行政院國家科學委員會專題研究計畫 成果報告

有無代謝症候群停經婦女之心率變異度及走路計畫效應研究
研究成果報告(精簡版)

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計 畫 主 持 人 ：許妙如

計畫參與人員：碩士級-專任助理人員：葉秋萍

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 ：本計畫涉及專利或其他智慧財產權，2 年後可公開查詢

中 華 民 國 99 年 10 月 31 日

行政院國家科學委員會補助專題研究計畫 ■ 成 果 報 告
□期中進度報告

Heart rate variability in postmenopausal females with and without metabolic syndrome and the effect of a walking program

有無代謝症候群停經婦女之心率變異度及走路計畫效應研究

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成果報告類型(依經費核定清單規定繳交)：■精簡報告　□完整報告

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中　華　民　國　99　年 10　月 30　日

一、中文摘要

過去研究顯示停經後婦女自主神經系統活性降低，增加心血管相關疾病罹患率。停經女性中不乏代謝症候群者，停經改變了自主神經調控可能是原因之一，但目前仍未有相關研究探索。而運動/增加身體活動量是一個改善自主神經活性之方式，但對於代謝症候群之停經婦女是否有效，則有待調查。本研究目的為探討：(1)有代謝症候群及無代謝症候群之停經後婦女自主神經活性之異同；(2)增加身體活動量對有代謝症候群及無代謝症候群之停經後婦女自主神經活性之影響。收納未服用荷爾蒙治療之停經後婦女，無代謝症候群者35 位，及有代謝症候群者12 位。其中有18位參與為期兩個月之走路運動，以增加身體活動量。不論組別，每位受試者均接受在仰臥、坐姿及站姿下之心率變異程度量測。參與運動計畫者於兩個月走路計畫結束後，接受與運動前相同之自主神經活性測試。結果顯示，有無代謝症候群者在仰臥、坐姿及站姿下之全功率、標準化高頻、標準化低頻，以及低頻/高頻比在組間並無差異(P>0.05)。接受兩個月的走路運動後，參數未達顯著變化。

關鍵詞：停經後；代謝症候群；身體活動；心率變異

Abstract

Previous studies have shown that autonomic nervous activity in postmenopausal females is decreased and thus increases the risk of cardiovascular disease. The prevalence of metabolic syndrome in postmenopausal women (PW) is high. The dysfunction of cardiac regulation might contribute to this. However, relevant studies are lacking. Exercise/Physical activity might help improve autonomic nervous regulation in postmenopausal women with metabolic syndrome (MS). Nevertheless, studies need to be done to substantiate this conjecture. The purposes of this are to investigate: (1) the differences of heart rate variability (HRV) between PW and MS; (2) the effect of physical activity on HRV in PW and MS. We recruited 35 PW and 12 MS. Eighteen of 47 subjects participated in the 2-month walking program. Each subject received HRV test under supine, sitting and standing position. Subjects participating in the 2-month walking program received the same autonomic test as mentioned above, after the exercise program was completed. The results showed that no significant differences on total power, HF, LF, and LF/HF under supine, sitting, and standing and the 2-month walking program did not show significant improvement on HRV.

Keywords：postmenopause, metabolic syndrome, physical activity, heart rate variability

二、背景及目的

自主神經活性可由非侵入式之心率變異分析(Heart rate variability analysis)來做評估，此方式已被廣泛利用於分析健康人及疾病族群之心率自主神經系統調控情形，例如：高血壓、代謝症候群及糖尿病患者等(Kasahara et al., 2006; Takagi et al., 2006; Liao et al., 1998)。最常用以計算的為心電圖中的 R 波，藉由計算 RR 之間的時間間隔，成為一序列的數列。目前分析的方式可再分為時域（或稱為時間域，Time domain）、及頻譜 (或稱為頻率域，Frequency domain)。頻譜分析利用傅利葉轉換將心跳間隔的時間序列轉換為頻譜，以功率頻譜密度(Power spectral density, PSD)或是頻譜分佈(Spectral distribution)的方式表現。一般常測量 5 分鐘心率變異以計算全功率(total power)、高頻(HF：0.15-0.40 Hz)、低頻(LF：0.04-0.15 Hz)、標準化低頻(normalized LF，LF%)、低頻/高頻比(LF/HF)數值，分別代表自主神經整體活性、副交感神經活性、交感與副交感神經活性、交感神經活性，以及交感與副交感神經之平衡狀態(Mancia et al., 1999； Laude et al., 2004)。

心率變異度是自主神經活性的指標，同時也是評估心血管疾病的重要因子，心率變異度降低會增加心血管疾病及其死亡的風險。Eaker等人指出女性在五十至六十歲左右的停經期，心血管疾病的發生率急劇增加(Eaker et al.,1993)，除了因身體活動減少及正常老化外，亦有可能是女性停經所造成。Saeki等人比較停經前、後婦女，以及年齡相仿於停經後婦女之男性，在姿勢改變下心率變異及感壓反應情形，除發現停經後婦女副交感神經興奮度較差外，感壓反應亦較其他兩組為差(Saeki et al., 1998)。

近幾十年來，由於「代謝症候群」患者罹患糖尿病與心血管疾病風險較高，因此近年來相關議題備受重視。台灣對於「代謝症候群」之診斷，依行政院衛生署國民健康局訂立之最新代謝症候群之判定標準如表一所示。停經前，婦女低於男性，但 50 歲以後女性高於男性；美國相關盛行率調查也呈現類似結果(Ford et al.,2002)，推測代謝症候群之盛行率在停經後婦女族群增高可能與停經後女性荷爾蒙減少有關，但詳細機制仍不清楚。缺乏雌激素易導致動脈硬化、血壓升高；並可能造成脂肪代謝失調，使得停經後婦女容易堆積脂肪，導致肥胖，也間接增高血壓，形成多項代謝症候群之危險因子。因此，推測停經後婦女族群中有較高比例之代謝症候群患者與雌激素減少有關，但詳細機制仍待更多研究釐清。

如上所述，停經後婦女之自主神經有失調現象，而此變化是否也使得停經婦女容易成為代謝症候群？目前未有相關研究，有待進一步探索。停經後婦女，因老化及缺乏女性荷爾蒙之影響，自主神經系統活性降低，增加心血管相關疾病罹患率。停經女性中不乏代謝症候群者，然而究竟其中機制為何，停經對女性自主神經所造成之改變是否為機制之一，仍未有研究探索。而運動/增加身體活動可以是一個改善自主神經活性之機制，理論上，對於代謝症候群之停經婦女應有同樣效益，未有研究探討，並且運動/增加身體活動效益是否能更高於未有代謝症候群之停經婦女，亦有待調查，值得進一步探究。

本研究計畫目的為探討：(1)有代謝症候群及無代謝症候群之停經後婦女自主神經活性之異同；(2)增加身體活動量對有代謝症候群及無代謝症候群之停經後婦女自主神經活性之影響。

表一：台灣(2006)代謝症候群之判定標準

危險因子	異常值
腹部肥胖	腰圍　男性 ≧ 90 cm 女性 ≧ 80 cm
血壓	≧130 mmHg/ 85 mmHg
高密度酯蛋白膽固醇過低	男性 <40 mg/dl 女性 <50 mg/dl
空腹血糖值上升	FG ≧100 mg/dl
三酸甘油脂上升	TG ≧150 mg/dl

**以上 5 項危險因子中，若包含 3 項或以上者，即可判定為代謝症候群

三、方法與步驟

本研究之收案條件為停經一年以上未滿65 歲且未服用荷爾蒙藥物之女性；代謝症候群依台灣診斷標準：腰圍≧ 80 cm、血壓≧130 mmHg/ 85 mmHg、高密度酯蛋白膽固醇<50 mg/dl、空腹血糖值≧100 mg/dl、三酸甘油脂≧150 mg/dl；以上判別標準達三項(含)以上。排案條件：服用抗高血壓或控制血糖藥物、經診斷為冠狀動脈疾病、高血壓或糖尿病患者，或心電圖有明顯異常表徵者。

第一階段為測量受試者在仰臥、坐姿及站姿下之心率變異程度。受試者接受心率變異分析測試之前至少24 小時，禁止攝取任何含咖啡因之飲料、避免運動或熬夜。實驗室溫度控制在24-25℃，所有受試者在簽署完同意書了解實驗流程，並接受基礎量測後，開始心率變異分析測試。心電圖電極片採用第二導程，受試者靜躺十五分鐘，請受試者心情維持平靜，之後進入五分鐘心率收集，測試過程中請受試者盡量均勻呼吸，避免避氣或過度深呼吸。完成仰臥心率變異量測後，再分別以相同步驟進行坐姿及站姿之心率變異測量。

第二階段為於無、有代謝症候群婦女兩組中招募參與為期8週之走路運動計畫。每位受試者配有一個計步器，早上起床至就寢前佩戴於腰間，以記錄行走步數。走路運動執行兩個月後，所有受試者回來接受後測，測試步驟與第一階段相同

四、統計

受試者基本資料，以描述性統計分析，並以t-test檢視兩組是否有顯著差異。心率變異參數(全功率、標準化高頻、標準化低頻及低高頻比)方面，取自然對數後進行統計分析。利用雙因子變異分析(two-way ANOVA)比較第一階段組間(無代謝症候群 vs 有代謝症候群)在不同身體姿勢下之自主神經參數差異，Tukey test 為事後檢定。利用雙因子變異分析(two-way ANOVA)比較兩組在走路運動介入前後，不同身體姿勢下，各個自主神經參數改變之差異，Tukey test 為事後檢定。顯著水準為0.05。

五、結果與討論

共 47 位停經後婦女參與實驗，無、有代謝症候群婦女各為 35、12 人，無代謝症候群婦女之年齡、身高、體重及停經年數分別為 56.94±3.68 歲、156.29±5.50 公分、56.92±7.67 公斤及 6.53±5.87 年；有代謝症候群婦女之年齡、身高、體重及停經年數分別為 57.92±3.10 歲、156.52±4.38 公分、59.80±8.34 公斤及 7.00±4.82 年，兩組年齡、身高、體重及停經年數均無顯著相關(P>0.05)。無、有代謝症候群婦女在仰臥、坐姿、站姿下之全功率、標準化高頻、標準化低頻、及低高頻比分別整理於表一及表二。

表二、無代謝症候群停經婦女心率變異程度

參數	仰臥	坐姿	站姿
全功率 (ms^2)	529.77 (434.82)	545.00 (504.85)	512.80 (668.88)
標準化高頻(ms^2)	45.29 (17.32)	47.74 (17.26)	41.05 (18.65)
標準化低頻(ms^2)	54.69 (17.31)	52.26 (17.26)	58.95 (18.65)
低高頻比	1.86 (2.34)	1.51 (1.40)	2.03 (1.59)

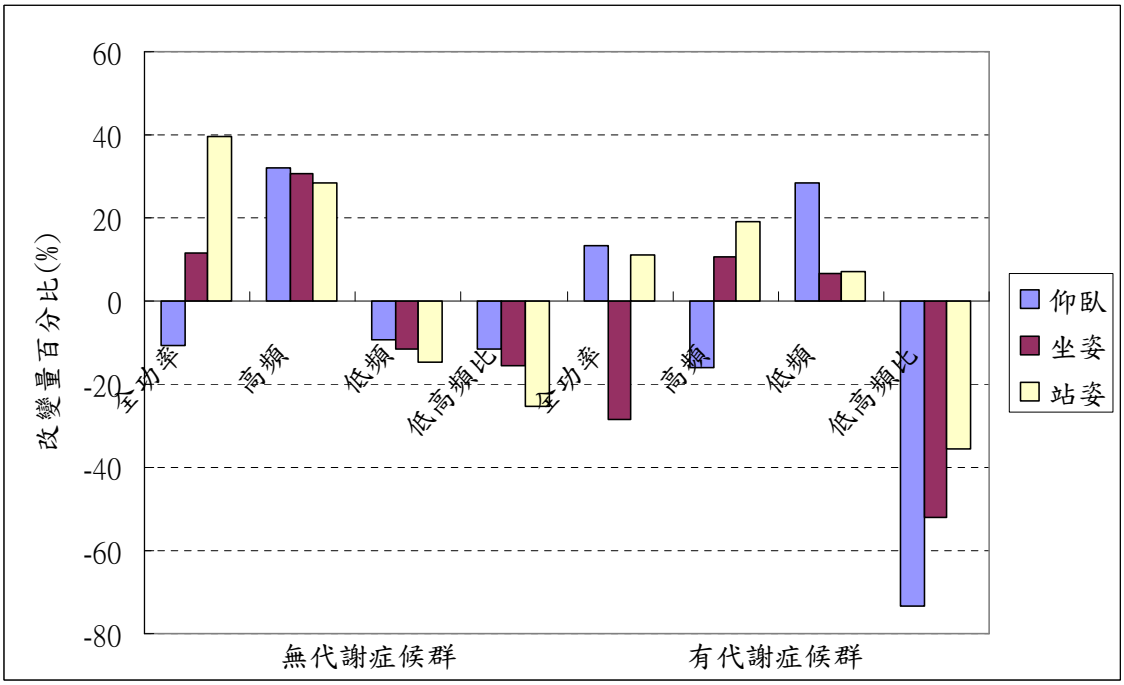
表三、有代謝症候群停經婦女心率變異程度

參數	仰臥	坐姿	站姿
全功率 (ms^2)	371.17 (0.875)	389.00 (197.08)	353.50 (288.41)
標準化高頻(ms^2)	43.87 (16.05)	45.38 (19.09)	38.17 (16.69)
標準化低頻(ms^2)	56.12 (16.07)	54.61 (19.09)	61.83 (16.69)
低高頻比	1.56 (0.87)	1.65 (1.31)	2.22 (1.61)

無代謝症候群及有代謝症候群婦女在不同姿勢下的自主神經活性，均以坐姿最高。兩組比較，有代謝症候群者在各姿勢下全功率、標準化高頻均較低(表一、二)，但 ANOVA 結果顯示未達顯著差異(P>0.05)；反之，其標準化低頻及低高頻比偏高，但亦未達統計上顯著差異(P>0.05)。

共有 18 人(無、有代謝症候群各 9 人)接受走路運動，兩組運動後之自主神經變化百分比如圖一所示。運動後，無代謝症候群組標準化高頻增加，低高頻比降低；有代謝症候群組除低高頻比在各姿勢下有減少趨勢外，其他參數變化情形不一，但 ANOVA 結果顯示不論組別及身體姿勢，全功率、高頻、低頻及低高頻比均無統計上差異。

本研究計畫中無、有代謝症候群婦女在不同姿勢下之自主神經活性並未有顯著差異，其原因可能是組內變異度過大，將持續收案，建議未來研究可將一些潛在影響心率變異原因(例如: 體能狀況)作進一步考量。此外，本研究未進一步在身體(例如:進行身體活動中)或心理刺激(例如：心理壓力測試)下做自主神經活性測量，亦可能是造成兩組未有顯著差異原因。



圖一、無、有代謝症候群者運動後之自主神經參數變化百分比

四、未來研究

本研究中未測量停經婦女之體能，亦未量測身體或心理挑戰下自主神經調控反應，未來研究可針對這些方面深入探討，以增加對停經婦女自主神經活性之了解。

VI、References

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行政院國家科學委員會補助國內專家學者出席國際學術會議報告

98 年 06 月 23 日

報告人姓名	許妙如	服務機構及職稱	高雄醫學大學物理治療學系助理教授
會議時間地點	June 13（正式開始）to June 17 Istanbul（伊斯坦堡), Turkey	本會核定補助文號	97-2629-B-037 -001
會議名稱	（中文)第五屆世界復健醫學年會(2009) （英文)5th World Congress of the International Society of Physical and Rehabilitation Medicine Annual Conference (2009)		
發表論文題目	1.(中文)神經肌肉電刺激對健康成人攝氧量之影響 （英文) Effect of neuromuscular electrical stimulation on oxygen consumption in healthy adults		

報告內容應包括下列各項：

一、參加會議經過

會議於土耳其伊斯坦堡市區之會議中心舉行，大會於六月十三日正式開始，持續至十六月十七日，參與人數約有萬人以上。會議內容有講演(lecture)，口頭報告(oral presentation)及壁報展示(poster presentation)等等。

二、與會心得

參與會議人數眾多，且為跨專業（例如：復健科醫師、物理治療師、職能治療師等）之會議，可獲悉各領域對於同一議題之多方看法，分享心得，以探討議題的各個層次，增加分析問題的深度及廣度。特別的是，會中某一專題演講(symposium)為"音樂治療(musical therapy)"，結合土耳其傳統音樂與舞蹈，發展出配合音樂的運動，特殊性十足。現場亦由演出者帶領出席者，參與體驗，該運動較著重於上背的活動，敝人參與後確實感到上背肌肉較為舒緩，有作為上背肩頸運動健康促進的另一選擇之潛力。由於配合音樂給予運動，增加趣味性，且選擇的音樂亦有影響自主神經活性之潛能，適合健康體適能領域採用。會議中有豐富的口頭報告及壁報展示，由於多專業之參與，因此口頭報告及壁報展示呈現相當多樣性，增加個人未來研究之豐富性及廣度，實在深感受益匪淺，對於提升國內物理治療研究素質大有助益。

三、考察參觀活動(無是項活動者省略)

無

四、建議

無。

五、攜回資料名稱及內容

附上：

1. 會議CD（會議內容）節錄一份(附件一)。
2. 發表壁報展示照片一張(附件二)。
3. 會議活動照片（專題演講）一張(附件三)。

六、其他

總體而言，參加此會議對提升國內物理治療研究素質有莫大幫助，可以促進跨專業領域之間對話，值得繼續參與。

附件一、會議資料節錄

[OP-001]

Stroke | June 14, 2009 Sunday, 10:30 - 12:00, 10 min, HALL I

Cerebral blood flow during constraint-induced movement therapy after stroke

Iuly Treger[1], Lena Aidinof[2], Hiela Lehrer[1]
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OBJECTIVE: Constraint-induced movement therapy (CIMT) is a physical rehabilitation regime that has been previously shown to improve motor function in hemiparetic stroke patients. Changes of blood flow velocity in the right and left middle cerebral artery (MCA) induced by motor tasks are detectable by means of transcranial Doppler sonography (TCD) monitoring. These measurements can indicate the patterns of hemispheric activation in post stroke patients with and without CIMT.
METHODS: Bilateral continuous MCA monitoring with TCD of 6 healthy subjects and 28 acute stroke patients with arm paresis, all right-handed, was performed while the subjects underwent 3 tasks by paretic hand. Their non-involved hand was free and after that - restricted. Mean blood flow velocity (MFV) and the velocity change during the tests were calculated. The motor task included ball elevation, spins insertion and eating with spoon. 9 patients (study group) received CIMT during 2 weeks according to protocol of gradual healthy hand restriction.
RESULTS: No significant blood velocity changes were found in healthy subjects. Patients that received CIMT for two weeks with gradual healthy hand restriction showed good compliance and significant improvement in paretic hand ability indexes after one month of rehabilitation treatment. Significant elevation of blood flow velocity in damaged MCA, especially during the eating test, was recorded in post-stroke patients after restriction of undamaged hand. Delta MVF was even greater in the second test after one month of rehabilitation treatment.
CONCLUSION: Our study suggests that CIMT with gradual healthy hand restriction for two weeks is effective for sub-acute stroke patients. As registered by TCD monitoring, CIMT can cause activation of damaged, but not - undamaged hemisphere as a part of brain reorganization after stroke. This finding can be important for improvement of CIMT protocol and for better understanding of brain reorganization patterns after stroke.

Keywords: Stroke, CIMT, TCD

[L-007]

Muscle pain syndrome: Evaluation, treatment and rehabilitation

Martin Grabois
Dept. of PMR, Baylor College of Medicine, Houston, Texas

This presentation will discuss specifically two muscle pain syndromes, Fibromyalgia and Myofascial Pain Syndrome. These syndromes will be compared and contrasted based on a review of the current literature and my experience in treating both syndromes. The incidence, etiology and pathophysiology will be presented. Special emphasis will be on the criteria developed to define each syndrome for diagnosis purposes. The clinical laboratory evaluation appropriate to diagnosis these syndromes will be presented. Finally, concepts of treatment as well as specific treatment such as trigger point blocks, spray and stretch technique, appropriate pharmaceuticals and finally therapy and psychosocial intervention will be presented.
In summary, the presentation outcomes in relation to pain management and functional improvement will be addressed.

Keywords: Muscle pain, fibromyalgia, myofascial pain

[P-0953]

June 15, 2009 Monday

Effectiveness of low level laser therapy on pain and functional status in ankylosing spondylitis

Elif Bulak, Hakan Gündüz, Eylem Akcan, Gülseren Akyüz
Marmara University School of Medicine, Department of Phyical Medicine and Rehabilitation, Istanbul, Turkey

OBJECTIVE: The aim of this study is to evaluate the effects of low level laser therapy (LLLT) in functional status and disease activity in patients with ankylosing spondylitis (AS).
METHODS: A total of 37 patients who had a diagnosis of AS according to the modified New York criteria were included in the study. The patients were randomly assigned to two groups. In Group 1 (n = 19) the patients received LLLT for 10 sessions (1.2J, 30 mW), group 2 received placebo laser. Patients were evaluated before the study, at the end of the treatment (2 weeks) and at the second month. Evaluation parameters were visual analog scale in rest and in movement, morning stiffness, the patient's global evaluation and the physician's global evaluation, the Bath Ankylosing Spondilitis Disease Activity Index (BASDAI), Bath Ankylosing Spondylitis Functional Index (BASFI), Ankylosing Spondylitis Quality of Life (ASQoL) questionnaire, Schober test (ST), modified Schober test (MST), finger to floor distance in antero-posterior flexion and lateral flexions.
RESULTS: There were no statistically significant differences between laser treatment and placebo for any measures of pain, functional status and disease activity ($p>0.05$). LLLT group showed significant improvements for parameters of visual analog scale in rest, finger to floor distance in antero-posterior flexion and left lateral flexion at 2 weeks ($p<0.05$), but only for the parameters of visual analog scale in movement, ASQoL, patient's global evaluation and physician's global evaluation at the end of the treatment and at the second month ($p<0.05$).
CONCLUSION: LLLT seemed to have a supplementary effect on disease activity and functional parameters in AS patients. However, there is a need for further well designed RCTs evaluating different durations of treatment, different wavelengths and different dosages of LLLT in AS patients.

Keywords: Low level laser therapy, ankylosing spondylitis

[PL-1]

Physical and Rehabilitation Medicine: Looking back and moving forward

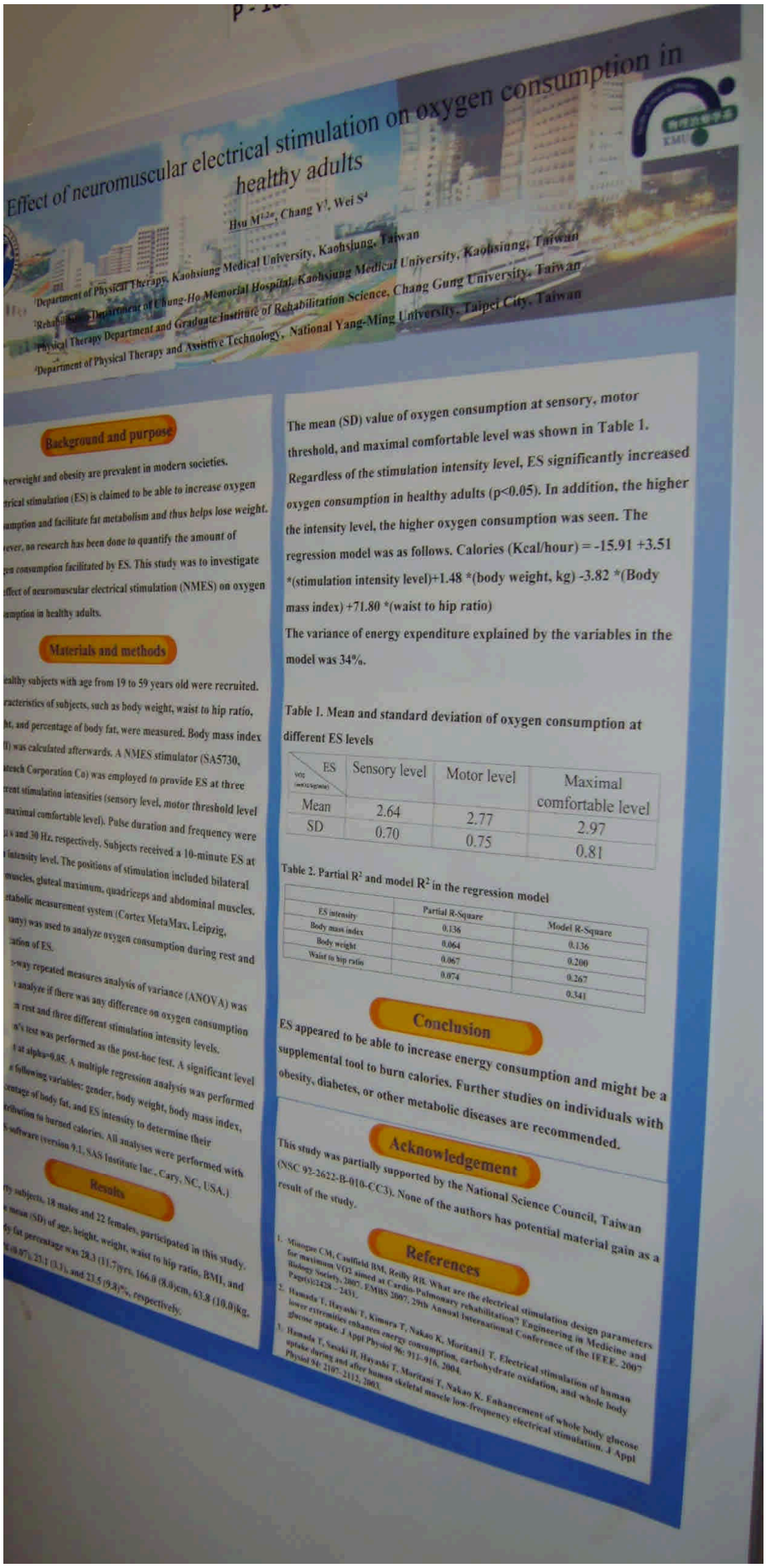
Önder Kayhan
Istanbul, Turkey

A lot of important developments within the science of physics have happened during the last couple of years. These developments have inevitably led to the formation of a new era in biotechnology, and medical practice and foremost in imaging, and also in diagnosis and treatment. A lot of physical medicine applications which we have used 30-40 years ago, and which invaded quite some space in the textbooks, are today either dormant or have lost their importance. And we cannot really say that we were able to replace that with a new treatment modality which only physiatrists use and were trained in. Medical physicists, which know about new technologies and apply them very well, might currently be working on cancer therapy and imaging, but will, in the near future, become our competitors in the hospitals in the field of pain and loss of function. We need to very quickly incorporate areas such as nanotechnology, quantum mechanics, genetic engineering and robotics into the Physical Medicine and Rehabilitation (PRM) expert training programmes, and switch to new appliances what with the treatment of pain and loss of function and rehabilitation.

Keywords: ---

表 Y04

附件二、發表展示壁報照片



Effect of neuromuscular electrical stimulation on oxygen consumption in healthy adults

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[3]Physical Therapy Department and Graduate Institute of Rehabilitation Science, Chang Gung University, Taiwan
[4]Department of Physical Therapy and Assistive Technology, National Yang-Ming University, Taipei City, Taiwan

Background and purpose

verweight and obesity are prevalent in modern societies.
trical stimulation (ES) is claimed to be able to increase oxygen
umption and facilitate fat metabolism and thus helps lose weight.
wever, no research has been done to quantify the amount of
gen consumption facilitated by ES. This study was to investigate
ffect of neuromuscular electrical stimulation (NMES) on oxygen
umption in healthy adults.

Materials and methods

ealthy subjects with age from 19 to 59 years old were recruited.
racteristics of subjects, such as body weight, waist to hip ratio,
ht, and percentage of body fat, were measured. Body mass index
I) was calculated afterwards. A NMES stimulator (SA5730,
tech Corporation Co) was employed to provide ES at three
rent stimulation intensities (sensory level, motor threshold level
maximal comfortable level). Pulse duration and frequency were
s and 30 Hz, respectively. Subjects received a 10-minute ES at
intensity level. The positions of stimulation included bilateral
muscles, gluteal maximum, quadriceps and abdominal muscles.
etabolic measurement system (Cortex MetaMax, Leipzig,
any) was used to analyze oxygen consumption during rest and
ation of ES.

-way repeated measures analysis of variance (ANOVA) was
analyze if there was any difference on oxygen consumption
n rest and three different stimulation intensity levels.
's test was performed as the post-hoc test. A significant level
at alpha=0.05. A multiple regression analysis was performed
following variables: gender, body weight, body mass index,
entage of body fat, and ES intensity to determine their
ribution to burned calories. All analyses were performed with
software (version 9.1, SAS Institute Inc., Cary, NC, USA).

Results

ty subjects, 18 males and 22 females, participated in this study.
mean (SD) of age, height, weight, waist to hip ratio, BMI, and
y fat percentage was 28.3 (11.7)yrs, 166.8 (8.0)cm, 63.8 (10.0)kg,
8 (0.97), 23.1 (3.1), and 23.5 (9.8)%, respectively.

The mean (SD) value of oxygen consumption at sensory, motor threshold, and maximal comfortable level was shown in Table 1. Regardless of the stimulation intensity level, ES significantly increased oxygen consumption in healthy adults ($p<0.05$). In addition, the higher the intensity level, the higher oxygen consumption was seen. The regression model was as follows. Calories (Kcal/hour) = -15.91 +3.51 *(stimulation intensity level)+1.48 *(body weight, kg) -3.82 *(Body mass index) +71.80 *(waist to hip ratio)

The variance of energy expenditure explained by the variables in the model was 34%.

Table 1. Mean and standard deviation of oxygen consumption at different ES levels

ES / VO2 (ml/kg/min)	Sensory level	Motor level	Maximal comfortable level
Mean	2.64	2.77	2.97
SD	0.70	0.75	0.81

Table 2. Partial R^2 and model R^2 in the regression model

	Partial R-Square	Model R-Square
ES intensity	0.136	0.136
Body mass index	0.064	0.200
Body weight	0.067	0.267
Waist to hip ratio	0.074	0.341

Conclusion

ES appeared to be able to increase energy consumption and might be a supplemental tool to burn calories. Further studies on individuals with obesity, diabetes, or other metabolic diseases are recommended.

Acknowledgement

This study was partially supported by the National Science Council, Taiwan (NSC 92-2622-B-010-CC3). None of the authors has potential material gain as a result of the study.

References

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表 Y04

附件三、會議照片

音樂治療現場

表 Y04

無衍生研發成果推廣資料

97 年度專題研究計畫研究成果彙整表

計畫主持人：許妙如	計畫編號：97-2629-B-037-001-
計畫名稱：有無代謝症候群停經婦女之心率變異度及走路計畫效應研究	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	1	1	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

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。)	無

	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	

國科會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)

(A)本研究中未測量停經婦女之體能，亦未量測身體或心理挑戰下自主神經調控反應，未來研究可針對這些方面深入探討，以增加對停經婦女自主神經活性之了解。(B)代謝症候群患者參與運動計畫意願較低落，未來應探討如何以行為改變方式幫助該族群建立運動習慣。