

## A New Community-Based Outdoor Intervention to Increase Physical Activity in Singapore Children: Findings from Focus Groups

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### Abstract

**Introduction:** Myopia is a significant public health problem in Singapore with estimates that more than 50% of the population is affected by it by the time of adulthood. Childhood obesity is also increasing and has been linked to long-term health problems. Recent studies have found that Singaporean children in Primary 1 spend less than 3 hours a day outdoors which is less than children in other countries. Physical activity has been shown to be protective against obesity and recently, there has been some evidence to suggest that time spent outdoors may reduce the prevalence and severity of myopia. This study aims to explore the barriers and enablers to children in Singapore participating in outdoor activities. **Materials and Methods:** Qualitative data, gathered from focus group discussions was thematically analysed against the PRECEDE component of the PRECEDE-PROCEED model which provided a conceptual framework for examining factors relevant to children participating in an outdoor activity intervention. A total of 31 people participated in 4 focus groups held over a 6-month period. **Results:** This feasibility study was exploratory in nature but provided valuable information concerning barriers and enablers to participation. Data informed the development of a larger study. **Conclusion:** Results indicated that families preferred structured activities such as orienteering and a choice of weekend attendance days and times.

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**Key words:** Myopia, Physical activity, Qualitative research, Singapore

### Introduction

The World Health Organization asserts that uncorrected refractive errors are the second leading cause of blindness globally and the main cause of low vision.<sup>1,2</sup> High myopia, defined as being greater than -6.0 dioptres is associated with primary open-angle glaucoma, retinal pathologies such as retinal detachment and cataract.<sup>1,3,4</sup> Lin et al<sup>5</sup> found that the second most common cause of visual impairment and blindness among elderly Taiwanese was myopic retinopathy.<sup>6</sup> Similar findings have been found in China and Singapore.<sup>7</sup> Furthermore, there is evidence to suggest that myopia is also a significant cause of visual impairment and blindness in western populations.<sup>7,8</sup>

Myopia in the Singaporean population is a significant public health problem with recent estimates that 25% of 5 to 7 years old, 50% of 12 years old and 80% of 18 years

old males are affected.<sup>4,9</sup> A recent study that examined the prevalence of myopia in children of Chinese origin in Sydney and Singapore found that the prevalence was lower in Sydney (3.3%) than Singapore (29.1%).<sup>10</sup> Childhood myopia in Singapore is a financial burden with the literature indicating that the mean direct annual cost per person is S\$221.68.<sup>4,11</sup>

The risk factors for myopia include family history and close work.<sup>12,13</sup> Previous studies have concentrated on genetics, close work and reading on the prevalence and severity of myopia<sup>14-17</sup> and certainly there is evidence to demonstrate that there are a number of factors that influence the development of myopia. Lifestyle factors such as urbanisation, city living and a competitive school environment have also been associated with a higher prevalence of myopia.<sup>5</sup> In addition, there has been some

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debate concerning the relationship between genetics and environmental factors in the development of myopia.<sup>6,13</sup> Significant new findings in recent studies suggest that higher levels of outdoor activity result in lower levels of myopia in primary school children and that this effect may be consistent across ethnic groups.<sup>18-20</sup> It has also been hypothesised that the pressure of academic pursuits may contribute to the early development of myopia.<sup>20</sup>

Singaporean children in Primary 1 aged between 5 and 6 years have been found to spend an average of only 2.32 hours per day outdoors.<sup>19</sup> Rates of childhood obesity are also on the rise in Singapore.<sup>21</sup> Childhood obesity has been shown to have lifelong adverse health and economic consequences.<sup>22,23</sup> Conversely, the protective effects of physical activity for weight management are well documented.<sup>24</sup> Therefore, a sustainable, cost-effective, and scalable intervention that simultaneously addresses both outdoor time and inactivity has the potential to have a significant public health impact.

The amount of time spent outdoors undertaking a number of leisure activities such as playing and sport in early school years appears to contribute to lower prevalence rates and lower severity of myopia.<sup>4,10,19,25</sup> Rose et al<sup>19</sup> suggest that a primary health intervention aimed at increasing outdoor activity for Singaporean children may provide a protective factor against myopia while also providing additional health benefits such as decreasing obesity. Rates of childhood obesity are also on the rise in Singapore.<sup>15</sup> Childhood obesity has been shown to have lifelong adverse health and economic consequences.<sup>16,17</sup> Conversely, the protective effects of physical activity for weight management are well documented.

In Singapore, the Ministry of Health (MOH) and the Ministry of Education (MOE) have launched the National Myopia Prevention Programme (NMPP) which is organised by the Health Promotion Board (HPB). The aim of this programme is to prevent the onset and rapid progression of myopia among children at the preprimary and primary school levels. One of the target behaviours of the NMPP is to increase the amount of time children spend outdoors. Obesity is also a major health factor being targeted by the HPB which is currently working with the MOH to develop health promoting initiatives to reduce obesity. Thus, this study is consistent with the strategies adopted for the NMPP as well as goals set by the MOH.

The aim of the study was to develop and evaluate the feasibility of a community-based behavioural intervention programme. The intervention involved children aged 5 to 7 years and at least 1 of their parents attending an outdoor activity in a national park in Singapore. Focus groups, which are a type of group interview<sup>26</sup> were used to generate data from the participants. Focus groups are integral in the development of complex community-based interventions

and are a suitable method to gain an in depth understanding of the relevant barriers and facilitators to increasing outdoor activity.<sup>27</sup>

### *Conceptual Framework*

The PRECEDE-PROCEED model was used as a conceptual model to identify factors affecting participation in an outdoor activity, to incorporate those factors into building a feasible and sustainable intervention programme and to evaluate the feasibility and success of the programme. This model has been used extensively in health promotion planning and evaluation with children.<sup>28-31</sup> The PRECEDE-PROCEED model consists of 4 planning phases, 1 implementation phase and 3 evaluation phases.<sup>32</sup> The planning phase of this model involves identifying factors that impact on the community and focusing on the identified health needs to develop a realistic intervention.<sup>32-34</sup> Following the identification of an intervention, predisposing, enabling and modifying factors are identified. Manipulation of these factors have been found to result in behaviour change that is sustainable over time.<sup>32,35</sup> Focus group interviews were guided by the PRECEDE component of the model.<sup>34,36</sup> The PRECEDE phase represents the process that precedes the intervention and is an acronym for the predisposing, reinforcing and enabling constructs.<sup>32</sup> Predisposing factors include characteristics such as knowledge and attitudes that motivate behaviour prior or during the intervention.<sup>32</sup> Enabling factors include skill development and access to resources that facilitate change and participation in the intervention and reinforcing factors are the positive and negative factors that result as a consequence of behaviour.<sup>32,34</sup>

### **Materials and Methods**

Four focus groups (n=31) were conducted with participating children's parents. The focus group used a facilitator experienced in running focus groups and a semi-structured interview process to encourage discussion. A semi-structured interview process involves the researcher developing a set of key questions that guide the focus group session, however there is significant flexibility in the process allowing additional topics to be raised.<sup>37</sup>

Focus group information was collected using field notes and audio recordings. The first focus group was held at a community centre in Singapore prior to the intervention with the aim of discovering what types of activities would be acceptable to parents and what the barriers and enablers to participation were. Three separate focus groups post intervention were held in the early evening at a local school. The focus groups had between 5 and 12 participants, a facilitator and 2 assistants. The sessions were informal and held on weekday evenings and lasted for 60

minutes. The facilitator guided the discussion using open ended questions, prompts, probing questions and laddering techniques ensuring all participants had an equal opportunity to contribute to the discussion. The assistants operated the recording equipment, recorded impressions, made notes of salient points, assisted with general administration and summarised with key points at the end of the session. Questions asked at the focus groups were developed through discussion with the research team and through identifying what information we needed to gather.

Each session followed the same structure. All focus groups were conducted in English which was the mother tongue of the facilitator but not the mother tongue for any of the participants. To ensure accurate understanding, the questions were projected onto a screen using PowerPoint. This helped prevent misunderstanding due to accents or wording. Participants were able to validate data during the summary. At the end of the session, participants were reimbursed for their time.

Data analysis was guided by Braun and Clarke's 6 step thematic analysis process.<sup>38</sup> This was a validated, rigorous process that involved (i) immersing oneself in the data and becoming familiar with the data; (ii) generating initial codes; (iii) searching for themes; (iv) reviewing and refining themes; (v) defining and naming themes; and (vi) producing a report. Following each focus group, the data were listened to and field notes read. Data were then grouped according to 3 main themes of predisposing, enabling and reinforcing factors with subsequent subthemes. A comparison was made with the field notes taken by the assistants and quotes that illustrated the key points were selected for inclusion in the final analysis.

### *Sampling and Recruitment*

Approval was sought from the MOE to conduct the study in 1 primary school in the central part of Singapore. The research team presented the study to children aged 5 to 7 years in primary one to primary three at the school assembly. Of the 49 children who indicated interest, a total of 38 children aged 7 to 12 years from 29 families consented to participate in the study. Four families dropped out citing family commitments during the 3-month period. Ethical approval from the Institutional Review Board (IRB) at the National University of Singapore (NUS) was granted and adhered to the tenets of the Declaration of Helsinki. IRB approval from NUS was acceptable to the MOE and the school as the study was non-invasive, involved minimal risk to participants and did not impact on their academic or enrichment pursuits.

### *The Intervention*

The intervention comprised 3 main components: weekend outdoor park activity, health education counselling and keeping a diary.

#### *Weekend Outdoor Park Activity*

Structured half day outdoor programmes were organised by National Parks on Saturday mornings for participating children. The outdoor programmes included guided walks and orienteering at selected national parks throughout Singapore. The intervention went for a 3-month period from January to May 2011.

Participating children and 1 parent wore the Omron HJ-720ITC pedometer, a small portable monitor that displayed daily step activities such as walking, jogging or running. Participating family members wore the pedometer during their waking hours over the course of the month in efforts to obtain incentives. Various incentives were offered to participants to encourage participation, for example, participants who attained at least 10,000 steps a day for 20 days received a cash reward.

#### *Health Education Counselling*

Participating children and their families received educational counselling and HPB pamphlets on outdoor and physical activity as preventive lifestyle modification measures at baseline. In addition to the aforementioned, monthly newsletters were sent to all children and families, a blog was established and reminder letters were sent each week with details and maps of the forthcoming weekend activity.

#### *Participant Diary*

Parents of participating children were asked to maintain a diary detailing the number of hours the child spent outdoors during the week on weekdays and weekends. The diary was based on the Child Development Supplement 7 day diary (CDS-III).<sup>39</sup> The park visits and pedometer steps were tracked every month.

### **Results**

The overall attendance at the weekend outdoor activity was 57.4%. The average attendance for each visit was 72.1% in the first month (January to February), 51.4% in the second month (February to March) and 48.6% in the third month (March to April). The decrease in attendance in the third month may have been due to external factors such as mid-year examinations which were held in May, however parents were not asked why they did not attend. The mean number of visits attended per month was 2.3.

Incentives were provided to encourage children to accrue more than 10,000 steps for more than 20 days per month; 30.3% of participating children achieved this goal in the first month with an average number, 32.4% achieved it in the second month and 52.9% achieved it in the third month. The average number of steps per day of all the participating children was 8074 steps in the first month, 8748 steps in the second month and 8996 steps in the third month. From the outdoor diary data in the first and last week of the 3-month trial, the number of hours per day spent outdoors on weekdays remained at 1.1 to 0.8 hours per day ( $P = 0.2$ ), while the number of hours per day spent outdoors

on weekends increased slightly from 2.4 to 2.6 hours per day, although this was not statistically significant ( $P = 0.7$ ). There were moderate correlations between the increase in outdoor time on weekends with number of park visits ( $r = 0.52$ ) and the increase in pedometer steps ( $r = 0.37$ ).

The parents of participating children in this pilot study revealed that they preferred the weekend park activities to be held on Saturday mornings, followed by Sunday afternoons and Saturday afternoons; 72.5% of the parents indicated that the structured activity should be 1 to 2 hours long with structured activities such as orienteering or treasure hunts.

Themes were thematically analysed according to the

Table 1. Themes and Subthemes

Themes and Subthemes	Construct	Participants' Words
<b>Predisposing Factors</b>		
Knowledge	Most participants were aware of the HPB campaign about myopia. However there was minimal knowledge concerning long-term consequences of myopia. Many parents believed that as myopia was treatable with refraction, it was of little concern.	"I know the campaign. Very important. In Singapore glasses are normal." Participant, focus group 1.
Attitudes and values	Whilst parents acknowledged the importance of good health and being outside the value of education was placed higher than all else. Enrichment, or tuition outside school hours, was deemed as essential.	"Very important that enrichment is not interrupted. Can do but education is most important." Participant, focus group 1.
<b>Enabling Factors</b>		
Skill development	The aim of the outdoor programme was to guide parents into becoming independent and self-guiding. However, it was found that parents preferred the structure of guided activities such as orienteering.  Parents reported that initially the walks were very difficult due to a lack of fitness. They were proud of their success at completing some of the more difficult walks.	"Just walking is quite boring. Activities like the sheets to find things – my kids like that." Participant, focus group 2.  "I thought after the [name excluded] people would give up [laughs]. Really, oh my God, but the next week, we were all there again." Participant, focus group 2.
Availability, accessibility and affordability	Accessibility was not deemed to be an issue. This was due to the transport reimbursement which was used for taxis by participants especially for activities at the more distant venues. It was agreed that if they had to pay their own costs to get to venues, it could become unaffordable.	"No trouble, no trouble. I can get a taxi with the reimbursement, like when we went to [name excluded] Town Garden." Participant, focus group 4.
<b>Reinforcing Factors</b>		
Motivators	Children were motivated by the incentives that related to the number of steps to be achieved over a given number of days per month. There was also competition between family and friends to see who could walk the most number of steps.  From a parental perspective, the motivating factor was the impact the activities had on family relationships especially bonding between fathers and children.	"One day when we walk from X to this Y, they were trying to hit twenty thousand steps because they already hit ten thousand halfway so they aim for a higher score. I was worried – especially for a child, it is a lot of steps to walk." Participant, focus group 3.  "This kinda forces you, er you know, make you to, er actually spend time with your children so that's the difference." Participant, focus group 3.
Barriers	The only barrier to participation cited was the interference with enrichment classes and music tuition. Parents felt a choice of days and times would overcome this.	"More choice of day and time. Like for my daughter, she's out of Mandarin class already and she needs to learn Japanese class which I already drawn her every Saturday afternoon, so I need other time to go." Participant, focus group 4.

PRECEDE framework, thus leading to 3 main themes of predisposing, enabling and reinforcing factors with subsequent subthemes (Table 1).

#### *Predisposing Factors*

Predisposing factors are the influences that motivate behaviour prior to the occurrence of the behaviour. In this study, predisposing factors were elicited at the focus group held prior to developing the intervention and also at the initial clinic when potential participants and their families attended for information and to sign consent forms. Three subthemes were formed under this category: knowledge, values and attitudes (Table 1).

#### *Reinforcing Factors*

Reinforcers were the positive and negative factors that encouraged or discouraged participation in the intervention. Two themes were identified here: motivators and barriers (Table 1).

### **Discussion**

Our focus group discussions showed that parents and children in Singapore enjoyed being in the outdoors. Consistent with the conceptual framework, behaviour was reinforced by a range of positive factors including monetary incentives and family bonding. This is consistent with the literature which demonstrates that there is an increasing emphasis on using incentives to positively influence health behaviours.<sup>40</sup> Studies have shown that the use of incentives promotes significant behaviour change in a range of areas, including obesity and inactivity.<sup>41-44</sup>

Participants preferred organised activities such as orienteering and guided walks rather than self-directed walks, thus structured interventions may contribute to Singaporean children spending more time outdoors (Table 1 – participant's comments). There is a dearth of literature that discusses whether organised physical activity is a motivator for behaviour change in children. However there is some evidence to suggest that promoting physical activity in children may involve control-based interventions<sup>45</sup> and a facilitator to assist with accessing physical activities.<sup>46</sup> Weekend activities of no more than 2 hours duration were preferred by the participants in this study. However, previous studies have identified that incorporating physical activity into school curriculums can have positive outcomes on children.<sup>47,48</sup>

Data from the focus groups indicate that the strategies used in this study may be feasible and acceptable to a larger population of parents and children. Focus group participants indicated that wearing pedometers to increase

physical activity (10,000 steps or more) with appropriate incentives was a realistic method of getting families and children to increase physical activity (Table 1 – participant's comments). It was also highlighted by participants that this number of steps would be almost impossible to complete indoors so would also result in more outdoor activity time. A systematic review undertaken in 2007 determined that pedometer use in adults, especially when coupled with a step goal, increased physical activity.<sup>49</sup> There is, however, a paucity of literature examining whether pedometer use and step goals increase physical activity in children.

Additionally, participants were very supportive of structured weekend outdoor programmes with all participants saying that they would commit to structured weekend programmes of 3 to 4 hours. Participants preferred structured outdoor programmes to self-directed activities and identified that a variety of activities over the month enhanced motivation. Duncan<sup>50</sup> in his study of 1115 New Zealand children asserts that the promotion of physical activity at weekends is a priority. Other studies have identified that physical activity outside school is the main source of activity for most children<sup>51</sup> and consequently interventions should be targeted at both family and community levels.<sup>52</sup> However, there is also some evidence to suggest that community-based physical activity interventions designed to increase physical activity are not effective<sup>53</sup> and that school-based interventions involving the family and the community were more successful.<sup>54</sup> The focus groups indicated that the intervention required some refinement to facilitate sustainability.

Although it was apparent that both children and parents preferred structured, guided activities this is not cost-effective, especially for a large population. Therefore it is recommended that future outdoor activities aim to equip parents and children with the ability to self-direct. This could be enhanced by having activities available in the parks at weekends and having a booth at the park entrance where orienteering maps may be collected. Family groups could also be assisted to form and plan for their own regular outdoor group activities.

### **Conclusion**

In summary, we have developed a feasible community intervention to increase outdoor time and physical activity. However, further studies have to be conducted to further improve the intervention and evaluate the efficacy of the intervention to reduce myopia and obesity in Children in Singapore.

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