Levels of Physical Activity Among School-Age Children in Taiwan: A Comparison With International Recommendations

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ABSTRACT: Few studies have investigated levels of physical activity among children in Taiwan. The purposes of this study were to explore levels of physical activity among children and examine their rates of compliance with various international recommendations. The sample was comprised 463 children (249 boys and 214 girls), aged between nine and twelve from four cities in Taiwan. Three-day Physical Activity Logs (3-d PAL) were used as the instrument to measure physical activity in the previous seven days. The mean and percentile of average estimated energy expenditure (EE, kcal/kg/day), moderate-vigorous physical activity (MVPA, min/day) and vigorous physical activity (VPA, min/day) among boys and girls according to age group were reported. Four international physical activity recommendations were used, as the criteria with which were examined compliance rates. Results indicated no significant main effects of age or gender, and no interaction was found between EE and MVPA. VPA significantly increased between the aged nine and eleven. Girls aged 12 engaged less significantly VPA than boys. Over 90% of children met the Physical Activity Guidelines for Adolescents (PAGA) and the United States' Healthy People Objective No. 22.6; 80% met the United Kingdom Expert Consensus Group guideline; and 70% met the Healthy People Objective No. 22.7. These results indicated that physical activity among the majority of children complied with the international recommendations. The only significant difference came in participation rates for vigorous physical activity among children of different ages and gender. Our results provide important information for health policy in the field of children's physical activity. We would recommend the setting up of national objectives for the physical activity of children and the conducting of a national surveillance study with a more precise and consistent measurement of physical activity for children to offer a comparable data in the future is suggested.

Key Words: physical activity, children, recommendations, public health surveillance.

Introduction

Recently, lack of regular physical activity has been well documented as a risk factor for coronary heart disease (Armstrong & Simons-Morton, 1994), obesity and other chronic diseases (Fletcher et al., 1996). High intensity exercise has been shown to be strongly associated with longevity and particularly with improved cardiopulmonary function (Lee, Hsieh, & Paffenbarger, 1995), but even modest increases in activity levels can result in improved health and substantial savings in medical costs (Katzmarzyk, Gledhill, & Shephard, 2000). The benefits of regular physical activity to the health of adults, adolescents and children have been highlighted by previous studies (Blair, Kohl, Gordon, & Paffenbarger, 1992; Bouchard, Shephard, & Stephens, 1994, U.S. Department of Health and Human Services [USDHHS], 1996). Less physical activity may predispose young people to develope a sedentary lifestyle later in life (Malina, 1996; Telama, Yang, Laakso, & Viikari, 1997).

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Promoting physical activity has become a public priority in the United States (USDHHS, 1996), and in Taiwan (Department of Health, Executive Yuan, n.d.). Some National Surveys on young people's health in the U.S. have incorporated issues concerning physical activity (USDHHS, 1996). Children aged between nine and twelve years old questioned for the Youth Risk Behavior Survey (YRBS) in 1995 (Grunbaum et al., 2002), 52.1% of girls and 74.4% of boys reported that they exercised vigorously on at least three of the previous seven days. The Young Media Campaign Longitudinal Survey (YMCLS) of 2002 (Duke, Huhman, & Heitzler, 2003) established 61.5% of children aged between nine and thirteen years do not participate in any organized physical activity during their non-school hours, and 22.6% do not engage in any free-time physical activity. However, difference in methods, measuring tools, and in different types of race let international and intranational comparison and cooperation become difficulty. The establishment of policy and standards for physical activity could guide practice and research. Many countries have established their own guidelines or recommendations of physical activity to compare the differences between current levels of physical activity and guidelines, and then pointed out the room needed to improve. Health providers need to understand the prevalence of physical activity among children, in order to develop strategies to help them.

Sallis and Patrick (1994) invited 34 experts from scientific, medicine and government to establish guidelines of physical activity among adolescents. They reached a consensus statement that adolescent should engage in three or more sessions per week of activities that last 20 minutes or more and that require moderate to vigorous intensity physical activity (MVPA) of exertion. This landmark action endeavored to fill gaps in knowledge and practice. Healthy People 2010 built both established national health objectives and served as a broad consultation process by the US government. Objectives No. 22.6 and 22.7 illustrated the students in grades 9 through 12 who need fulfill two objectives of physical activity: 150 minutes per week of moderate intensity and 60 minutes per week of vigorous intensity physical activity (VPA) (Welk, 2002). Physical activity recommendation of United Kingdom (UK) was higher criteria than Healthy People 2010, due to the childhood overweight and obesity is increasing in the UK. One hour of physical activity per day represents a more favorable level and is particularly appropriate for children of primary school age (Cavill, Biddle, & Sallis, 2001). Table 1 shows the operational definitions of the four recommendations of physical activity.

We not only lack a national consensus on the objectives of physical activity for children and adolescents, but have also conducted only limited reporting on the prevalence of physical activity among children and adolescents (Liou, 2004). The absence of any consensus imposes constraints on health care providers interested in counseling their pediatric clients about physical activity. The purposes of this study were to assess the physical activity levels of

Table 1.
Operational Definitions of Physical Activity Recommendations

Author	Source	Guidelines	Operational Definitions
Sallis and Patrick (1994).	1994 Physical Activity Guidelines for Adolescents	Engage in three or more sessions per week of activities that last 20 min or more at a time and that require moderate to vigorous levels of exertion.	Physical activity at an intensity of three or more METs (MVPA) reported more than ≥ 90 min/wk.
Welk (2002).	Healthy People 2010 No. 22.6	Engage in moderate physical activity for at least 30 minutes per day on five or more days per week.	Physical activity at an intensity of three or more METs (MVPA) reported more than ≥ 150 min/wk
Cavill, Biddle, & Sallis (2001).	2001 United Kingdom Expert Consensus Group	Participate in physical activity that is of at least moderate intensity for an average of one hour per day.	Physical activity at an intensity of three or more METs (MVPA) reported more than ≥ 420 min/wk
Welk (2002).	Healthy People 2010 No. 22.7	Engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness three or more days per week for 20 or more minutes.	Physical activity at an intensity of six or more METs (VPA) reported more than ≥ 60 min/wk

Note. MVPA: Moderate or vigorous intensity physical activity; VPA: Vigorous intensity physical activity.

school-age children and describe the compliance rate on the basis of four international recommendations for children's physical activity. Assessment of children's physical activity could elicit information to establish an appropriate policy concerning physical activity for children and adolescents in Taiwan and to compare the results with those of international studies.

Literature Review

Physical activity was defined by Caspersen, Powell, and Christenson (1985) as "any bodily movement produced by skeletal muscles that result in energy expenditure". The primary focus of this paper is physical activity, which is a complex set of behaviors and which are their consequences correlated with health-related physical fitness. Physical activity varies along four basic dimensions (Frequency, Intensity, Time, and Type) often referred to as the FITT mnemonic. "Frequency" is typically expressed as number of sessions per day or week. "Intensity" refers to the rate of energy expenditure, corrected for body mass, and is often indicated by kilocalories expended per minute or by multiples of resting metabolic rate (METs). "Time" spent in activity may refer to a single instance of physical activity or a cumulative time measure over a day or a week. "Type" of activity is a qualitative descriptor for different body movements (Sallis & Patrick, 1994; Bouchard et al., 1994). Various physical activity assessments, including subjective daily logs, objective observations and the carrying of accelerometers to reflect FITT have been discussed (Pate, 1993; Tremblay, Shephard, McKenzie, & Gledhill, 2001; Welk, 2002).

Self-reporting measures in the area of physical activity are relatively cost-effective and convenient for large-sample surveys. Although the disadvantages of these procedures are limited by the recall abilities of children, levels of concurrence between self-reporting measures and direct observations have been shown to be as high as 86% (Simons-Morton, Baranowski, O'Hara, Huang, & Wilson, 1990). A Three-day Physical Activity Log (3-d PAL) designed by Bouchard et al. (1983) has been used as a convenient measure of physical activity levels among school-aged children in Taiwan with, good reliability and criterion validity (Lu, Lee, & Chen, 2000; Lu, Lin, Huang, Lee, & Wang, 2001).

Gender and age differences in physical activity were the most consistently reported. Studies illustrated that boys were significantly more active than girls. Boys engaged in moderate-to-vigorous physical activity more than girls (Sallis et al., 1998; Mota, Santos, Guerra, Ribeiro, & Duarte, 2002) and boys particularly participated in vigorous physical activity more than girls (Trost et al., 2002; Gavarry, Giacomoni, Bernard, Seymat, & Falgairette, 2003). MVPA decreased as grade level increased (Trost et al., 2002). In the Youth Risk Behaviors Survey (YRBS) among upper grade students, boys were more active than girls and a greater percentage of girls than boys failed to meet the vigorous activity criterion (Grunbaum et al., 2002). Rowland (1990) presented decreases in physical activity, as youth people grow older on the basis of estimated daily energy expenditure derived from heart rate data. Age-related physical activity declines have become important issues to study. Cavill et al. (2001) pointed out that levels of physical activity among young people are not consistent, and suggested that girl's aged between 12 and 18 years and older adolescents (16–18 years) need specific focus as priority groups. In the YRBS, vigorous physical activity was less common in upper grade students. But the study by Duke et al. (2003) found no significant differences between the ages of nine and thirteen. To date, the critical periods of physical activity decline have not been reported. No data about age and gender differences in physical activity among children in Taiwan are available. Age differences were given in the United Kingdom Expert Consensus Group guideline, but gender differences were not statistically significant.

There are no prevalence reports about physical activity levels and compliance with physical activity recommendations regarding children in Taiwan (Liou, 2004). Previous studies in Taiwan have focused on reporting estimated energy expenditure and influencing factors (Huang & Malina, 1996; Lee, 1998; Lu et al., 2000).

Methods

Samples

The subjects for this study included 463 children aged between nine and twelve years old, a systematic random cluster sampling from seven elementary schools in Taipei, Taoyuan, Taichung, and Kaohsiung. The sample comprised 249 boys (mean = 10.8) and 214 girls (mean = 10.8). The data were collected from the class during a three-month period (from February to May, 2001). The children completed the self-administered questionnaire under the instruction of a research assistant who received one-day training on anthropometrical measurement and

questionnaire administration. For the sample-size calculation, sample size 463, for two-tailed alpha as .05 and for two-factors ANOVA (compare gender and four levels of age), the observed power for estimated energy expenditure was .358, for MVPA was .460, for VPA was .773 (SPSS, 1999).

Instruments

The 3-d PAL designed by Bouchard et al. (1983) that was adopted and refined on the basis of the "Weekly Activity Checklist" designed by Sallis et al. (1985). Each child was asked to record one of nine levels of physical activity for every 15-minute interval on the 3-d PAL for one weekday, Saturday and Sunday during the previous seven days. This instrument has the advantage of counting the total estimated energy expenditure (EE) for each day, in that the nine levels of different physical activity can be converted into the calorie expenditure per kilogram for each 15-minute period (kcal/kg/15 min), using the constants, 0.26, 0.38, 0.57, 0.69, 0.84, 1.2, 1.4, 1.5, and 2.0 (kcal/kg/15 min), respectively. The 3-d PAL can count the duration of physical activity of moderate or vigorous intensity, to judge the rate of compliance with four international recommendations for physical activity. The nine physical activity levels were classified into three categories: category 1: low intensity (< 3 METs) including sleep (level 1) and mild activity (level 2-5); category 2: medium intensity (≥ 3 and ≤ 6 METs) as moderate activity (level 6-7), and category 3: high intensity (> 6 METs) as vigorous activity (level 8-9). This instrument has good test-retest (7-14 days) reliability (Spearman r = .88), good criterion validity (concurrent validity) (Spearman r = .74) that gives results consistent with seven-day measures of physical activity levels (Lu et al., 2000; Lu et al., 2001). Table 1 shows the operational definitions for the data reduction in this study based on various international recommendations. The duration of the moderate or vigorous physical activity was the criterion by which rates of compliance with the four international recommendations were judged.

Data Analysis

SPSS for Windows (version 10.0) was used to analyze the descriptive and inferential statistics. We used the t tests to assess the differences between gender in different age groups and ANOVA tests to compare the differences between age groups by gender. The General Linear Model (GLM): univariance was the method of two-factors ANOVA used to examine the main effect and interaction of age and gender on physical activity (EE, MVPA, and VPA). Chi-Square analysis was used to compare differences in rate of compliance across age and gender. Statistical significance was set as $p < .05$.

Results

Subjects

Table 2 presents the means and standard deviations of height and body weight of participants that the data is consistent with the Taiwan representative samples reported by Chen et al. (2003). The averages of body mass index (BMI) fall into the recommended range by age and sex of the Department of Health in Taiwan (n.d.).

Levels of Physical Activity

Table 3 depicts the distributions for average and median estimated energy expenditure (kcal/kg/day) in the previous seven days, time spent in MVPA and VPA by boys and girls in each age level. Although EE and MVPA increase by age, age and gender have no significant main effect and no interaction on EE and MVPA by univariance two-factors ANOVA (see Figures 1 and 2). VPA increases with age; the main effect of age on VPA is statistically

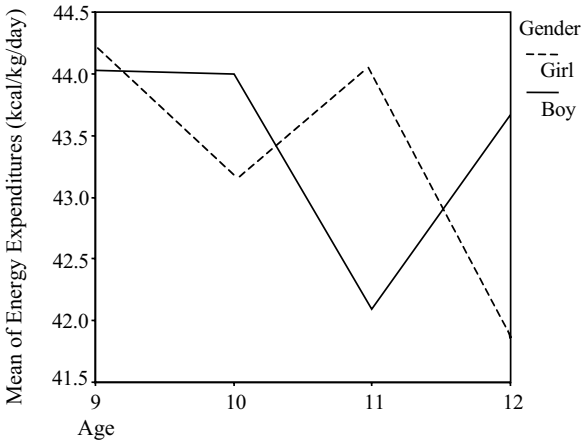
Table 2.
Subject Characteristics Across Gender and Age (N = 463)

Age	Boys (n = 249)							Girls (n = 214)						
		Height (cm)		Weight (kg)		BMI			Height (cm)		Weight (kg)		BMI	
(Yr)	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
9	31	130.5	5.6	29.3	6.6	17.2	3.4	36	129.3	5.4	26.8	5.2	16.1	2.7
10	51	135.2	8.8	34.5	10.4	18.5	3.8	58	135.2	7.5	30.7	5.2	16.7	2.4
11	57	140.5	7.8	38.2	10.9	19.1	4.1	74	141.5	8.0	36.9	8.7	18.2	3.2
12	75	149.0	8.1	43.6	10.8	19.5	4.0	81	149.7	8.0	42.8	10.1	19.9	3.5

Table 3.
Distribution of Estimated Energy Expenditure, Moderated-to-vigorous and Vigorous Physical Activity by Gender and Age (N = 463)

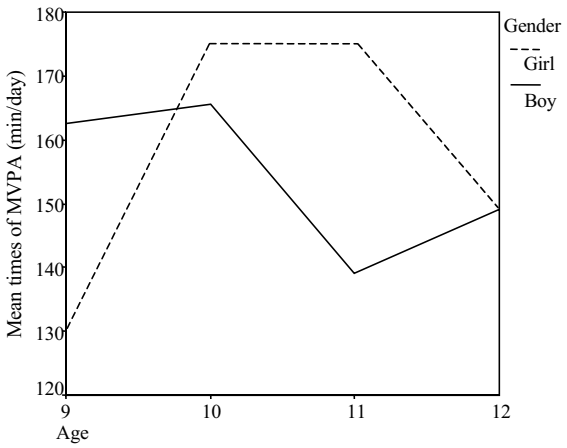
Age	Boys (n = 249)						Girls (n = 214)					
(Yr)	*n*	*M*	*SD*	25th%	50th%	75th%	*n*	*M*	*SD*	25th%	50th%	75th%
EE (kcal/kg/day)												
9	31	44.0	6.8	38.5	44.8	49.2	36	44.3	7.1	38.4	43.0	49.1
10	51	44.0	8.1	37.8	43.6	49.8	58	43.2	7.4	37.6	41.5	46.7
11	57	42.1	9.4	36.6	39.0	46.5	74	44.1	8.2	38.4	43.2	47.7
12	75	43.7	9.2	36.3	41.0	50.0	81	41.9	7.5	36.2	40.1	44.7
MVPA (min/day)												
9	31	162.6	109.0	80.9	139.3	240.0	36	130.0	75.3	51.4	124.3	192.9
10	51	165.6	123.5	69.6	133.9	256.6	58	175.8	122.8	90.0	165.0	261.4
11	57	139.1	115.9	59.5	113.6	189.6	74	175.5	112.2	73.9	150.0	243.2
12	75	149.2	106.3	70.1	130.7	214.3	81	150.0	121.7	64.3	113.6	207.9
VPA (min/day)												
9	31	38.2	54.3	0	24.6	54.6	36	42.5	47.6	0	25.7	68.6
10	51	58.2	65.4	0	38.6	87.9	58	58.0	64.4	0	36.4	96.4
11	57	67.1	73.4	8.6	37.5	108.2	74	71.4	70.6	11.8	55.7	108.2
12	75	72.5	78.9	15.0	51.4	100.7	81	46.4	66.7	0	19.3	70.7

Note. EE: Estimated energy expenditure; MVPA: Moderate or vigorous intensity physical activity; VPA: Vigorous intensity physical activity.



Note. Girl: ANOVA, $F = 1.26$, $p = .290$; Boy: ANOVA, $F = 0.73$, $p = .533$.

Figure 1. Distribution of estimated energy expenditures by age and gender.



Note. Girl: ANOVA $F = 1.59$ $p = .193$; Boy: ANOVA $F = 0.72$ $p = .543$.

Figure 2. Distribution of time of engage in moderate or vigorous intensity physical activity (MVPA) by age and gender.

significant ($F = 2.628$, $p = .050$). The interaction effect of age and sex has not significant ($F = 1.449$, $p = .228$). *Children aged 11 engage in significantly more VPA than those aged nine that prove by Post Hoc with Turkey method* ($SE = 71.79$, $p = .026$). VPA of girls aged 12 decreases and that significantly less than boys by t-test ($T = -2.223$, $p = .028$) (Figure 3). The increase trend of boys and girls aged 12 counteract by dramatic decreasing of girl.

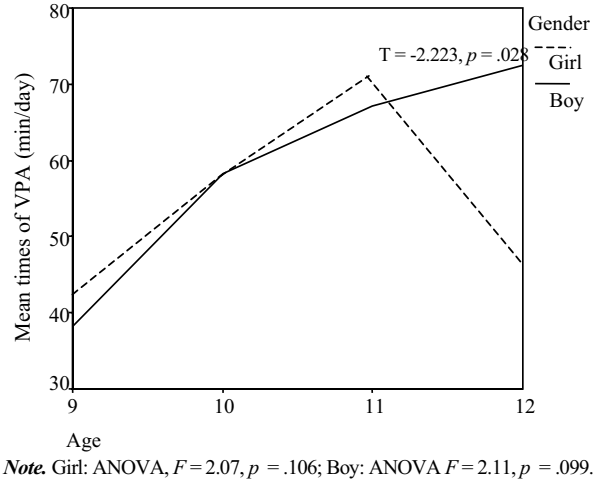
Comparison with Physical Activity Recommendations

Less than hundred percent of the students in this study met the Physical Activity Guidelines for Adolescents, recommending participation in MVPA for more than 90 minutes per week. Over 90% of children met the Healthy People 2010 Objective No. 22.6, engaging in MVPA for more than 150 minutes per week. The criterion of the United

Table 4.
Percentage of Children Meeting Guidelines and Recommendations by Gender and Age (by Chi-Square)

	Physical Activity Guidelines for Adolescents (MVPA ≥ 90 min)	Healthy People 2010 No. 22.6 (MVPA ≥ 150 min)	United Kingdom Expert Consensus Group (MVPA ≥ 420 min)	Healthy People 2010 No. 22.7 (VPA ≥ 60 min)
Boys (%)				
9	97.2	97.2	80.6	58.3
10	93.1	91.4	81.0	70.7
11	90.5	90.5	75.7	77.0
12	92.6	88.9	77.8	80.2
All boys	92.8	91.2	78.3	73.9
χ^2 (p)	1.626 (.654)	2.200 (.532)	0.676 (.879)	6.899 (.075)
Girls (%)				
9	93.5	93.5	74.2	71.0
10	90.2	86.3	80.4	72.5
11	96.5	94.7	87.7	78.9
12	97.3	96.0	78.7	68.0
All girls	94.9	93.0	80.8	72.4
χ^2 (p)	3.637 (.303)	4.853 (.183)	2.861 (.414)	1.983 (.576)
All (%)				
9	95.5	95.5	77.6	64.2
10	91.7	89.0	80.7	71.6
11	93.1	92.4	80.9	77.9
12	94.9	92.3	78.2	74.4
χ^2 (p)	1.526 (.676)	2.517 (.472)	0.570 (.903)	4.489 (.213)

Note. No statistically significant difference between age and gender.



Note. Girl: ANOVA, $F = 2.07$, $p = .106$; Boy: ANOVA $F = 2.11$, $p = .099$.

Figure 3. Distribution of time of engage in vigorous intensity Physical activity (VPA) by age and gender.

Kingdom Expert Consensus participation in MVPA for more than 420 minutes per week was met by 78.2% of boys and 80.8% of girls. Almost 70% of children met the Healthy People 2010 Objective No. 22.7, taking part in VPA for more than 60 minutes per week. Rates of compliance with recommendations did not significantly differ with age and gender under Chi-Square analysis (Table 4).

Discussion

The strength of this study was in its inclusion of subjects from different regions in Taiwan with a large enough sample size to be representative of children aged between nine and twelve. Exploring the percentile of estimated energy expenditures, moderate-to-vigorous and vigorous physical activity, as well as the percent ages of students who met with various current, international physical activity recommendations could provide points of reference for health policy decisions to establish a physical activity consensus and objectives for children in Taiwan.

The important finding, the majority of children aged between nine and twelve years in MVPA was consistent with the findings of Pate et al. (2002). Pate et al. (2002)

reported that over 90% of students met Healthy People 2010; Objective No. 22.6 and nearly 70% met the United Kingdom Expert Consensus Group guideline. The National Center for Chronic Disease Prevention and Health Promotion [CDC] in the United States has reported that 73% of nine to twelve year old boys meet Health People 2010, Objective No. 22.7, but only 57% of girls meet the same recommendation. Taiwan's data showed that boys have similar prevalence rates (73.8%), and girls' participation rates (72.4%) are close to those of boys, and higher than those of American girls (National Center for Chronic Disease Prevention and Health Promotion [CDC], 2004). But our findings did not fully support the gender and age differences across four age levels. From the two factors, univariance of ANOVA illustrated that VPA increases, as young people grow older. But girls aged 12 less participated in dramatically and significantly VPA than boys. These results are also consistent with the report of Trost et al. (2002) and Gavarry et al. (2003) that boys engaged in VPA more than girls. Grunbaum et al. (2002) indicated that boys are more active than girls and a greater percentage of girls fail to meet the vigorous activity criterion in the upper grades. There are no differences between genders for EE, MVPA, and the percent age meeting the various guidelines. The age of the subjects in this study was limited to those between nine and twelve years old so it was not a comparison for the whole stage of childhood development. The report from Duke et al. (2003) presented no significant difference in physical activity for children aged between nine and thirteen, but Rowland's results (1990) in the YRBS showed significant decreases across with age for children in grades six to fourteen. The results were consistent with the findings of Duke et al. (2003) that there are no age-related differences in physical activity for children aged between nine and twelve. Gender differences may occur in the adolescent and young adult stage as Rowland reports. These results support the recommendations of Cavill et al. (2001) that young people are not a homogeneous group in physical activity and the decline of physical activity is more marked in girls than boys, and steeper in adolescence than in childhood. The scientific data therefore provide the priority groups for intervention from a public health perspective. Age-appropriate interventions for different gender groups are necessary. Health providers need to develop specific strategies for girls aged 12 in order to decrease their dramatically declining rates of VPA.

A national consensus on children's physical activity in Taiwan must be established as a guideline for counseling and education. The recommendation of Taiwan's Ministry of Education was for exercise three times for 30 minutes to raise the heart rate to 130/min that may be not comprehensive. For young children, physical activity can be carried out as part of active play, and not regular exercise. Emphasizing the accumulation of intermittent physical activity for more than 10 minutes in one shot and more occur over the day could be more practical approach (Liu & Hsieh, 2004). Moderate intensity physical activity is acceptable to the general population, and easy to engage in for more time to bring about more energy expenditure (Westerterp, 2001). Pate et al. (2002) suggested that the UK Group guideline was an appropriate consensus for children and adolescents, which could clearly reflect the age-related decline in physical activity, but in our small age range sample limited to present the decline of physical activity with age. The results of VPA based on Healthy People 2010, Objectives No. 22.7 showed discrepancies in prevalence rates between those that were self-reported and those that were objectively measured. Pate et al. (2002) reported that only two to four percent of children met these criteria by objective measure. But the YRBS reported that 52.1% of girls and 74.4% of boys aged between nine and twelve had exercised vigorously, on at least three of the previous seven days (USDHHS, 1996). Our findings are congruent with YRBS, because both use the self-report measurement of physical activity. Some researchers have suggested that self-reports are over-estimated and not appropriate for children under ten (Pate, 1993), or 12 years old (Baranowski, 1988). But in a large sample survey, objective measurement involves high costs and a long time collecting data and are sometimes under-estimated (Sallis et al., 1998). To develop a more precise and consistent measurement of self-report physical activity across the country will be most important. Different definitions and criteria limit scope for international cross-cultural comparison. An international consensus on definitions and measurements of physical activity is necessary.

The limitations of this study include the lack of objective measure of physical activity for children to improve the quality of measurement and the lack of a wide age range of samples to differentiate age-related declines in physical activity. National surveillance studies of physical activity including larger samples from low-grade students

to adolescent are important investigations for public health policy and comparisons of physical activity in international studies.

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台灣學齡兒童身體活動量：與國際推薦量的比較

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摘 要： 台灣有關於兒童身體活動行為的調查十分欠缺，本研究目的為探討學齡兒童的身體活動量，以及達到各種國際身體活動推薦量的比例。研究樣本涵蓋台灣四大城市的463 位(249 位男生與 214 位女生)年齡為 9 到 12 歲的兒童，使用三日活動量表測量過去一週的身體活動。分齡分別報告男生與女生的估計平均每日能量消耗(大卡/公斤/天)、平均每日中重度身體活動時間(分/天)、以及平均每日重度身體活動時間(分/天)的平均數、標準差、中位數與百分位數之分佈；以四項國際身體活動推薦量作為檢測遵循率的標準。結果顯示：年齡與性別對估計每日能量消耗與中重度身體活動時間並無影響，且沒有交互作用；隨著年齡由 9 歲增加到 11 歲，重度身體活動量的參與率會大幅增加；但是女生在 12 歲時重度身體活動參與率顯著比男生少。整體而言，超過 90%的兒童達到 1994 年青少年身體活動指引，以及美國 2010 年全民健康 22.6 號目標，80%達到英國專家共識團體推薦量，70%達到美國 2010 年全民健康 22.7 號目標，研究顯示本國兒童大多數符合國際推薦量，而年齡與性別只有對重度身體活動的參與率具有顯著的影響。此項結果可以提供兒童身體活動健康政策的決定性資料，並訂定兒童未來身體活動量之目標，建議未來能以更精確與一致的身體活動測量方法進行全國性監測調查。

關鍵詞： 身體活動、兒童、建議量、公共衛生監測調查。

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