

# A Correlational Study of Physical Activity Comparing Thai Children With and Without Congenital Heart Disease

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**Abstract:** The aims of this descriptive correlational study were to compare physical activity of Thai children with congenital heart disease after corrective surgery (Group A) to the children without congenital heart disease (Group B) and to explore factors correlated with the level of physical activity in each group.

A total of 320 subjects were purposively recruited: 80 school-aged children plus their parents in Group A from the cardiology clinic of a university hospital, and 80 matched-group children and their parents in Group B from two public primary schools. Data were collected using four instruments: 1) the Modified Thai Adolescent's Physical Activity Questionnaire, 2) the Child Health Status Questionnaire-Forms I and II, 3) the Parental Knowledge about School-aged Children Physical Activity Scale, and 4) the Perceived Self-efficacy to Physical Activity Questionnaire. Data were analyzed using independent t-test and Pearson's correlation.

The results revealed that physical activity of Group A in terms of total energy expenditure and mean duration of physical activity with moderate-to-vigorous intensity was less than Group B. In Group A, child perceived health status was significantly positively correlated with moderate-to-vigorous physical activity, but in Group B, child physical activity self-efficacy was a correlated factor. In both groups, parental knowledge of physical activity of school-aged children and parents' perception of their children's health status were not significantly correlated with physical activity.

The findings indicate that pediatric nurses should encourage physical activity and provide information about it for children and their parents. However, a replication of this study with larger sample size and other possible factors is recommended.

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**Key words:** Physical Activity, Congenital Heart Disease, Correlational Study, Children, Parents

## Introduction

Congenital heart disease (CHD) is a persistent defect of structural anomalies of the heart present at birth.<sup>1,2</sup> In Thailand, the incidence of CHD is approximately 0.8 - 1% of all live births.<sup>3</sup> Heart surgery has been a major treatment for correction of CHD because it can help restore a child's cardiopulmonary function and

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exercise tolerance, resulting in prolonged survival.<sup>1</sup> It was found that children with successful correction of simple cardiac lesion demonstrated physical performance and exercise capacity close to the normal level.<sup>4</sup> School-aged children with complete surgery or with mild residual lesions should therefore be encouraged to have the normal physical activity of a healthy child at three to six months after the operation.<sup>4,5</sup>

Physical activity (PA) is defined as all movements of skeletal muscles that require energy expenditure (EE).<sup>6</sup> PA can be explained according to type, duration, and intensity. A moderate-to-vigorous PA (MVPA) which refers to the amount of energy using more than six metabolic equivalents of a task (MET) by the body during PA, has positive effects on physiological improvement and emotional-psychosocial and cognitive development.<sup>4</sup> In children with CHD, MVPA affects emotional-psychosocial-cognitive development by enhancing their perception of self or self-concept<sup>8</sup>, social skills, and academic achievements<sup>9</sup>. In cases of physical inactivity or sedentary behavior, children have high risk of cardiovascular disease and obesity later.<sup>2</sup>

Despite the international recommendation of PA, children after having completely corrected CHD are less active than children without CHD.<sup>4</sup> One study in Taiwan showed that CHD school-aged children after corrective surgery, boys more than girls, had less daily PA than children without CHD.<sup>10</sup> In Thailand, CHD school-aged children undergo corrective surgery in approximately 600 cases/year, but little is known about their PA levels after treatment.<sup>3</sup> It is, therefore, essential to examine PA among Thai school-aged children after corrective surgery for CHD. Because studies in Asian healthy school-aged children indicate a trend of physical inactivity,<sup>10,11,12,13</sup> a correlational study comparing PA between Thai school-aged children with CHD and children without CHD, and exploring PA-related factors of both groups, is necessary. As suggested by a previous study<sup>14</sup>, only behavioral factors were investigated in this study.

## **Conceptual Framework and Literature Review**

Self-efficacy theory and relevant literature were used to guide this study. Self-efficacy, as described by Bandura<sup>15</sup>, is a personal belief or confidence in one's capability of performing a specified task effectively. It has been found to be a significant correlated and determinant of several health-related behaviors including the PA of healthy children and adolescents.<sup>16</sup> However, studies examining predictive ability of self-efficacy on physical activity and its relevance to school-aged children with CHD, specifically after corrective surgery, are scarce. Few studies have explored PA self-efficacy<sup>17,18,19,20</sup> and its relationship to PA in children and adolescents with CHD after corrective surgery.<sup>17,19,20</sup> Bar-Mor<sup>17</sup> assessed self-efficacy for PA of adolescents, aged 12–18 years, with various degrees of congenital cardiac malformation, by asking them to rate their ability to successfully perform each of 12 activities on a scale of 0 to 100. There was a significant positive relationship between the PA self-efficacy and PA levels ( $r = .50, p < .01$ ). Lunt<sup>18</sup> conducted a postal survey to examine habitual PA of Australian adolescents aged 12–18 years with CHD. Almost two-thirds of the subjects were classified as having mild cardiac disease with no activity restrictions. The study showed that percentages of the active subjects were comparable with healthy peers in previous studies but when PA levels were compared between male subjects, a lower percentage of the CHD adolescents participated in vigorous activity compared with their healthy peers. The PA self-efficacy was measured using a 5-item Likert scale and was found to be not significantly different between the children with CHD and their healthy peers or reference group. Lunt's study did not examine a relationship between PA self-efficacy and PA levels. Ray *et al.*<sup>19</sup>, and Ray and Henry<sup>20</sup>, studied PA in children with CHD aged 10–14 years who were

diagnosed with either category of CHD, as mild to moderate CHD requiring no treatment, or effectively treated without surgical interventions; as well as surgically-treated CHD requiring future surgical interventions; and complex or severe CHD, uncorrected or palliated. The children who had PA restrictions were excluded. The findings of these studies revealed that the children with CHD had lower PA levels than healthy children reported in other studies, and their participation in PA decreased as severity of the disease increased across the diagnostic categories.<sup>19</sup> In Ray and Henry's study<sup>20</sup>, the self-efficacy specific to PA was measured using the 8-item, 5-point rating scale that was initially developed for adolescent girls and has been used in healthy children. In one study, the children with CHD were reported to have scores of self-efficacy comparable to scores of healthy adolescents. Mean scores of self-efficacy were similar for children across diagnostic categories. The study also reported that homework and poor motor coordination were their barriers to PA self-efficacy. Self-efficacy, however, had a significantly positive relationship with PA participation ( $r=.47, p<.001$ ). The findings of these studies provided preliminary evidence of a relationship between PA self-efficacy and PA in children with CHD. Therefore, PA self-efficacy was selected as one factor and hypothesized as having a positive relationship with PA levels in school-aged children.

Another factor studied is a child's self-perceived health status, which refers to the subjective health status of a child as self-perceived. This has been studied among children and adolescents with CHD<sup>21,22,23</sup> in relation to PA. In a survey among 57 adolescents with CHD, aged 11–16 years<sup>21</sup> it was found that 46% of the respondents perceived their health as either good or very good and the majority (66%) believed they were the same as or only slightly different to their peers. Moreover, findings revealed a positive relationship between their self-reported difference from others and physical limitations that included limitations in performing PA. In a pre-post

design study by Moon<sup>22,23</sup>, after attending a three-day sports camp, children who had CHD and surgery were expected to have significant, positive changes in their perceived health status and habitual PA. Findings showed that the children had improved perceived health status but not improved habitual PA. Even though this study did not examine the relationship between a child's perceived health status and PA, a positive relationship was implied. Binkhorst et al<sup>24</sup> compared the self-rated general health status of two groups of children and adolescents (aged 8–17 years) with ventricular septal defect (VSD) with healthy children and adolescents; one group had surgically-corrected VSD and the other received unoperated conservative treatment. The surgically-corrected VSD group and the conservatively-treated group rated their general health as similar to that of the healthy group. Regarding their PA, the two groups of children with VSD reported lower participation in sport than the healthy group. Decreased participation in leisure activity was found in the surgically-corrected group, whereas participation in school activities (including physical education classes and school yard playing) was not different among the three groups. Unfortunately, the correlation between self-perceived health and PA participation was not investigated. Based upon findings of these previous studies, this study hypothesized that the self-perceived physical health status and PA levels of children with CHD are positively correlated.

A child's health status as perceived by parents is rarely studied in relation to the PA of children with CHD. In a study of physical activity in children and adolescents aged 7–18 years after the Fontan procedure, McCrindle<sup>25</sup> found that parents' perceptions of their child's general health had a positively significant correlation with child-reported MVPA ( $r=.23, p<.05$ ). In another study<sup>26</sup>, although parents' perceptions of their child's health status were not directly measured, when asked about functional status of school-aged children with a surgically-corrected CHD the majority of parents rated their children as not having limitations

of PA, and that they took gym classes and kept up with their peers. These findings might indicate that the children had satisfactory health status. In this study, parental perceptions of child health status are seen to be positively related with the PA of children with CHD.

Although no previous study of the parental knowledge on PA of school-aged children and its relation to PA was found, there was a suggestion that this variable should be studied in children with CHD comparing with health children.<sup>10</sup> A positive correlation between parental knowledge on PA of school-aged children and PA level of children was proposed based on findings of the American national survey in children aged 9–13 years.<sup>27</sup>

Four independent variables of PA self-efficacy of children, child perceived health status, child health status as perceived by parents, and parental knowledge of the PA of school-aged children were investigated to determine whether they had correlations with PA in Thai children with CHD after corrective surgery, compared with those without CHD.

## Methods

**Design:** A descriptive correlational design was used for this study.

**Ethical Considerations:** Approval to conduct the study was granted by the Research Ethics Review Committee of Faculty of Nursing, Chiang Mai University, the Ethics Committees that Review Biomedical Research of the university hospital, and the directors of the two public primary schools of the study sites. All children and their parents were informed about purposes, procedures, confidentiality and anonymity issues, as well as potential risks and benefits. They were also informed of their right to participate or withdraw from the study without repercussions. Then written consent of parents and child participation was obtained from the parents, and assent was obtained from the children.

**Setting:** The study was conducted at the cardiology clinic of the university hospital and two public primary schools in a province in the north of Thailand.

**Sample:** Sample size was determined using Cohen's power analysis,<sup>28</sup> using a statistical significance of .05, and a power of .80. A medium effect size as found in previous comparative study comparing PA levels between Taiwanese CHD and non-CHD children.<sup>12</sup> Therefore, a sample size of 63 subjects per group (CHD and non-CHD children and their parents) was chosen to achieve the number of 252 subjects. Estimating a potential 20% attrition rate, a total of 320 subjects (80 per group) was eventually used.

Eighty children with CHD (Group A) and their parents were purposively recruited from the cardiology clinic of the university hospital. The inclusion criteria for children with CHD (Group A) and their parents were: 1) being 8–12 years old and studying in second to sixth grades; 2) having undergone either type of corrective cardiac surgery for defects including atrial septal defect (ASD), ventricular septal defect (VSD), or patent ductus arteriosus (PDA) more than six months previously; 3) having been recommended to resume normal activity by a cardiologist; 4) not having other major illnesses; 5) currently receiving no medication related to cardiac disease; 6) having no installation of pacemaker or any artificial cardiac rhythm control device; 7) being able to communicate in the Thai language; and 8) being willing to participate and provide consent (parents)/assent (children) to be in this study.

An age-matched group of 80 healthy children (Group B) and their parents from two public primary schools was also recruited. The selection criteria of the children were having no history of major illness that was a barrier to PA. Their parents and the children provided informed consent and assent to be in the study. They were matched.

**Instruments:** There were four questionnaires: the Modified Thai Adolescent Physical Activity Questionnaire (MTAPAQ); the Child Health Status Questionnaires –Forms I and II (CHSQ); the Perceived Self-efficacy about Physical Activity Questionnaire (PSEPAQ); and the Parental Knowledge about School-aged Children Physical Activity Scale (PK Scale).

### ***The Modified Thai Adolescent Physical Activity Questionnaire***

The MTAPAQ, a self-reporting tool, a Thai version developed by Wattanasit,<sup>29</sup> was used to measure the total energy expenditure (TEE) of the children. This questionnaire has 37 items measuring three days of PA of children. Each child was asked to recall the number of days of performing each activity (frequency) and the duration spent daily in each activity during the previous three days. Then, expenditure value of each activity was calculated by multiplying the MET with frequency and duration, and MET-mins of activity were summed to present the volume of TEE.<sup>7</sup> The concurrent validity and stability of the tool were pilot tested with five children with CHD and five without CHD. The value of MET-mins (total amount of PA) obtained from this tool and from the accelerometer were significantly correlated ( $r = .741$ ,  $p < .001$ ). Regarding stability, the correlation between MET-mins for two administrations at one week interval of the MTAPAQ was also significant ( $r = .88$ ,  $p < .001$ ).

### ***The Child Health Status Questionnaires-Forms I and II***

The 10-item researcher-developed scale self-report, The Child Health Status Questionnaires-Forms I (CHSQ-Form I) and Form II (CHSQ-Form II), was used to examine child health status as perceived by children and parents. An example of a question is: "When you had activities with your friends at home or school, how often did you feel sick?" The child was asked to respond to a 4-point rating scale (1 = "never" to 4 = "very often [more than 4 times in a month]"). The total scores range from 10-40. A high score indicates comparatively better perceived health in relation to that of his/her peers. This instrument was pilot tested for internal consistency and stability. Cronbach's alpha of Form I and Form II was 0.77 and 0.84, respectively. The correlations between Time 1 and Time 2 scores of Form I and Form II were significant ( $r = .97$ ,  $p < .001$  and  $r = .91$ ,  $p < .001$ ).

### ***The Perceived Self-efficacy to Physical Activity Questionnaire***

PSEPAQ was used for assessing child PA self-efficacy. This questionnaire was originally developed by Wu and Pender<sup>30</sup> and translated into Thai by Deenan<sup>31</sup>. It has a 14-item rating scale: a 10-level range from 'not at all confident' (0) to 'very confident' (100) asking the child to judge his/her level of confidence about overcoming the barriers to being physically activity. A sample of items is: "Exercise even though I feel tired." A higher score indicates a higher sense of confidence in performing PA. The internal consistency reliability of this scale was tested. The Cronbach's alpha coefficient was .84 in this study.

### ***Parental Knowledge about School-aged Children's Physical Activity Scale (PK Scale)***

This 13-item researcher-developed scale was used to examine parents' knowledge of PA of school-aged children. A sample item is: "For strengthening of muscle, school-aged children should have physical activity at least 30 to 60 minutes a day." Respondents were asked to select "Yes", "No", or "Do not know". The total score was 13. The higher the total score, the better the parents' knowledge. The PK Scale showed an internal consistency coefficient of 0.75. The stability of the instrument was obtained using the test-retest method and found to be  $r = .92$ ,  $p < .001$ .

**Procedure:** After receiving permission from the authorities in the research setting, data collection was performed in a private room. Children in both groups were asked to complete the three relevant questionnaires after listening to the researcher read each question and being taught how to complete the scales. The MTAPAQ was completed first, then after a 15-minute break, the CHSQ-Form I and the PSEPAQ were completed. Participants were told to return these to the researcher or assistant. When questionnaires were returned with incomplete answers, the researcher or assistant would ask the subjects to complete them.

For the parent group, two questionnaires consisting of CHSQ-Form II and PK Scale were completed at a clinic for Group A, and at home for Group B. The first researcher was available for clarification and asked parents to finish any incomplete questionnaires.

## Data Analysis

Data were analyzed using descriptive statistics, the independent t-test, and Pearson's correlation. Significance level was set at  $p < .05$ .

## Results

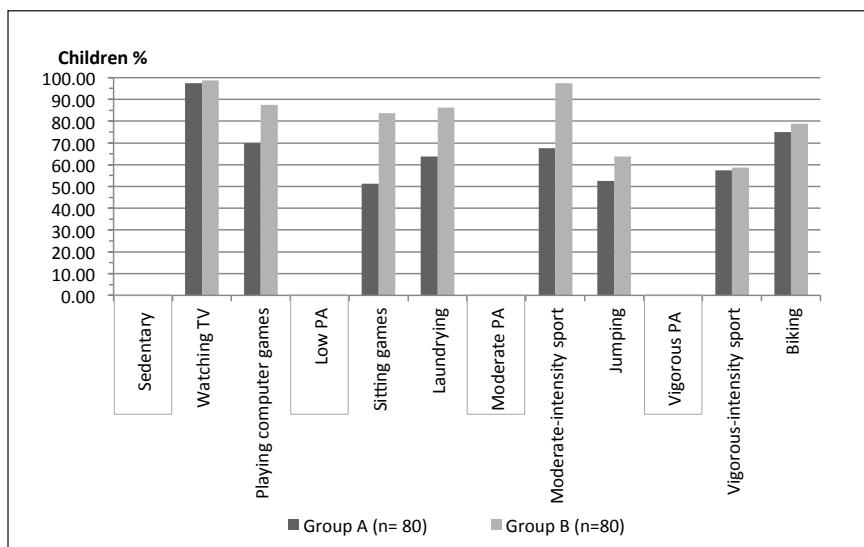
Children in Groups A and B were not significantly different in birth order, grade, and BMI, but were different in sex and age. Forty-seven children (59%) in Group A were girls, whereas 39 children (48%) in Group B were girls. A half of Group A and almost two-thirds of Group B were aged 8–10 years. The majority of the parents in both groups were mothers (72.50% for parents of Group A and 58.75% for parents of Group B, respectively). Almost all parents in both groups were farmers or employees with low

incomes. The distribution of children and parents' demographic data of the two groups were not significantly different.

More than half of children in Group A (52.50%) were diagnosed with VSD and had undergone VSD closure surgery. The majority had surgery only once. Almost half had had surgery after more than 37 months of waiting. Only 23.75% had their first surgery within their first year. Their ages at first surgery ranged from 6–125 months, with a median age of 34.5 months. More than 75% had their operation more than three years previously.

**Physical activity:** All types of PA were categorized according to MET into four categories: sedentary (1–1.9 MET), low (2–2.9 MET), moderate (3–5.9 MET), and vigorous PA (>6MET).<sup>7</sup>

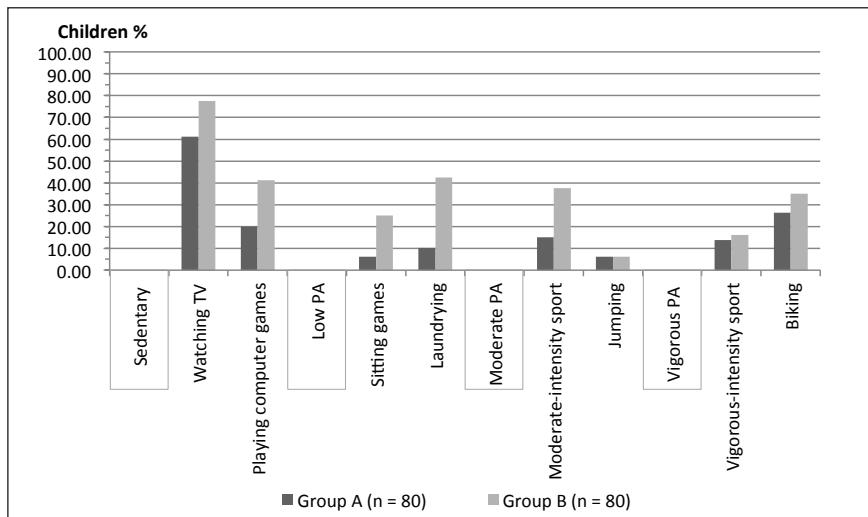
During the last three days, a few moderate-PA and vigorous-PA were reported among children in both groups. Only 67.5% and 57.5% of Group A performed moderate and vigorous intensity sports respectively, whereas most children in Group B (97.50%) reported acting with a moderate intensity and 58.75% reported acting vigorously. A large percentage of children in both groups were graded as having sedentary PA and low-PA (see **Figure 1**).



**Figure 1** Type of Physical Activity in Children with CHD and Without CHD

Only 15% and 13.75% of Group A participated in moderate intensity and vigorous sports everyday for three days as compared with 37.5% and 16.25% of Group B. Over half of the children in both groups watched television and played computer/video games every day (Figure 2). When comparing the two activities of each category usually played by most

children in both groups, it was found that variation of the percentage of children playing various types of activity were similar. The percentage of children having low intensity activities compared to those having moderate and vigorous intensity activities were not obviously different in type and frequency, as shown in Figures 1 and 2.



**Figure 2** Percentage of Children who have Activity Every Day during a Three-Day Period

Although both groups of children showed a similar percentage of VPA, children in Group A spent a shorter duration participating in MVPA. The mean duration of physical activities with MVPA intensity among Group A ( $\bar{X} = 105$  minutes/day,  $SD = 42.19$ ) was significantly lower than Group B ( $\bar{X} = 185$  minutes/day,  $SD = 72.10$ ) ( $t = -8.587, p < .001$ ). Children in Group A spent a shorter duration with vigorous

intensity ( $\bar{X} = 59.43$  minutes/day,  $SD = 39.75$ ) than in Group B ( $\bar{X} = 81.26$  minutes/day,  $SD = 56.87$ ).

Overall, the mean of TEE in Group A ( $\bar{X} = 6,822.95$  MET-mins,  $SD = 2602.27$ ) was significantly lower than Group B ( $\bar{X} = 11,016.99$  MET-mins,  $SD = 4762.78$ ). The energy expenditure from MVPA was greater than from sedentary and low-PA in both groups (see Table 1).

**Table 1** Comparison of the Energy Expenditure (MET-mins) of Physical Activity Between CHD Children and Healthy Children

Category of PA (MET-mins)	CHD group (n=80)				Healthy group (n=80)			
	Range	Mean	S.D.	Range	Mean	S.D.	t	
Sedentary	150-2448	868.57	470.29	252-4938	1426.22	844.78	-5.159***	
LPA	0-2519	484.13	386.71	32-4166	1248.81	930.22	-6.789***	
MPA	1164-8298	2863.37	1178.10	1360-10014	4831.00	1751.52	-8.337***	
VPA	0-9048	2606.87	2074.07	0-13182	3510.94	2758.59	-2.343*	
TEE	3124-16278.50	6822.95	2602.27	3342-23027	11016.99	4762.78	-6.912***	

Note: \* $p < .05$ . \*\*\* $p < .001$ ; LPA = low physical activity; MPA = moderate physical activity; VPA = vigorous physical activity; TEE = total energy expenditure

Previous studies<sup>10,18</sup> suggest that girls and boys have different PAs. Therefore, proportions were further compared between boys and girls to examine PA. The means of TEE of boys and girls in the CHD group were significantly lower than those of the healthy group ( $t=-4.63, p<.001$  and  $t=-5.09, p<.001$ , respectively). Consistently, energy expenditure was significantly higher in boys ( $\bar{X} = 7,735.30$  MET-mins,  $SD = 3045.65$ ) than girls ( $\bar{X} = 6,100.82$  MET-mins,  $SD = 1943.85$ ).

**Factors related to physical activity:** Mean scores of independent variables (child perceived health status, child health status as perceived by parent, and

parental knowledge on PA of school-aged children) in Group A and Group B were not significantly different, except child PA self-efficacy. The scores of PA self-efficacy among children in Group A ( $\bar{X} = 817.43, SD = 200.69$ ) were significantly lower than in Group B ( $\bar{X} = 891, SD = 180.88$ ) ( $t=-2.435, p<.001$ ).

In Group A, a significantly positive small correlation was found between child perceived health status and MVPA ( $r = .265, p<.05$ ). Child health status as perceived by parents, parental knowledge on PA of school-aged children, and PA self-efficacy were not significantly correlated with any form of PA (**Table 2**).

**Table 2** Correlations of Study Variables of Children with CHD (n=80) and Parents (n=80) and Energy Expenditure of Physical Activity

Variables	CHD group (n=80)		Parents (n=80)	
	CH	PASE	CHP	PK
MPA	0.195	0.066	0.212	0.102
VPA	0.237	0.206	0.136	-0.010
MVPA	0.265*	0.186	0.195	0.036

**Note:**\* $p<.05$ ;PA = physical activity; CH = child's perceived health status; PASE = child's PA self-efficacy; CHP = child's health status as perceived by parent; PK = parental knowledge on PA of school-aged children; MPA = moderate physical activity; VPA= vigorous physical activity; MVPA= moderate-to-vigorous physical activity

In Group B, child perceived self-efficacy about PA was found to be positively associated with MPA, VPA, and MVPA ( $r=.233, p<.001$ ;  $r=.201, p<.05$ ; and  $r = .274, p< .001$ , respectively). Child

health status as perceived by parents, parental knowledge on PA, and childperceived health status were not significant correlated with any form of PA (**Table 3**).

**Table 3** Correlations of Study Variables of Children without CHD (n=80) and Parents (n=80) and Energy Expenditure of Physical Activity

Variables	Healthy group (n=80) Parent (n=80)			
	CH	PASE	CHP	PK
MPA	0.026	0.233***	-0.116	-0.080
VPA	-0.045	0.201*	0.022	-0.010
MVPA	-0.020	0.274***	-0.037	-0.043

**Note:** \*  $p< .05$ . \*\*\*  $p< .001$ ; PA = physical activity; CH = child's perceived health status; PASE = child's PA self-efficacy; CHP = child's health status as perceived by parent; PK = parent knowledge about PA of school-aged; MPA = moderate physical activity; VPA = vigorous physical activity; MVPA = moderate-to-vigorous physical activity

## Discussion

This study examined PA in terms of type, frequency, duration, and TEE in 80 Thai CHD (Group A) and 80 Thai without CHD (Group B). Although the type and frequency of PA performed by the children of the two groups were not significantly different, the duration was significantly different. Children in Group A had a shorter duration of PA than those in Group B. This finding indicated that most children with CHD remain restricted in their duration of high-intensity activity after corrective surgery. The significant difference in duration of PA between the two groups may be explained as having two possible causes. First, the different proportion of girls and boys in the two groups may contribute to the different duration mentioned earlier. The proportion of girls in the CHD group was higher than that of the girls in the non-CHD group. Previous studies suggest that girls spend shorter time in doing physical activities than boys.<sup>10,18</sup> Second, the previous experience of discomfort before corrective surgery may inhibit activities of the CHD group. Most children with CHD in this study had their operation quite late, after the age of one year. While waiting for the operation, physical restrictions were often imposed on them due to their experiencing breathlessness and tiredness on exertion.<sup>32</sup> Thai parents of children waiting for surgery usually limit their child's PA.<sup>32,33</sup> As a result, most children carry their PA limitations until after surgery and dare not attempt normal activities as healthy ones do.<sup>32</sup> In addition, another study revealed that most children regard themselves as different from peers after corrective surgery.<sup>32</sup>

Our research also found that Group A had high rates of sedentary behavior, which was reflected in their relative inactivity. Children in Group B displayed PA inactivity by playing computer games and watching television. This result is consistent with physical inactivity in Thai children<sup>13,30</sup> so health risks associated with physical inactivity should be considered relevant to both groups of Thai children.

The low TEE and MVPA energy expenditure in Group A are consistent with previous studies compared with Group B. The findings of lower PA in children with CHD are consistent with those in one Asian study and three Western studies.<sup>10,17,18,19</sup> The TEE of the CHD group reported in this study corresponds with findings from previous studies.

This study demonstrated that the perceived health status of children in Group A was not different from that of Group B and the level of PA can be explained by the children's health status. This is consistent with findings implying that children with better perceived physical health status have more PA.<sup>21,22,24</sup> Findings also show that the CHD group after corrective surgery could participate in the same type and frequency of regular PA to MVPA as compared to non-CHD group, as the perception of good physical health has positive effects for PA.

Health status of children in Groups A and B was perceived by parents as not being different. Thai parents compare their child's health status with healthy classmates and perceive this as similar in physical health as their peers. However, the non-significant finding about of children's health status as perceived by parents did not correlate with PA of children in Group A. Even the perception of their child's health status as healthy can be explained by the long duration of the waiting time before surgery, when the majority of parents accounted their children's exercise-intolerance and activity-restrictions as characteristic of the disease<sup>33</sup>. Thus, after surgery, a surgical scar and concern for their child's safety may make Thai parents reluctant about PA<sup>33,34</sup> This could explain why Thai CHD children after corrective surgery perform little PA and MVPA.

Parental knowledge concerning the PA of Group A also showed no correlation with MVPA, which is in contrast to previous studies.<sup>27</sup> The parents of Group A children had some understanding and general knowledge of PA in school aged children. Because items of the PK Scale involved general knowledge of school-aged PA, the Scale might not be suitable in

children with the CHD. Therefore future research should include measurements of knowledge toward PA in the CHD group. The possible explanation for this discrepancy might be due to using a general scale to measure knowledge of general school-aged child PA rather than one specific to children with CHD.

Another result indicates that the non-significance of relationships between self-efficacy and MVPA is inconsistent with previous studies.<sup>17,20</sup> Children in Group A showed a mean score of PA self-efficacy lower than that of Group B. This finding may be explained by the long-term unhealthiness that CHD children display in breathlessness and tiredness on exertion.<sup>31,32</sup> It might support the belief that Thai CHD children after corrective surgery may not be capable of overcoming their previous physical effects experience, and turn to low self-efficacy. Therefore, verbal persuasion and encouragement are required strategies for parents who are the significant others for school-aged children with regard to PA. The low self-efficacy among these CHD children might have originated with the parents, who triggered it in their children because of uncertainty about the operation scar and concern for their children's safety as mentioned earlier.<sup>32,33</sup> This would explain why Thai CHD children after corrective surgery hardly perform MVPA or do so more restrictedly. It is typical that Thai parents tend to be overprotective of their children with CHD because of the disease's complications.<sup>33</sup> Lack of parental encouragement is perceived as a barrier to children's activity. This could be why self-efficacy had no correlation with MPA, VPA, and MVPA.

For children in Group B, a child PA self-efficacy was statistically significant and associated with MVPA. This finding can be explained by positive experience. No physiological effects after PA will inhibit the activities of the healthy group. There are no restrictions and no verbal warning against activity from their parents. Thus, performance mastery is an important source of self-efficacy in these healthy children.<sup>15</sup>

## Conclusion

Physical activity levels demonstrated significant differences between Thai children with CHD and those without. In the CHD group, perceived health status was significantly positively correlated with MVPA, but in the non-CHD group, the correlation was with PA self-efficacy. Parental factors were not correlated with PA in either group. However, before interventions can be designed, factors predicting PA in this group of children should be re-examined in a replicated study with a larger heterogeneous sample size.

Based on the findings of this study, pediatric nurses should monitor a child's PA after corrective surgery. In addition, nurses need to provide information aimed at promoting a healthy lifestyle, especially about the "when" and "how" of PA after the operation. Nursing actions can be implemented at the outpatient cardiology clinic and cardiology unit, and later by community nurses and school nurses.

## Limitations and Recommendations:

The limitations of the study were incurred by matching of sample by age and sex that would affect the findings by showing different total energy expenditures. A small sample size might lead to improper matching and would require further analysis of sex and age as covariate. Further study should include a larger sample with equal numbers matching by sex and age.

The replication of this study is recommended to test the predictor of PA. The other possible related factors such as parental overprotection should be included in order to gain a broader understanding of children's PA. The measurement of PA self-efficacy items and the parental knowledge scale on school-aged children's PA should be specific to CHD children.

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## References:

1. Park MK. Pediatric Cardiology for Practitioner. 5<sup>th</sup> ed. London: Springer Publishing; 2008.
2. Vetter VL. Pediatric cardiology: The requisites in pediatrics. 5<sup>th</sup> ed. Philadelphia: Mosby Elsevier; 2006.
3. Pongpanich B. The second Asia-Pacific congress of pediatric cardiology and cardiac surgery. Japan: Chiba-Shi; 2010.
4. Hirth A, Reybrouck T, Bjarnason-Wehrens B, Lawrenz W, Hoffmann, A. Recommendations for participation in competitive and leisure sports in patients with congenital heart disease: A consensus document European. J Cardiopulm Rehabil Prev. 2006; 13: 293 – 9.
5. Schickendantz S, Striker EJ, Dordel S, Bjarnason-Wehrens B. Sport and physical activity in children with congenital heart disease. DtschArzlebi. 2007; 104(9): A 593 – 9.
6. Bouchard C, Tremblay A, Leblanc C, Lortie G, Savard R, Theriault G. A method to assess energy expenditure in children and adults. Am J ClinNutr. 1983; 37: 461 – 7.
7. Ainsworth BE, Haskell WL, Whitt MC, Irwin M, Swartz AM, Strath SJ. Compendium of physical activities: An update of activity codes and MET intensities. Med Sci Sports Exerc. 2000; 32: S498 – 16.
8. Chen CW, Li CY, Wang JK. Self-concept: Comparison between school-aged children with congenital heart disease and normal school-aged children. J ClinNurs. 2005; 14: 394 – 02.
9. Wernovsky G, Stiles KM, Gauvreau, K, Gentles TL, DuPlessis AJ, Bellinger DC, et al. Cognitive development after the Fontan operation. Circ. 2000; 102: 883 – 9.
10. Kao YL, Wang R H, Pai L. Physical activity levels of school-age children with congenital heart disease in Taiwan. ApplNurs Res. 2009; 22 (3): 191 – 7.
11. Tudor-Locke C, Ainsworth BE, Adair LS, Du S, Poplkin BM. Physical activity and inactivity in Chinese school-aged youth: The China Health and Nutrition Survey. Int J ObesRelatMetabDisord. 2003; 27: 1093 – 9.
12. McCrindle BW, Williams RD, Mital S, Clark BJ, Jennifure LR, Klein G, et.al. Physical activity levels in children and adolescent are reduced after the Fontan procedure, independent of exercise capacity, and are associated with lower perceived general health. Arch Dis Child. 2007; 92: 509 – 14.
13. Sennun S, Nimsakul N, Kingkeow C, Budhawong P, Suwanalor W, Janrit J, et al. Effect of physical activity education on physical activity behavior for 8–12 years old obese children, Kumtiang Anusorn school, Chiang Mai, Thailand 2006– 2007.
14. Massin MM, Hovels-Gurich HH, Gerard P, Seghaye MC. Physical activity patterns of children after neonatal atrial switch operation. Ann Thorac Surg. 2006; 81: 665 – 70.
15. Bandura A, editor. Self-efficacy: The exercise of control. New York: W. H. Freeman; 1997.
16. Sallis JF, Prochaska JJ, Taylor WC. A review of correlations of physical activity of children and adolescents. Med Sci Sports Exerc. 2000; 963 – 75.
17. Bar-Mor G, Bar-Tal Y, Yeevi B. Self-efficacy and physical activity in adolescents with trivial, mild or moderate congenital malformations. Cardiol Young. 2000; 10(6): 561 – 6.
18. Lunt D, Briffa K, Ramsay J. Physical activity levels of adolescents with congenital heart disease. Aust J Physiother. 2003; 49: 43–50.
19. Ray TD, Green A, Henry K. Physical activity and obesity in children with congenital heart disease. Cardiol Young. 2011; 1: 1–5.
20. Ray T, Henry K. Self-efficacy and physical activity in children with congenital heart disease: is there a relationship. J Spec Pediatric Nurs. 2011; 16: 105 – 12.
21. Kendall L, Lewin RJP, Parsons JM, Veldtman GR, Quirk J, Hardman GF. Factors associated with self-perceived state of health in adolescents with congenital cardiac disease attending pediatric cardiologic clinics. Cardiol Young. 2001; 11: 431 – 8.
22. Moons P, Barrea C, Wolf D, Gewillig M, Massin M, Mertens L, et al. Changes in perceived health of children with congenital heart disease after attending a special sports camp. Pediatr Cardiol. 2006; 27: 1472 – 79.
23. Moons P, Barrea C, Suys B, Ovaert C, Boshoff D, Eyskens B, et al. Improved perceived health status persist three months after a special sports camp for children with congenital heart disease. Eur J Pediatr. 2006; 165: 767 – 72.
24. Binkhorst M, Belt T, Hoog M, Dijk A, Schokking M, Hopman M. Exercise capacity and participation of children with a ventricular septal defect. Am J Cardiol. 2008; 102(18): 1079 – 84.

25. McCrindle BW, Williams RD, Mital S, Clark BJ, Jennifure LR, Klein G, et.al. Physical activity levels in children and adolescent are reduced after the Fontan procedure, independent of exercise capacity, and are associated with lower perceived general health. *Arch Dis Child.* 2007; 92: 509 – 14.
26. Miatton M, Wolf DD, Francois K, Thiery E, Vingerhoets G. Behavior and self-perception in children with a surgically corrected congenital heart disease. *J Dev Behav Pediatr.* 2007; 28: 294–301.
27. Heitzler CD, Martin SL, Duke J, Huhman M. Correlates of physical activity in a national sample of children aged 9–13 years. *Int J Prev Med.* 2006; 42: 254 – 60.
28. Cohen, J. Statistical power analysis for the behavioral sciences (2<sup>nd</sup> ed.). Hillsdale: Lawrence Erlbaum Associates; 1988.
29. Wattanasit P, Prateepchikul L, Petpitchetian W, Meininger JC, Kijboonchoo, K. Validation and reliability of the modified Thai adolescent's physical activity questionnaire. *Pac Rim Int J Nurs Res.* 2010; 14(1): 79–92.
30. Wu TY, Pender N. Determinants of physical activity among Taiwanese adolescents: an application of the health promotion model. *Res Nurs Health.* 2002; 25(1): 25 – 36.
31. Deenan A. Testing the Health Promotion Model with Thai adolescents [dissertation]. Baguio: Saint Louis Univ.; 2003.
32. Birks Y, Sloper PS, Mphil RL, Parsons J. Exploring health-related experiences of children and young people with congenital heart disease. *Health Expect.* 2006; 10: 16–29.
33. Nukulkij P. How Thai families define and manage childhood heart disease [dissertation]. Chicago (IL): Univ. Illinois at Chicago; 1993.
34. Srichantaranit A, Chontawan R, Yenbut J, Ray L, Laohaprasitiporn D, Wanitkun S. Thai families' caring practices for infants with congenital heart disease prior to cardiac surgery. *Pac Rim Int J Nurs Res.* 2010; 14(1): 61–78.

## การศึกษาเชิงหาความสัมพันธ์ในการทำกิจกรรมทางกายของเด็กโรคหัวใจโดยเปรียบเทียบกับเด็กไม่เป็นโรคหัวใจ

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**บทคัดย่อ:** การวิจัยแบบบรรยายเชิงหาความสัมพันธ์นี้มุ่งศึกษาภารกิจกรรมทางกายและปัจจัยที่เกี่ยวข้องในเด็กที่ได้รับการผ่าตัดช่องคอและโรคหัวใจพิการแต่กำเนิด (กลุ่ม A) โดยเปรียบเทียบกับเด็กปกติที่ไม่มีปัญหาสุขภาพ (กลุ่ม B) กลุ่มตัวอย่างจำนวน 320 คน ประกอบด้วยเด็กกลุ่ม A ที่เป็นวัยเรียนที่ได้รับการผ่าตัดช่องคอและโรคหัวใจพิการแต่กำเนิดที่มารับบริการที่ศูนย์ลินิกโรคหัวใจโรงพยาบาลของมหาวิทยาลัยแห่งหนึ่งจำนวน 80 คน ส่วนเด็กกลุ่ม B เป็นเด็กปกติที่ไม่เป็นโรคหัวใจจำนวน 80 คนซึ่งเป็นนักเรียนในโรงเรียนประถมศึกษาของรัฐ 2 แห่งและมีคุณลักษณะเหมือนกลุ่มเด็กโรคหัวใจและผู้ป่วยของเด็กทั้งสองกลุ่มฯ ละ 80 คน การเลือกกลุ่มตัวอย่างทั้งหมดได้ใช้วิธีสุ่มเลือกตามเกณฑ์ที่กำหนดเครื่องมือที่ใช้เก็บข้อมูลคือแบบสอบถาม 4 ฉบับประกอบด้วย 1) แบบสอบถามการมีกิจกรรมทางกายของวัยรุ่นไทยฉบับปรับปรุง 2) แบบสอบถามภาวะสุขภาพของเด็กชุดที่ 1 และ 2, 3) แบบสอบถามสมรรถนะแห่งตนในการทำกิจกรรมทางกายและ 4) แบบวัดความรู้ของผู้ป่วยของผู้ป่วยกับการมีกิจกรรมทางกายของเด็กวัยเรียนวิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาการทดสอบที่แบบข้อมูลเป็นอิสระต่ออันและสถิติสหสัมพันธ์เพียร์สัน

ผลการวิจัยพบว่ากลุ่มเด็กกลุ่ม A มีการใช้พลังงานในการทำกิจกรรมทางกายทั้งหมดน้อยกว่ากลุ่มเด็กกลุ่ม B โดยมีค่าเฉลี่ยของระยะเวลาในการทำกิจกรรมทางกายที่มีความแรงระดับปานกลางถึงระดับหนักน้อยกว่าเด็กกลุ่ม B ส่วนชนิดของกิจกรรมทางกายที่เด็กทั้งสองกลุ่มเลือกทำนั้นมีความคล้ายคลึงกันรวมทั้งมีความต่างในการทำกิจกรรมทางกายที่ไม่ได้เลือกกันปัจจัยที่พบว่ามีความสัมพันธ์เชิงบวกอย่างมีนัยสำคัญกับการทำกิจกรรมทางกายที่มีความแรงระดับปานกลางถึงระดับหนักในเด็กกลุ่ม A คือภาวะสุขภาพที่เด็กรับรู้ด้วยตนเองส่วนสมรรถนะแห่งตนของเด็กมีความสัมพันธ์เชิงบวกอย่างมีนัยสำคัญกับการทำกิจกรรมทางกายที่มีความแรงระดับปานกลางถึงระดับหนักของเด็กกลุ่ม B ความรู้ของผู้ป่วยกับการทำกิจกรรมทางกายของเด็กวัยเรียนและภาวะสุขภาพของเด็กตามการรับรู้ของผู้ป่วยกับการมีความสัมพันธ์กับการทำกิจกรรมทางกายของเด็กทั้งสองกลุ่มฯ

จากการวิจัยครั้นี้ พยาบาลควรจะกระตุ้นให้เด็กมีกิจกรรมทางกายที่เหมาะสม รวมถึงการให้ข้อมูลเกี่ยวกับกิจกรรมทางกายแก่เด็กและผู้ป่วย อย่างไรก็ตามผู้วิจัยแนะนำว่าควรมีการทำวิจัยขั้นโดยศึกษาปัจจัยอื่นๆ ที่อาจมีความสัมพันธ์กับการมีกิจกรรมทางกายของเด็กกลุ่มนี้และเพิ่มจำนวนตัวอย่างให้มากขึ้นด้วย

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**คำสำคัญ:** กิจกรรมทางกายโรคหัวใจพิการแต่กำเนิดการศึกษาเชิงหาความสัมพันธ์เด็กผู้ป่วย

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