行政院國家科學委員會專題研究計畫 成果報告

發展協調障礙兒童之心血管危險因子特性分析
研究成果報告(精簡版)

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計 畫 主 持 人：吳昇光
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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

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

中 華 民 國 101 年 10 月 29 日

中文摘要：背景與目的：迄今國際上甚少使用探討發展協調障礙兒童心血管危險因子之研究，過去研究雖指出發展協調障礙兒童之體適能與心肺功能明顯低於正常發展兒童，而且這可能導致成年得心血管疾病的風險。本探索性研究計畫的目的在於分析發展協調障礙兒童在心血管之危險因子，並長期比較正常發展兒童在健康相關因子之差異。方法：本研究以 Movement ABC-2 測驗篩檢 141 位 11 到 12 歲兒童，在評估確認發展協調障礙兒童之四個診斷條件後，9 位符合確認之發展協調障礙兒童及 132 位正常發展兒童當成控制組，以進行 Movement ABC-2 測驗、Leger20 公尺折返跑測驗、血壓、身體組成、肺功能，並請參與兒童自我知覺身體活動問卷(CSAPPA 中文版)之結果比較。結果：本計畫發現評估發展協調障礙兒童在心血管危險因子（血壓、血脂、血糖、肺功能、有氧能力、身體組成等）與正常發展兒童進行比較後，發現發展協調障礙兒童在有氧能力較差、身體體脂肪百分比與身體質量指數值顯著較高，在其餘項目則無顯著差異；另外兩組在知覺動作能力、普遍性自我效能並無顯著差異。結論：此初步研究結果可以幫助我們了解現今台灣在發展協調障礙兒童心肺與健康行為僅略低於正常發展兒童，未來研究應進行長期追蹤的探討，以進一步了解發展協調障礙兒童在進入青少年階段之變化與影響。

中文關鍵詞：發展協調障礙、心血管疾病、危險因子、體適能、動作能力、追蹤研究

英文摘要：Background and Purpose: Currently, there have been very limited research studies to examine cardiovascular risk factors of children with developmental coordination disorder (DCD) in the world. Several research studies have shown that physical fitness and cardiorespiratory function of children with DCD was poorer than typically developing children, and thus this may increase the cardiovascular disease (CVD) in adults when children with DCD grow up. However, no systematic examination of DCD children in this topic has been found. The purposes of this exploratory project were to analyze the cardiovascular risk factors influencing children with DCD and to compare children with DCD in health-related factors to typically developing children. Methods: Using Movement ABC-2 test, 141 school children aged 11 to 12 years were recruited for

screening to identify whether DCD, borderline DCD or typical development (TD) in motor coordination. Nine children with DCD were selected with parental consents and 132 peers with TD matched were recruited as controls. All children participating in this project will attend the Movement ABC test, Leger 20-meter shuttle run in field, measures of blood pressure and body composition, and pulmonary function test. In addition, children with DCD and TD were asked to complete Children's Self-Perception of Adequacy in and Predilection for Physical Activity Scale (CSAPPA Scale). Results: Through this investigation, we found that children with DCD were poorer in aerobic capacity and were higher in body fat and body mass index than TD children. However, no significant differences in other CVD factors between two groups were found. In addition, children with DCD were not significantly different from TD children in perceived competence and generalized self-efficacy. Conclusion: Children with DCD may less fit than TD children. Although we briefly examined the differences in CVD and health behavior between two groups, the longitudinal study to monitor children with DCD to adolescents is essential.

英文關鍵詞： developmental coordination disorder, cardiovascular disease, risk factor, physical fitness, motor proficiency, longitudinal study

行政院國家科學委員會補助專題研究計畫成果報告

發展協調障礙兒童之心血管危險因子特性分析

Analysis of Cardiovascular Risk Factor Profile in Children with Developmental Coordination Disorder

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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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※赴國外出差或研習心得報告
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中　華　民　國　101　年 10 月 28 日

中文摘要

背景與目的：迄今國際上甚少使用探討發展協調障礙兒童心血管危險因子之研究，過去研究雖指出發展協調障礙兒童之體適能與心肺功能明顯低於正常發展兒童，而且這可能導致成年得心血管疾病的風險。本探索性研究計畫的目的在於分析發展協調障礙兒童在心血管之危險因子，並長期比較正常發展兒童在健康相關因子之差異。方法：本研究以 Movement ABC-2 測驗篩檢 141 位 11 到 12 歲兒童，在評估確認發展協調障礙兒童之四個診斷條件後，9 位符合確認之發展協調障礙兒童及 132 位正常發展兒童當成控制組，以進行 Movement ABC-2 測驗、Leger20 公尺折返跑測驗、血壓、身體組成、肺功能，並請參與兒童自我知覺身體活動問卷(CSAPPA 中文版)之結果比較。結果：本計畫發現評估發展協調障礙兒童在心血管危險因子（血壓、血脂、血糖、肺功能、有氧能力、身體組成等）與正常發展兒童進行比較後，發現發展協調障礙兒童在有氧能力較差、身體體脂肪百分比與身體質量指數值顯著較高，在其餘項目則無顯著差異；另外兩組在知覺動作能力、普遍性自我效能並無顯著差異。結論：此初步研究結果可以幫助我們了解現今台灣在發展協調障礙兒童心肺與健康行為僅略低於正常發展兒童，未來研究應進行長期追蹤的探討，以進一步了解發展協調障礙兒童在進入青少年階段之變化與影響。

關鍵字：發展協調障礙、心血管疾病、危險因子、體適能、動作能力、追蹤研究

Abstract

Background and Purpose: Currently, there have been very limited research studies to examine cardiovascular risk factors of children with developmental coordination disorder (DCD) in the world. Several research studies have shown that physical fitness and cardiorespiratory function of children with DCD was poorer than typically developing children, and thus this may increase the cardiovascular disease (CVD) in adults when children with DCD grow up. However, no systematic examination of DCD children in this topic has been found. The purposes of this exploratory project were to analyze the cardiovascular risk factors influencing children with DCD and to compare children with DCD in health-related factors to typically developing children. **Methods**: Using Movement ABC-2 test, 141 school children aged 11 to 12 years were recruited for screening to identify whether DCD, borderline DCD or typical development (TD) in motor coordination. Nine children with DCD were selected with parental consents and 132 peers with TD matched were recruited as controls. All children participating in this project will attend the Movement ABC test, Leger 20-meter shuttle run in field, measures of blood pressure and body composition, and pulmonary function test. In addition, children with DCD and TD were asked to complete Childrenôs Self-Perception of Adequacy in and Predilection for Physical Activity Scale (CSAPPA Scale). **Results:** Through this investigation, we found that children with DCD were poorer in aerobic capacity and were higher in body fat and body mass index than TD children. However, no significant differences in other CVD factors between two groups were found. In addition, children with DCD were not significantly different from TD children in perceived competence and generalized self-efficacy. **Conclusion:** Children with DCD may less fit than TD children. Although we briefly examined the differences in CVD and health behavior between two groups, the longitudinal study to monitor children with DCD to adolescents is essential.

Keywords: developmental coordination disorder, cardiovascular disease, risk factor, physical fitness, motor proficiency, longitudinal study

Introduction

Developmental Coordination Disorder (DCD) is a common childhood disorder that according to the prevalence estimate affects 5%-9% of all school-aged children (American Psychiatric Association, 2000; Barnhart, Davenport, Epps, & Nordquist, 2003; Kadesjo & Gillberg, 1999). This means that every classroom with over 30 students is likely to have at least two to three children with DCD. In Taiwan, the prevalence (12.6%) of children with DCD in ages 7 to 10 years is even higher than most published articles in western countries (Wu, 2001). However, there is limited awareness of this disorder among parents, teachers and many health professionals. As a result, typically children with coordination problems remains undiagnosed. Surprisingly, these prevalence estimates suggest that DCD ranks high among the most common childhood disorders. This lack of awareness may stem in part from a lack of understanding of the physiologic health risks that may accompany DCD. DCD is often thought of as a ñplayground disorderò (Hay & Missiuna, 1998; Cairney et al., 2005c). The risks to the physical health of the child have remained largely unexplored in Taiwan and even in the world.

Motor difficulties in children with DCD are varied including both fine and gross motor coordination problems, and difficulties with fundamental physical skills such as throwing, catching, kicking, skipping and jumping (Sudgen & Wright, 1998; Visser, 2003; Wall, 1982; Wu et al., 2009). As children grow and the demands for more complex coordinated physical skills increases, children with DCD fall even further behind their motor proficient peers (Bouffard, Watkinson, & Thompson, 1996). Children with DCD may tend to avoid physical activities and sports, selecting instead inactive pursuits where their problems are less noticeable (Causgrove Dunn, 2000; Causgrove Dunn & Dunn, 2006). As a result, inactive lifestyle and its negative consequence are a major health issue in the DCD population. In particular, children with DCD may be at risk for negative physical health outcomes such as overweight or obesity and poor physical fitness. Both may be possible risk factors for cardiovascular disease. A small, but consistent body of work identifies this concern. Children and adolescents with DCD do appear to be less physically active in several studies (Cairney et al., 2005b, 2005c), more likely to be overweight and obese (Cairney et al., 2005a, 2010a; Zhu, Wu, & Cairney, 2011), and less physically fit (Cairney et al., 2006b, 2007; Faught, Hay, Cairney, & Flouris, 2005; Wu et al., 2010) than non-affected children. Those studies have shown that children with obesity and less physical activity have great impact on more sedentary daily activities and may later cause the increase of CVD in adults (Whitaker et al., 1997). Indeed, the influencing process of children with DCD on related health problems has not been examined deeply and systematically in Taiwan and even most countries in the world (Cairney et al., 2010a; Wu et al., 2010).

Research Purposes and Research Questions

The main purposes of this exploratory project were to analyze the cardiovascular risk factors influencing children with DCD from physiological perspectives and to compare children with DCD in related health factors to typically developing (TD) children.

Based on the research purposes in this project, two research questions were investigated.

1) Are children with DCD at greater risk for CVD risk, as measured by adiposity, physical fitness, pulmonary function, and hypertension than their TD peers?

2) Are differences in CVD risk between children with DCD and controls due to differences in perceptions of physical ability (e.g., self-efficacy)?

METHODS

Participants

In this study, 141 healthy participants ages 11 or 12 years with parent consents attended the test. First, they attended the Leger 20-meter shuttle run in school to measure the cardiorespiratory fitness in the field-based test. Currently, the Leger 20-meter shuttle run is the most popular test to predict peak aerobic power for children. This test has been applied in several studies of children with DCD such as in Canada, Europe, and Australia (Cairney et al., 2005b, 2006b, 2007; Hands, 2008; Schott, Alof, Hultsch, & Meermann, 2007; Tsiotra, Nevill, Lane, & Koutedakis, 2009). Participants performed the test in groups of 10, and the test was terminated when each individual could not keep up the required running pace for two consecutive signals. The maximal speed (km/hr) during the last stage of the test is subsequently used to calculate the metabolic equivalent using the following equation.

$$MET=31.025+3.238\ (\text{maximal speed})-3.248(\text{age})+0.1536(\text{speed}*\text{age})$$

Each participantôs predicted peak VO2 was calculated by multiplying the MET value associated with the final completed level of activity by 4.6 ml/kg/min for 1 MET, suggested by researchers. This test is well developed as a valid field measure to estimate maximal oxygen uptake in children with validation using a treadmill with Bruce protocol ($r=0.72$, $p<.01$).

In addition, all participants were tested with the Movement ABC-2 test in school. The testing items were shown in Table 2. The testing procedures follow the manual of the Movement ABC-2 (Henderson, Sugden, & Barnett, 2007).

Table 2. Testing Items in the Movement ABC Test

Domains	Items for 9-10 years old	Items for 11-12 years old
Manual dexterity	1. shifting pegs by rows	1. turning pegs
	2. threading nuts on bolt	2. cutting-out elephant
	3. flower trail	3. flower trail
Ball Skills	1. two-hand catch	1. one-hand catch
	2. throwing a bean-bag into a box	2. throwing at wall target
Balance	1. one-board balance	1. two-board balance
	2. hopping in squares	2. jumping and clapping
	3. ball balance	3. walking backwards

(cited from Henderson, Sugden, & Barnett, 2007)

A typical laboratory session was routinely scheduled from 8 am to 12 pm for six children. It is important to note that all children, DCD and controls, were tested in the exact same manner. The approximate schedule and order of testing for a laboratory are described in Table 3. The whole test was taken approximately 50 minutes for each child.

i) ***Blood Pressure:*** The child wear non-restrictive clothing and did not cross their legs or talk during blood pressure measurement. Blood pressure and resting heart rate (RHR) was measured using the same equipment Nonin 2120 blood pressure monitor (Plymouth, MN, USA) and protocol as the European Youth Heart Study (Wedderkopp et al., 2003). Five independent sequential measurements were taken at 1-minute intervals. The first two measurements have been done to familiarize the child with the process and sensation of the cuff pressurization. The final two measurements were averaged to provide a measure of systolic and diastolic blood pressure (SBP and DBP).

ii) ***Body Composition:*** The BIA system for the pediatric populations (Tanita BC-545 model, Japan) was used to measure body weight, body fat percentage and lean body mass in this study.

iii) ***Pulmonary Function Test:*** In this study, the Master Screen Pneumo spirometer (Hochberg, Germany) was used to measure the pulmonary function of children. The testing procedures for collecting the forced vital capacity maneuver follow the instructions and criteria provided by the American Thoracic Society in order to ensure the quality of the data (Wu et al., 2011). Before the formal test is conducted each day, the spirometer has been calibrated using a standardized syrinage (one-liter volume). Each participant is asked to stand to complete the assessment. A nose-clip was used during practice sessions when the participant only breathed through their mouth a few times. He or she immediately conducted a maximal forced inspiration (i.e., take a breath as deep as possible), and then followed the maximal forced expiration (i.e., blow out long and hard and breath out). Results of FVC and $FEV_{1.0}$ were recorded each time. Each participant was asked to conduct the pulmonary test a minimum of three and a maximum of four times. The maximal values of FVC, $FEV_{1.0}$ and FVC/height were analyzed in this study.

Table 3. Chronology and Order of Laboratory Testing

Order	Testing Item	Time
1	Blood pressure	10 minutes
2	Body composition using BIA	5 minutes
3	DCD children complete PQOL and CSAPPA	15 minutes
4	Pulmonary function test	20 minutes

Children completed the Childrenôs Self-Perception of Adequacy in and Predilection for Physical Activity (CSAPPA) (Cairney et al., 2005c; Hay, 1992; Hay, Hawes, & Faught, 2004) as they were used to measure their perceptions and self-efficacy in physical activities. All questionnaires used in the study were translated into Chinese editions with proper revisions for using in Taiwan.

3. Statistical Analyses

Basic descriptive statistics and tests were conducted on all continuous variables prior to any analyses. Baseline differences (Questions 1, 2) in CVD risk between children with DCD and those without were examined using case-control analyses. We examined differences in CVD risk factors using independent t-test (two-group comparisons).

RESULTS & DISCUSSION

In this study, we analyzed the cardiopulmonary data and health behaviours of TD and pDCD groups. When the basic data in two groups were compared. the results were shown in Table 1. Generally, the pDCD group was higher in weight, BMI, and body fat than the TD group ($p \leqq .001$). The pDCD group was also poorer in manual dexterity, balance and ball skills than the TD group ($p<.001$). This indicated that the pDCD group was significantly poorer in movement coordination and also fatter and heavier than the TD group. Cairney et al (2005a) had also reported that Canadian children with DCD were more likely to be overweight and obese (23.3%) than children without DCD (12.1%). The similar finding was confirmed by a large sample size of the Taiwanese study conducted Zhu et al (2011) and the Greek study conducted by Tsiotra et al (2009).

Table 1. Comparison of basic data in two groups

	Group	N	Mean	SD	t value	p value
AGE	TD	132	11.48	.50	-1.751	.082
	pDCD	9	11.78	.44		
HEIGHT	TD	132	153.58	8.75	-1.405	.162
	pDCD	9	157.89	11.14		
WEIGHT	TD	132	45.70	11.55	-3.745	<.001
	pDCD	9	61.17	17.58		
BMI	TD	132	19.18	3.73	-3.702	<.001
	pDCD	9	24.05	5.11		
FAT	TD	132	18.42	9.38	-3.446	.001
	pDCD	9	29.69	11.09		
MANUAL	TD	132	31.58	4.53	4.670	<.001
	pDCD	9	24.44	2.54		
BALL	TD	132	23.00	4.73	4.513	<.001
	pDCD	9	15.61	5.00		
BALANCE	TD	132	31.33	4.78	7.852	<.001
	pDCD	9	18.22	5.87		
TOTAL	TD	132	85.91	9.19	8.810	<.001
	pDCD	9	58.28	7.62		

When we compared the cardiopulmonary results between the TD and pDCD groups, we found that the TD group was higher in predicted maximal oxygen consumption than the pDCD group ($p<.01$). However, no significant difference in the resting HR, BP, and pulmonary function between TD and pDCD groups was found ($p>.05$). The finding of poor aerobic fitness in DCD children was similar to most studies (Cairney et al, 2010b; Wu et al, 2010). However, it is surprising that DCD children were not significantly different in pulmonary function. The result was completely different from the previous Taiwanese study conducted by Wu et al (2011).

In addition, we may expect that children with DCD may have higher resting HR and BP than TD children. However, the results showed that no significant difference between two groups was found. In the critical and systematic review by Rivilis et al (2011), they found that several empirical studies identified that TD children had higher aerobic fitness and endurance.

Table 2. Comparison of cardiopulmonary data in two groups

	Group	N	Mean	SD	t value	p value
VO2 (ml/min)	TD	132	44.58	4.65	2.974	.003
	pDCD	9	39.88	3.30		
SBP (mm-Hg)	TD	132	97.04	10.66	-1.366	.174
	pDCD	9	102.11	12.53		
DBP (mm-Hg)	TD	132	57.16	8.49	-.059	.953
	pDCD	9	57.33	8.96		
HR (beats/min)	TD	132	89.44	12.80	-.277	.782
	pDCD	9	90.67	13.83		
MBP (mm-Hg)	TD	132	70.48	8.45	-.595	.553
	pDCD	9	72.22	9.02		
FVC (liter)	TD	132	2.65	.56	-1.533	.128
	pDCD	9	2.95	.83		
FVC1 (liter)	TD	132	2.21	.49	-1.876	.063
	pDCD	9	2.54	.68		
FVC1/FVC (%)	TD	132	81.75	10.93	-.095	.924
	pDCD	9	82.10	6.71		
FVC/HT	TD	132	1.71	.31	-1.218	.225
	pDCD	9	1.85	.45		

In the health behaviours, we found that no significant difference in CSAPPA between the TD and pDCD groups ($p>.05$, see Tables 3). When we analyzed the detailed components of CSAPPA and PQOL, still no significant difference was found. In the assessment of CSAPPA, three main components (i.e. adequacy, predilection and enjoy physical activity) and the total score were used to measure children's self perceptions of their adequacy in performing, and their desire to participate in physical activities (Hay, 1992). Generally, the objective of the test was to detect children at risk for hypoactivity. Actually, no significant difference in each component and total score between DCD and TD groups was found in this study. The results were obviously different from the Canadian studies which demonstrated the low CSAPPA scores in children with DCD (Cairney et al., 2006a; Hay et al., 2004; Hay & Cairney, 2006; Hay & Mussiuna, 1998). We may recognize that most DCD or non-DCD children in Taiwan need to study more hours in school and after school than those of the western countries. Physical activities for Taiwanese children in the school or after school recess time may not be emphasized as important as the academic subjects. Therefore, many Taiwanese students were less fit and overweight than 20 years ago (Li et al, 2011). According to the findings, this issue should be concerned seriously.

Table 3. Comparison of CSAPPA in two groups

	Group	N	Mean	SD	t value	p value
ADEQUACY	TD	132	20.98	4.52	.279	.781
	pDCD	9	20.56	1.24		
PREDILEC	TD	132	21.44	4.49	1.393	.166
	pDCD	9	19.33	2.12		
ENJOYPA	TD	132	10.17	2.22	.083	.934
	pDCD	9	10.11	1.76		
CSAPPA	TD	132	52.60	10.15	.761	.448
	pDCD	9	50.00	3.61		

Dewey et al (2002) have reported that children with DCD may have some problems related to attention, learning, and psychosocial adjustment. Those problems may affect their academic performance and also quality of life. However, in the current study, our findings did not support the proposed manner.

Rivilis et al (2011) have demonstrated that body composition, cardiorespiratory fitness, muscle strength and endurance, anaerobic capacity, power, and physical activity have all been negatively associated, to various degrees, with poor motor proficiency, except the influence of flexibility. In this study, we only analyzed the cardiopulmonary function, aerobic ability, cardiovascular function, self-efficacy toward physical activity and quality of life. However, our findings were slightly different from previous studies in western countries which have revealed that DCD children were significantly poorer than TD children. The problem in Taiwan may related to the limited physical activities in most children. Therefore, even TD children in Taiwan may have less aerobic fitness and self-efficacy physical activities than children with or without DCD. Thus, gradually TD children may even become poorer in physical fitness and quality of life. However, this issue need further clarification with more scientific evidence.

In this study, we also recognized that it is essential to follow-up children with DCD or non-DCD for a few years in order to realize how the long sedentary academic life to affect the children's fitness, physical abilities and health in Taiwan. The long-term influence may even last to adolescents. Currently, there were only a few studies to monitor children's coordination, motor abilities and educational and social functions (e.g., Cairney et al, 2010a; Cantell et al, 1994; Hands , 2008; Li et al, 2012). All of those studies reveled that children with DCD were less fit than their TD peers, even when they grew up. Thus, several studies have suggested that proper interventions for children with DCD is essential.

CONCLUSION

Based on the research findings, children with DCD may less fit than TD children in terms of less cardiovascular endurance and higher body fat and BMI. However, we did not identify the difference between pDCD and TD children in pulmonary function, resting HR and BP, and health behaviours and self-efficacy (CSAPPA) in this study. Although we briefly examined the differences in CVD and health

behavior between two groups, it is essential to monitor children with DCD to adolescents through the longitudinal follow-up study. In addition, the sample size of this study is limited. It is necessary to examine more large samples of children with DCD in order to identify their cardiopulmonary fitness and health behaviours in greater depth.

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國科會補助專題研究計畫項下出席國際學術會議心得報告

日期：101 年 6 月 9 日

計畫編號	NSC 100 – 2314 – B – 028 – 001		
計畫名稱	發展協調障礙兒童之心血管危險因子特性分析		
出國人員姓名	吳昇光	服務機構及職稱	國立臺灣體育運動大學教授
會議時間	101 年 5 月 29 日至 101 年 6 月 2 日	會議地點	美國舊金山
會議名稱	(中文)第 59 屆美國運動醫學會年會 (英文)59th Annual Meeting, American College of Sports Medicine		
發表論文題目	(中文)發展協調障礙兒童之七天身體活動與自覺從事身體活動之效能 (英文)7-day physical activity and self-efficacy toward physical activity of children with developmental coordination disorder		

一、參加會議經過

今年 5 月 28 日至 6 月 5 日的美國運動醫學學習之旅，筆者於 5 月 29 日至 6 月 2 日參加由美國運動醫學會（American College of Sport Medicine）所主辦之知名年會，同時合併舉辦第三屆運動即醫學國際會議(3rd World Congress on Exercise is Medicine, 縮寫 EIM)。由於這是本人第一次參與美國運動醫學會此組織所舉辦之學術會議活動，在五天參加會議的過程中聆聽許多場專題演講、專項主題討論與學術論文口頭及海報發表，所有參與此次會議的成員皆感到收穫甚大，以下僅將此次行程的內容進行整理，以供國人之參考。

此學術會議於101年5月29日至6月2日在美國舊金山(San Francisco)的國際會議廳盛大舉行，共吸引來自世界60個國家超過六千名學者專家與臨床工作者參與此每年一次之大型學術盛會，共計十餘場次的專題演講、數百場研究專題討論。其中在參與審查後接受發表共計有3581篇摘要，參與學者中主要以美國為主，但許多運動醫學及運動科學盛行的國家皆有許多知名學者參與，在亞洲地區也有日本、韓國、中國、香港、泰國、新加坡、台灣參加，但在世界各國的發表之中主要以美國、加拿大發表為最多，佔80%以上。而歐美澳等已開發國家學者的發表佔了全部90%以上。除此之外，筆者並一併參加第三屆運動即醫學的學術討論，以了解國際上在此EIM的重要概念與價值,相信EIM將會是在21世紀中逐漸突顯出來的最大影響。第60屆的美國運動醫學會將於2013年5月底在印弟安那州的印弟安那波里市舉行,恰逢為此年會60周年慶祝的大日子，相信屆時將會有來自世界各地的學者專家參與此大會。整體而言，筆者此次的美國舊金山學術發表之行成果可謂十分豐碩。

二、與會心得

此次台灣共計有近一百名學者或研究生參與此次會議，在會場中有機會見到國內運動科學界十分積極的多位學者，其中國立體育大學及台北體育學院更組了近四十人的參加團體，包括近三十位碩博士班研究生，對研究生而言這是很好的充電與學習機會，同時可以刺激英文能力，更是難得機會能在會場中見到許多知名的學者。

在發表海報論文時筆者探討發展協調障礙兒童之運動健康行為與身體活動能力之分析，在此次會議中算是較為冷門的領域與討論主題。筆者雖被安排在五月31日下午兒童身體活動(Physical activity in youth)的主題，但似乎大多學者強調在

一般學齡或學齡前兒童之身體活動、身體發展與健康議題，僅有少數學者至本人的海報進行討論，雖然如此，筆者巧與德國烏姆大學兒童肥胖、身體活動與健康研究群在鄰，並與此研究群學者 Anja Schreiber 有所討論。整體而言，兒童肥胖與健康行為為熱門的研究主題，但是此次發表論文中僅有少數海報發表是探討特殊族群身體活動與健康研究，但筆者有機會聆聽到多場精彩的專題演講或工作坊，使得筆者很充實的度過這繁忙的五天。其中大會精心的內容安排，同時段有近二十場次的進行，讓筆者體會到這個大型的學術會議雖像大拜拜的會議模式，此會議發表的質與量卻受到參與此次會議世界各國代表的肯定。

而筆者的海報發表被安排在第三天的議題中，所發表的題目為『發展協調障礙兒童之七天身體活動與自覺從事身體活動之效能』(7-day physical activity and self-efficacy toward physical activity of children with developmental coordination disorder)。此研究為本次會議中唯一一篇從健康行為觀點探討發展協調障礙兒童的問題。較為可惜的是，筆者在其中並未發現在此主題有特別興趣的學者專家，除了無法深入討論外，也無法進行進一步的國際交流與合作。

筆者在其他四天半的時段也忙碌聆聽不同的場次，個人主要針對身體活動與健康研究、健康促進政策與規畫、客觀測量身體活動量、兒童靜態行為之相關研究、兒童肥胖與活動、兒童運動科學等發表場次較有興趣。在會議之中其中最吸引筆者為 Joseph Wolffe Memorial Lecture，由科羅拉多大學醫學院教授 Wendy Kohrt 談到身體活動與骨骼健康的研究；以及 D. B. Bill Historical Lecture 中，由加拿大魁北克心肺研究所教授 Jean-Pierre Despres 所談到的肥胖、體能及心肺代謝與健康，兩個場次皆讓筆者大開眼界，了解數十年來深入及系統性的研究，並如何將

研究與應用做進一步的結合，以嘗試改變人類現今所遭遇的問題。其中 Despres 自己也是業餘長跑選手，更是身體力行每週跑步及訓練外，能夠將研究成果告知世人肥胖所造成的嚴重問題。這也讓筆者非常佩服他的學術貢獻及推廣身體活動的價值。

另外筆者也有機會聆聽美國田納西大學 Edward Howley 教授用 50 分鐘時間整體介紹運動生理學，在全場聽眾爆滿的情況下，Howley 教授在短暫時間內將能量系統、神經肌肉系統、心肺系統及運動處方做了非常精闢的演說，果然是世界大師級的風采與專業，讓筆者在學校教導大學部運動生理課程中充滿了鼓舞與希望，因為這門課程可以講的如此生動，並能讓理論與實務應用相結合。

整體而言，此次學術研討會水準極高，也見識到多位在教科書或知名期刊經常發表的學者專家，特別是美國運動醫學會已具備很大的規模，在事先已經嚴格審查過濾後才讓學者專家進行口頭報告或海報發表，讓與會人士皆感到此次國際學術會議有運動醫學深入且不同的論點，收穫之大不可言語。

三、考察參觀活動(無是項活動者略)

筆者在會議期間也到會議中心的會場內展覽室進行參觀與了解，其中一併收集到現今國際上最常用於身體活動量收集的儀器設備，在了解功能與應用後，會場並提供 DM 以便未來購買，也能上網進一步查詢這兩家知名品牌的訊息。除此之外，筆者也在會場上展示的運動醫學書商中，購買相關領域的專業書籍，除了現場直接拿書外，單價也比定價至少便宜了 15%，非常值得。

四、建議

筆者在此會議中學習到最新的兒童活動量與健康行為的相關研究議題與趨勢，雖然筆者之研究具有競爭性，但仍需注意這方面議題需要長期投入與追蹤，期望國科會應當注意兒童健康與身體活動的進階追蹤研究。特別要留意不要過度強調升學及學科學習，而忽略掉台灣兒童的健康，進而產生更嚴重的問題。

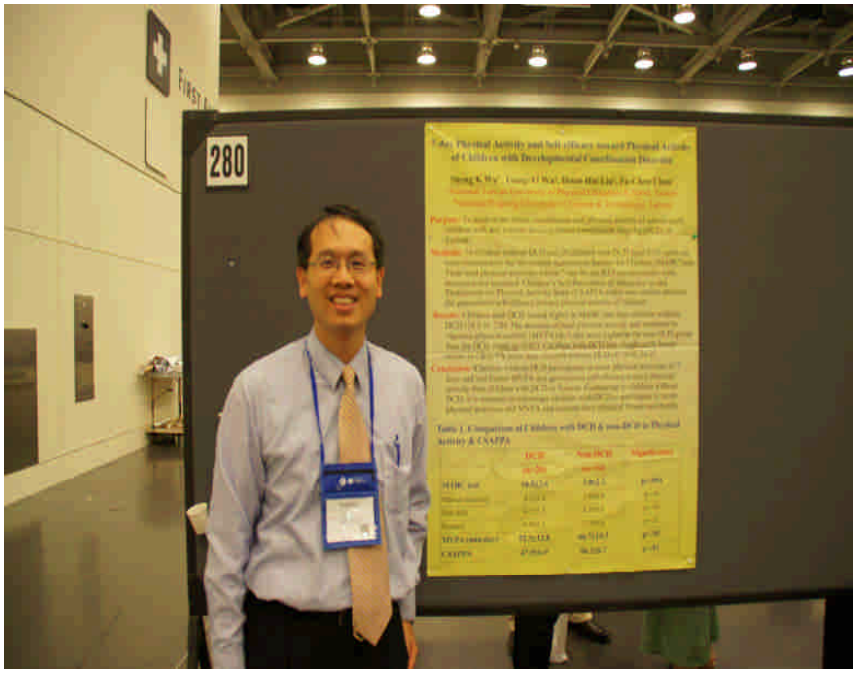
最後特別感謝國科會予以經費上之補助，本校相關系所行政協助與支持，方能有此機會至美國舊金山進行海報發表學術論文成果及加以學習最新的運動醫學知識與研究方向，並能一併造訪這個極具特色的西岸知名城市，也期望國科會未來能在兒童身體活動與健康行為之研究與學術會議上繼續予以大力支持與重視。期望下屆我們能再一次參與美國運動醫學會及進行學術成果的發表與交流，並對世界有更多的學術貢獻與增加更多國際合作的機會。

五、攜回資料名稱及內容

本次大會會議摘要集、大會議程手冊、摘要光碟，兩份國際身體活動工具的目錄。

六、其他

附上大會接受摘要發表信函及本篇海報發表摘要，以及參加會議照片。



圖一、筆者於會場的海報發表(2012.5.31)

圖二、筆者在報到後於會議會場留下的照片（2012.5.29）

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Wu, S. K., Wu, T. Y., Lin, H. H., & Chen, F. C. (2012). 7-day physical activity and self-efficacy toward physical activity of children with developmental coordination disorder. Submitted for presentation at the 59th Annual Meeting of American College of Sports Medicine. San Francisco, USA.

7-day physical activity and self-efficacy toward physical activity of children with developmental coordination disorder

Sheng K Wu[1], Tsung-Yi Wu[1], Hsien-Hui Lin[1], Fu-Chen Chen[2]

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Abstract

PURPOSE: To analyze the motor coordination and physical activity of school-aged children with and without developmental coordination disorder (DCD) in Taiwan.

METHODS: Participants including 34 children without DCD and 20 children with DCD aged 9-11 years old, were examined by the Movement Assessment Battery for Children (MABC) test, and measured and recorded their total physical activities within 7-day by the RT3 accelerometer. Children's Self-Perception of Adequacy in and Predilection for Physical Activity Scale (CSAPPA scale) was used to measure the generalized self-efficacy toward physical activity of children.

RESULTS: Children with DCD scored higher in MABC test than children without DCD (18.5 vs. 7.0, $p<0.001$). The amounts of total physical activity and moderate to vigorous physical activity (MVPA) in 7-day were higher in the non-DCD group than the DCD group ($p<0.05$). Children with DCD had significantly lower scores in CSAPPA scale than children without DCD (47.9 vs. 56.2, $p<0.01$).

CONCLUSIONS: This study confirmed that children without DCD participated in more physical activities in 7 days and had higher MVPA and generalized self-efficacy toward physical activity than children with DCD in Taiwan. Comparing to children without DCD, it is essential to encourage children with DCD to participate in more physical activities and MVPA and concern their physical fitness and health.

國科會補助計畫衍生研發成果推廣資料表

日期:2012/10/28

國科會補助計畫	計畫名稱: 發展協調障礙兒童之心血管危險因子特性分析
	計畫主持人: 吳昇光
	計畫編號: 100-2314-B-028-001- 學門領域: 復健科

無研發成果推廣資料

100 年度專題研究計畫研究成果彙整表

計畫主持人：吳昇光	計畫編號：100-2314-B-028-001-
計畫名稱：發展協調障礙兒童之心血管危險因子特性分析	

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	1	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	2	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%		
國外	論文著作	期刊論文	0	1	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	1	1	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：

本研究整體上算是達成目標，只有在兒童血液生化指標無法進行，主要原因是家長及學校不同意研究者抽取受試樣本兒童的血液，除此之外本研究該收集的資料尚屬完整。

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）

本研究了解發展協調障礙兒童的心肺生理及健康行為的問題，以全面及系統的觀點來了解我國發展協調障礙兒童的問題。在本研究群過去多年探討的結果下，再次確定發展協調障礙兒童有過胖及體能不佳的問題，在健康行為上雖然與一般發展兒童未有顯著差異，但仍需長期追蹤這類兒童在生理、心理、社會發展的變化。本研究的發現無論在學術確認心肺生理能力確實受到動作協調能力及肥胖因素的影響，在應用上應了解要注重學童在多方面的發展，特別是身體活動量確實會影響兒童的動作協調能力及肥胖與體能，在執行上值得學校及家長的重視，這些發現皆具備實際的價值。