099(0.048)	*0.025

Table 8.EMG between genders in phone typing condition.

	All participants (N=41)		
	Phone		
	male	Female	P value
Rtra	0.030(0.033)	0.050(0.118)	*0.034
Ltra	0.032(0.022)	0.044(0.021)	0.064
RCES	0.260(0.101)	0.266(0.113)	0.856
LCES	0.227(0.095)	0.263(0.098)	0.135
RED	0.039(0.029)	0.053(0.029)	0.052
RFDS	0.032 (0.023)	0.036(0.019)	0.480
LED	0.045(0.031)	0.050(0.034)	0.553
LFDS	0.044(0.028)	0.044(0.030)	0.915

Discussion

The present study aims to compare the working postures between male and female workers. The researchers also want to evaluate the effect of working conditions (smartphone and computer task) on their postures.

Our results revealed that there were significant main effects on conditions of angle mean and angle range. Large angles were mostly found during the computer task; however, more head and neck flexion were noted during smartphone task.

Significant condition effects were found on most of the kinematic variables. We found when the participants were using smartphones, they tended to have a more flexed head and neck postures which we speculate it might increase the risk of musculoskeletal symptoms for this region. On the contrast, they retracted their upper arms. Therefore, they had a more flexed elbow but more extended shoulder movement which might decrease the stress on their shoulder region during smartphone use. According to Gold's observational study (2012), they found the mobile device users tend to have a flexed neck, as well as a non-neutral typing side wrist. However, we did not have similar finding for the wrist posture. The difference might be due to different mobile devices (touch screen) were used in the current study.

Our results showed that males had greater low-cervical angle than females only during the phone typing task. On the other hand, females had greater head flexion range and wrist deviation range as compared to males only during the computer task. Our study hypothesized that female workers might demonstrate different postures while they were using different information technology devices. Previous studies have provided evidence on gender difference for the computer users. For example, Won et al. (2009) compared the difference of upper extremity posture between male and female computer workers and found that the range of motion for wrist, shoulder and shoulder external rotation were higher for women (Won et al. 2009). Our previous study (Yang and Cho, 2012) has shown that male computer users had larger head and neck flexion angles than females. Gold (2012) found that male users tend to have a more protracted shoulder and female users have a more flexed elbow.

Similar trend was found between male and female computer users for the shoulder, elbow flexion, and wrist deviation angles. This study used a similar design like our previous study but smartphone task was added. It was also found male smartphone users had larger lower-cervical angle as compared with females only during the smart phone use. We thought higher average postural angles for men might be due to gender difference on their anthropometry. Due to their anthropometry difference, if without proper intervention, we speculate that the male participants might be at a higher risk to obtain musculoskeletal disorders in this region than females. We also found that females had greater head flexion range and wrist deviation range as compared to males during the computer task. This result may indicate female computer users tend to demonstrate more extreme postures in these two regions. When designing computer task for female users, we need to pay special attention to these two regions.

For the muscle control, our results showed that there was a significant main effect on conditions for most of the muscles except cervical extensors. The participants tended to have a higher muscle activity during computer task as compared to phone task. Pressing computer keyboard requires a higher muscle force than texting on the smart phones. Therefore, proper design of break and exercises to relax their muscles is essential for those computer workers.

During computer task, females had higher EMG for both finger flexors as compared to males. During phone use, females had higher EMG for right upper trapezius as compared to males. These results reflect that computer task is a more effort demanding task which requires higher muscle activity as compared to the smartphone task, especially for finger flexors of the female subjects. Females may use their right arm to operate their smart phone than males. Therefore, female workers might need to take more breaks if they are going to conduct a long time task.

Smartphone addictors, also called phubbers, who might spend a lot of time on using this device. Therefore cumulative time effect cannot be neglected. We found most subjects increased their elbow flexion but decreased their shoulder flexion as time passed, which make them to have a closer view to their smartphone. This might increase their potential to develop symptoms to their elbows as well as eyes.

Conclusion:

The result of the current study showed more neck and head flexion angle during smartphone texting as compared with computer texting, and that may led to more complaints of cervical discomfort for smartphone users. Our results also suggested male smart phone users had a more flexed low-cervical posture which may increase the risk of musculoskeletal symptoms in this region. Females had greater head flexion range and wrist deviation range which may indicate they tend to demonstrate more extreme postures in these two regions. When considering the musculoskeletal symptoms among IT device users, gender issue cannot be neglected.

Implications:

The results suggested that the male participants might be at a higher risk of musculoskeletal symptoms than females since they had a more flexed lower cervical posture. However, females might need to use more muscle activity than males to perform the computer task. Smarphone users may demonstrate more extreme postures for head and neck as compared to computer users. Future studies on IT device users should consider the effect of gender on postures and include kinetic data for further analysis.

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參加世界生物力學大會 2014(July6-11) 波士頓記行

參加世界生物力學大會是非常偶然的。我的學生本來說要去法國馬賽，但是我上次參加的會議是在歐洲，因此，他查到有個會議在波士頓看起來也不錯。既然主題與我的專長符合，就決定開始準備投稿。剛好成老師在系務會議裡提及，他也要去參加這個會，於是我們就一起準備出發了！

飛機從桃園飛到波士頓連轉機時間要二十一個小時，這充分考驗了我這個中年人的耐力。幸好一路平安，我終於飛到睽違已久的波士頓。我在 1991-1993 是在波士頓念書的。睽違了二十年，我終於有空回來看看校園、看看老師。

第一天會場烏龍記。原本要註冊的我們因為大會電腦當機，只好選擇拿完資料就走。下午逛了逛市區回味一下當年在此念書的時光。

第二天的 keynote speech 是有關 Larva 運動行為，由加州大學柏克萊分校 Dr. Koehl 演講，他談到浮游生物如何在不穩定的水流中運動以尋求自身的穩定(moving in an unsteady world)，他會因為水流的運動試著改變密度或運動型態，這個題目算是讓我見識到生物力學的另一面。.晚上有開幕接風小宴，大會非常大器的提供了龍蝦三明治等美食，讓我們剛到就吃到波士頓的土產，十分開心。

第三天主要是去聽 Dr. Viceconti 主講的題目：Musculoskeletal Biomechanics in the age of virtual physiological human.他主要提到骨骼肌肉系統生物力學運用在不同年紀的人類活動上。 當然，還有今天的重點是 PhD 學生的競賽，自從上次我參加 AWP ACPT 之後，我就非常喜歡聆聽這一類的競賽，因為這些參與比賽的同學都是未來在生物力學界的後起之秀。

第四天除了聽演講外，主任也要報告他的 poster，我也抽空看了許多海報，獲得最新的研究資訊，包括 U of Waterloo 一篇與我學生研究相近的海報。機械系的朱老師也在同一天報告，大家中午聚在一起聊天，也讓不同領域的學者有交流的機會。 晚上則有晚宴活動，主持人報告了這次活動參予的一些統計數字，包括 58 個國家， 4200 位參予者，算是相當盛大的一個會。

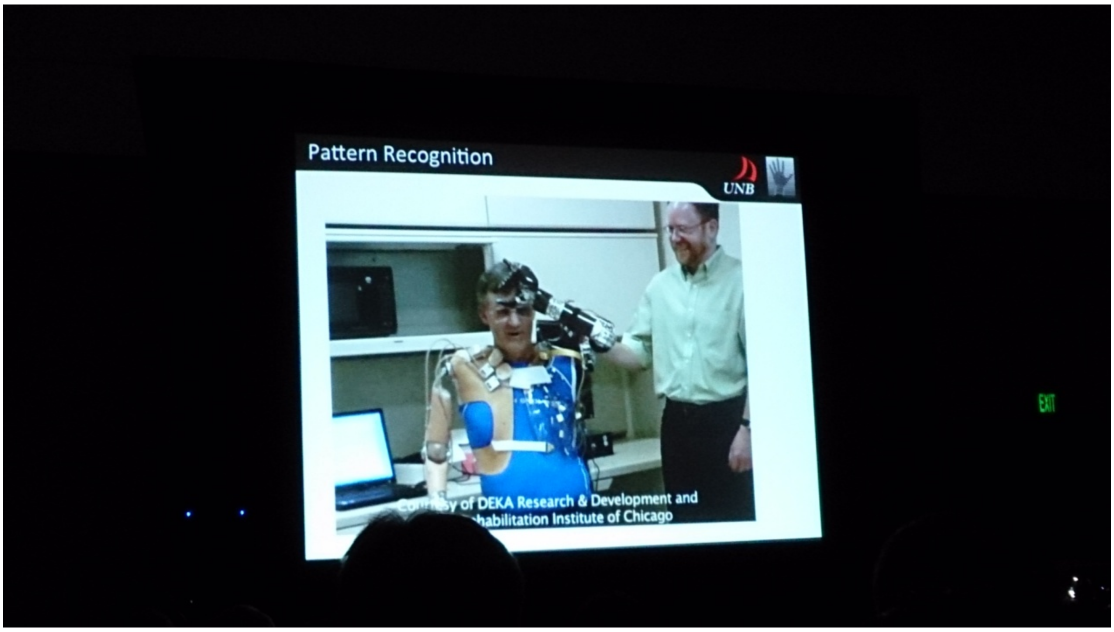
第五天 聽 Dr. Englehart 的演講主要是提到 Power upper limb prothesis，也去聽了一系列的有關 upper limb rehabilitation 的演講。我想生物力學在復健領域的應用這方面應該算是有相當多的創新。

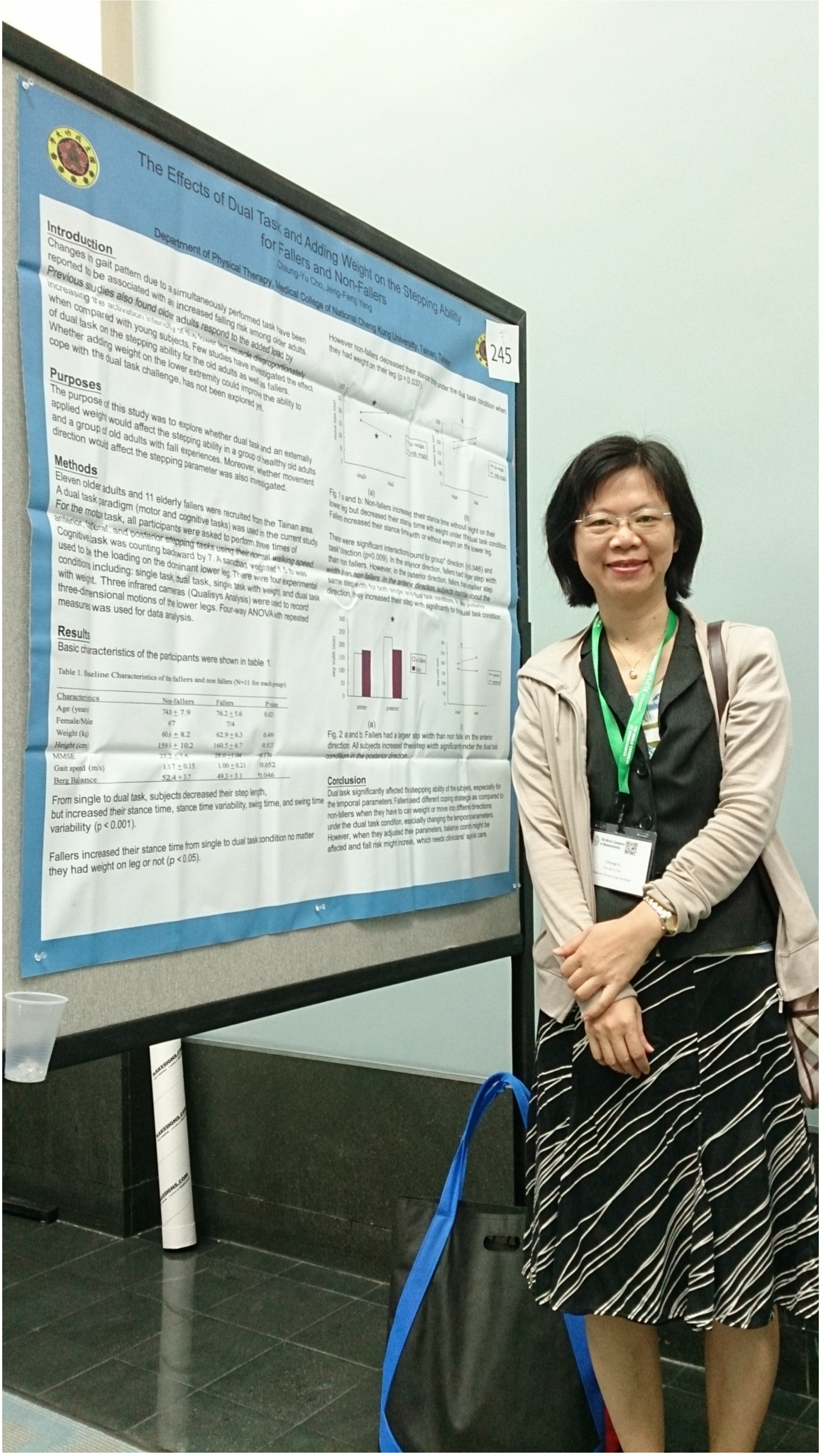
第六天演講題目 Dr. Guiliak Biomechanics and mechanobiology in the development of new therapy in osteoarthritis，他從 OA 受傷與形成的機轉講起，到最近的人工

生物組織的研發，做了相當精闢而深入的演講。中午有我的海報展示，也認識鄰座 Pittsburg U 的學生與其指導教授 Dr. Knooze。中午貼海報時還與鄰座日本學者交流，算是相當有收穫的一天。下午約好與老師吃飯，老師已經 64 歲明年就要退休了，我們已經二十年沒見面，還好還認得彼此，我們談著匹此這些年的改變與研究，真的是時光飛逝。

大會閉幕後，我又偷閒一天留在這裡逛逛，Boston 我的兩年碩士生涯在這裡度過，真是令人難忘的地方。

帶回資料有大會手冊與會議內容隨身碟。





The Effects of Dual Task and Adding Weight on the Stepping Ability for Fallers and Non-Fallers
Chiung-Yu Cho, Jeng-Feng Yang
Department of Physical Therapy, Medical College of National Cheng Kung University, Tainan, Taiwan
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Introduction
Purposes
Methods
Results
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The Effects of Dual Task and Adding Weight on the Stepping Ability for Fallers and Non-Fallers

Chiung-Yu Cho, Jeng-Feng Yang*
Department of Physical Therapy, Medical College, National Cheng Kung University, Tainan, Taiwan

Introduction: Changes in gait pattern due to a simultaneously performed task have been reported to be associated with an increased falling risk among older adults. Previous studies also found older adults respond to the added load by increasing the activation intensity of the lower leg muscle disproportionately when compared with young subjects. Few studies have investigated the effect of dual task on the stepping ability for the old adults as well as fallers. Whether adding weight on the lower extremity could improve the ability to cope with the dual task challenge, has not been explored yet. **Purposes:** The purpose of this study was to explore whether dual task and an externally applied weight would affect the stepping ability in a group of healthy old adults and a group of old adults with fall experiences. Moreover, whether movement direction would affect the stepping parameter was also investigated.

Methods: Eleven older adults and 11 elderly fallers were recruited from the Tainan area. A dual task paradigm (motor and cognitive tasks) was used in the current study. For the motor task, all participants were asked to perform three times of anterior, lateral, and posterior stepping tasks using their normal walking speed. Cognitive task was counting backward by 7. A sandbag weighted 1.5 lb was used to be the loading

on the dominant lower leg. There were four experimental conditions including: single task, dual task, single task with weight, and dual task with weight. Three infrared cameras (Qualisys Analysis) were used to record three-dimensional motions of the lower legs. Four-way ANOVA with repeated measures was used for data analysis. **Results:** From single to dual task, subjects decreased their step length, but increased their stance time, stance time variability, swing time, and swing time variability ($p \leq 0.001$). Fallers increased their stance time from single to dual task condition no matter they had weight on leg or not ($p \leq 0.05$). However non-fallers decreased their stance time under the dual task condition when they had weight on their leg ($p = 0.037$). For the direction effect, subjects significantly increased their step width ($p=0.033$) and variability ($p<0.001$) when stepping to the posterior direction, but most temporal parameters decreased in this direction ($p \leq 0.05$). **Conclusion:** Dual task significantly affected the stepping ability of the subjects, especially for the temporal parameters. Fallers used different coping strategy as compared to non-fallers when they have to carry weight or move into different directions under the dual task condition, especially changing the temporal parameters. However, when they adjusted these parameters, balance control might be affected and fall risk might increase, which needs clinicians' special care.

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科技部補助計畫衍生研發成果推廣資料表

日期:2015/01/29

科技部補助計畫	計畫名稱: 使用多項電子資訊處理器和骨骼肌肉系統症狀之關係(GM03)
	計畫主持人: 卓瓊鈺
	計畫編號: 102-2629-B-006-001- 學門領域: 性別主流科技計畫
無研發成果推廣資料	

102 年度專題研究計畫研究成果彙整表

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<tr><td>博士後研究員</td><td>0</td><td>0</td><td>100%</td><td></td></tr>
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<tr><td>專任助理</td><td>0</td><td>0</td><td>100%</td><td></td></tr>
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其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	計畫主持人於 2013 年獲台灣物理治療學會最佳論文獎 今年 2015WCPT 將再與兩位國際學者會面 商討國際合作事宜

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

科技部補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

　　□實驗失敗

　　□因故實驗中斷

　　□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 □未發表之文稿 ■撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：（以 100 字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以 500 字為限）

本篇研究發現手機使用者在頭、頸的彎曲角度明顯比使用電腦大，對於手機使用者鄰床物理治療師應該提醒他們更注意他們頭頸部位的姿勢與症狀。而男性手機使用者比女性更明顯地增加了下頸部彎曲的角度，這可能造成此部位的骨骼肌肉系統症狀增加。女性電腦使用者則在頭彎曲與手腕尺側屈曲角度範圍較男性明顯增加，這意味著她們容易在此兩部位呈現較極端的姿勢。我們的研究結果建議在介入電子資訊處理器使用者的骨骼肌肉系統症狀時，不但要注意他們在使用時的姿勢，同時也要考慮性別差異。未來研究將朝智慧型手機使用者的生理與心理問題做進一步的探討。