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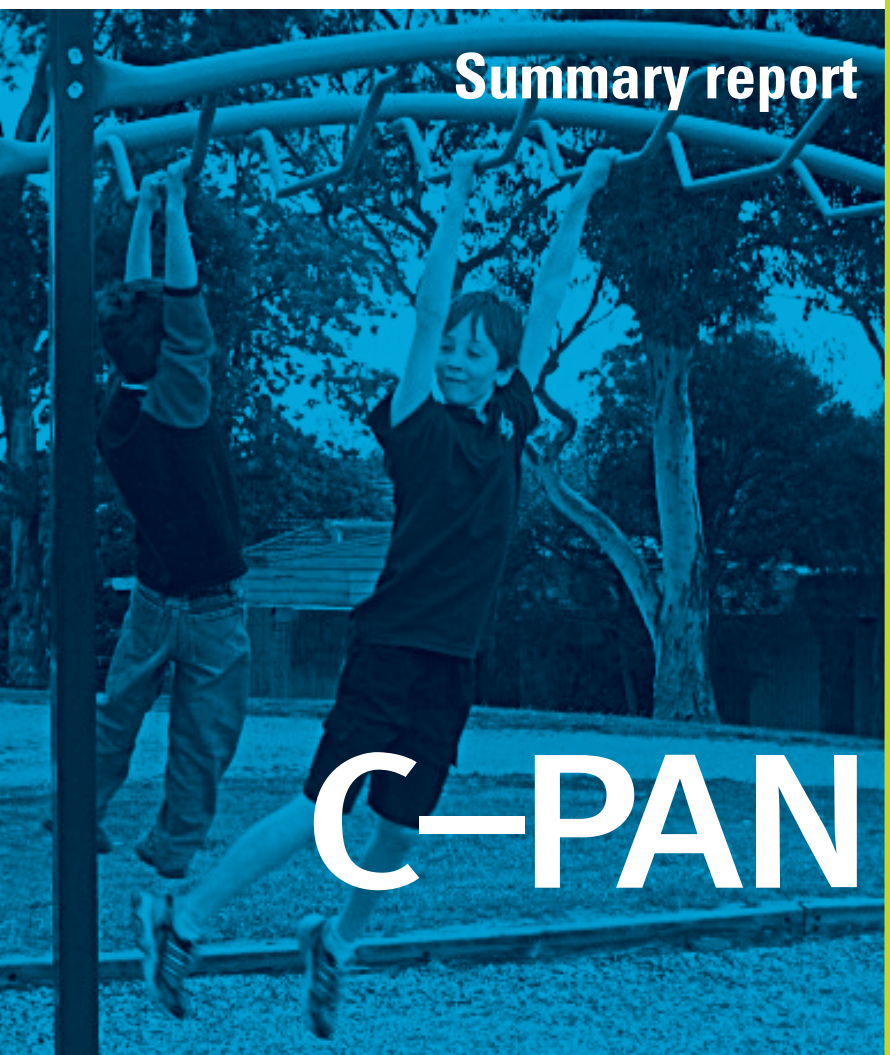
Public open spaces – what features encourage children to be active?

Centre for Physical Activity and Nutrition Research



Summary report

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C–PAN

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Executive summary

The health benefits of physical activity both during childhood and later in life are widely known. They include reduced risk of cardiovascular disease, diabetes, overweight and obesity, along with improved psychosocial health.

Certain segments of the population, particularly those of low socioeconomic position, are known to be at greater risk of lifestyle associated health conditions. Persons experiencing socioeconomic disadvantage also tend to have poorer health behaviours, including higher rates of physical inactivity.

In order to inform programs to support increased physical activity amongst young people, the Children Living in Active Neighbourhoods (CLAN) study has investigated factors that influence physical activity amongst children aged 9-15 years. Specifically, this report explores the association between levels of physical activity and the features of public open spaces. It also compares the nature of public open spaces in low socioeconomic status (SES) and high SES neighbourhoods.

The study found complex associations between the features of public open spaces and levels of physical activity. These associations varied amongst young children and adolescents and amongst girls and boys. They also varied between weekdays and weekends.

The most significant finding was in relation to the presence of playgrounds and the level of activity of boys on weekends. Access to playgrounds in the local park was associated with approximately 25 mins/day more physical activity for young boys on weekends (that is almost half of their recommended daily activity).

Features that were important for adolescent girls included trees that provided shade, a water feature and signage regarding dogs. For younger girls, the number of recreational facilities such as ovals, courts or grassed areas present was negatively associated with physical activity.

Features such as walking and cycling tracks did not show any association with levels of activity amongst girls or boys of either age group.

Overall, the study found consistent access to public open space between different socioeconomic groups. On average, most children in the study had a public open space within walking distance of their home. No difference was found in terms of the number of recreation facilities or playgrounds in those public open spaces.

However, there were differences between neighbourhoods in terms of the proportion of public open spaces that had certain features. For example, when comparing public open spaces in neighbourhoods of highest and lowest SES, those in the highest SES had:

- approximately 20% more walking and cycling paths;
- 40% more trees providing shade; and
- twice as much signage regarding dogs.

This study highlights the complex influences on children's physical activity and supports the view that future urban planning and design of public open spaces should consider features that promote physical activity for various age groups and genders. In particular it supports the inclusion of interesting and age-appropriate playground equipment. The findings also support the hypothesis that people living in low SES areas may have fewer opportunities to be active in interesting and attractive public open spaces with a variety of features.

This report describes the key findings of the study. It will be of interest to parents and families of children and adolescents; teachers and schools; urban planners and policy makers; and others interested in children's health and physical activity.

Background and study aims

1.1 Physical activity and public open spaces

Physical activity is known to have significant benefits for both physical and psychosocial health [1, 2]. In particular, participation in physical activity has been shown to protect against risk factors for cardiovascular disease such as hypertension, as well as other chronic diseases including type 2 diabetes and obesity [1].

One factor believed to influence levels of physical activity is access to public open spaces. Public open spaces, including parks, have been identified as important venues for physical activity [3, 4], and research among adults has shown that many people who visit parks engage in active recreation (mobile activities or sports) while at the park [5]. Bedimo-Rung and colleagues (2005) suggest that there are significant benefits associated with parks and park usage, both in terms of physical and psychological health, as well as social and economic benefits.

In relation to children's physical activity, several studies have shown that aspects of the physical and social environment around where children live are important. These include access and availability of facilities for physical activity such as formal parks and public open spaces [6]. Research among Victorian youth suggests that parks are a particularly important venue for children to engage in active play [7] and other types of more formal physical activity [8], and are common destinations to which children walk or cycle.

With one in five Australian children being overweight or obese, the promotion of physical activity is an important public health priority.

The importance of parks has also been demonstrated in an experimental study by Epstein and colleagues (2006), which tested whether reducing children's access to sedentary behaviours was related to their physical activity. That study also tested whether children's access to parks had any effect on sedentary behaviours and physical activity. The authors found that when children's access to sedentary options was decreased, increases in physical activity were seen among children with greater access to parks [9], thus supporting the suggestion that parks are an important destination for children to be active in. This is consistent with a study of 4-7 year-old children, which found those living in residential areas with a higher proportion of park area tended to be more physically active [10]. A further study also found that girls with greater access to parks in their neighbourhood tended to undertake more moderate-to vigorous-intensity physical activity (MVPA) than other children [11].

In another Australian study, 10-12 year-old girls who reported there were no nearby parks were 50% less likely to walk or cycle than girls who reported nearby parks [12]. Similar findings have been reported among adults.

Although the presence and number of parks nearby appears to be an important correlate of physical activity among youth, little is known about the specific features of parks and public open spaces that are related to physical activity among children [3]. One recent study in the United States by Cohen et al. (2007) suggests that features such as playgrounds are associated with physical activity among adolescent girls [11].

In the absence of research in this area, the present study has sought to understand whether parks and park features play a role in children's physical activity.

1.2 Physical activity and socioeconomic factors

Lack of physical activity is a particular concern amongst certain segments of the population. Persons experiencing socioeconomic disadvantage have been shown to have poorer health behaviours, including higher rates of physical inactivity [16]. This is one of a range of factors contributing to the greater risk of chronic conditions such as heart disease, diabetes and obesity amongst those of low socioeconomic position [17], and is therefore a significant public health concern.

As well as individual differences in physical activity according to socioeconomic position (SEP), there is evidence that the socioeconomic status (SES) of a neighbourhood is associated with physical activity [17,18]. One Australian study, involving 50 neighbourhoods and over 2,000 people, showed that people living in the most socioeconomically disadvantaged neighbourhoods were less likely to participate in sufficient physical activity for health benefits, even when accounting for individual-level SEP (e.g. education, income, occupation) [18].

One potential explanation for the socioeconomic inequalities in health behaviours is that there may be fewer opportunities for physical activity in socioeconomically disadvantaged neighbourhoods. This hypothesis is supported directly by recent data from the United Kingdom that shows that more deprived areas have fewer facilities for physical activity [19]. Hillsdon and colleagues (2007) showed that as deprivation worsens, the number of physical activity facilities decreases, and this finding was consistent for both public and private facilities. Limited data available among youth also support this hypothesis. Cradock and colleagues (2003), in a study of youth access to playgrounds in the United States, demonstrated that as the proportion of youth (<18 years) living in poverty increased in Boston neighbourhoods, distance to the nearest playground increased [20].

The relationship between access to facilities and physical activity is, however, still unclear as several studies, including one from Australia, have not found this relationship [13], or in fact, have found the reverse [21,22]. Indeed, in a previous study among Victorian youth by Timperio and colleagues (2007), public open spaces did not vary by neighbourhood socioeconomic status [23]. However, this study, like much of the previous research, considered only availability of parks and not the features of those parks (e.g. playgrounds, walking and cycling paths, water features) which may explain socioeconomic variations in physical activity.

The current study seeks to explore these relationships further, particularly in relation to the features of parks and open spaces that might be associated with physical activity.

1.3 Study aims

Given that persons living in low socioeconomic areas may be less likely to be physically active, it is important to establish whether this might be explained by differences in features of nearby public open spaces.

The aims of this study were therefore:

1. To examine associations between features of public open spaces and children's physical activity; and

2. To examine variation in the features of public open spaces by neighbourhood socioeconomic status.

Study design and methods

2.1 Study design

This study, known as the 'Children Living in Active Neighbourhoods' study or 'CLAN', involved three main aspects:

- surveys of parents, seeking demographic information that could be used to identify socioeconomic status and proximity to public open spaces;
- an audit of public open spaces in terms of the features and amenities offered; and
- direct measurement of physical activity among participating children.

These methods were applied in 2004 amongst children and parents from varying socioeconomic status (SES) suburbs of metropolitan Melbourne.

Approval to conduct all phases of this study was received from the Deakin University Human Research Ethics Committee, from the Victorian Department of Education and from the Catholic Education Office. Consent for participation in the study was provided by the parents on behalf of themselves and their child.

2.2 Study participants

Participants were recruited from those who had participated previously in the Children's Leisure Activities Study (CLASS) which was conducted in 2001[24]. They were recruited to the original CLASS study from government primary schools located in high and low SES suburbs of metropolitan Melbourne. Ten primary schools in eastern suburbs (high SES) and nine primary schools in western suburbs (low SES) participated in the study. All children aged 5-6 years, and 10-12 years and their parents were eligible to participate in 2001. They were contacted in 2004 to be part of the follow-up study (CLAN).

In 2001, participants were parents and children in prep and grades 5 and 6. In 2004, participants were parents and children in grade 2 and grades 7 to 10. This report contains information collected from participants in 2004.

The numbers of participants are outlined in Table 1.

Table 1 Study participants in 2001and 2004

	CLASS	CLAN
	2001	**2004**
Younger children	296 families	188 families
Adolescents	919 families	403 families
Total	**1210 families**	**591 families**

2.3 Parents' survey

Parents completed a survey in which they provided a range of data [24]. Of particular relevance to this study were address details of the family home, which enabled determination of data about proximity to public open spaces and other facilities.

Participants' addresses were geo-coded using a Geographic Information System (GIS). GIS is a computer-based tool that displays data about environments as charts, maps and tables. These charts, maps and tables consist of a set of data points each representing a facility or location of an object in the environment. Physical places and locations can be 'mapped' as well as characteristics and geographic features of the area. For the purposes of this study, all public open spaces (e.g. parks, walking/cycling paths, ovals etc.) within an 800m radius of the participants' homes were identified using a GIS. Previous research with parents has suggested that 800m is a reasonable walking distance for their child [12]. The proportion of participants with access to any public open space within this 800m radius was calculated.

In the survey, parents also reported the highest level of education obtained by the mother/female carer in the house, and this was used as an indicator of family-level socioeconomic position. The socioeconomic index for areas (SEIFA) from the Australian Bureau of Statistics [25] was used to determine the socioeconomic status of the neighbourhood that each family lived in. SEIFA is based on the postcode of an area, and the index is calculated according to factors such as education, occupation, employment, income, and some measure of wealth (e.g. car ownership and number of bedrooms in a dwelling) of the residents of that area. SEIFA incorporates these indicators and provides a summary of the socioeconomic characteristics of the people living in that area. The neighbourhoods in the index were split into five equal groups for these analyses.

2.4 Auditing of public open spaces

A short audit tool was developed to assess the features of public open spaces [26]. This tool required the auditor to record the presence of a number of features in the public open space that were hypothesised to be important influences on children's physical activity. These features included:

- recreational facilities (e.g. number of courts and ovals, athletics facilities, swimming pools and informal recreation spaces such as grassed areas)
- playgrounds
- amenities (e.g. rubbish bins, barbecue facilities, toilets, and drinking fountains/taps)
- walking paths
- cycling paths
- lighting along the paths
- trees providing shade
- water features
- signage about dogs in the space (e.g. no dogs allowed, dogs only allowed on leashes, dogs allowed off leashes), and
- signage restricting other activities (e.g. no ball games, no walking on the grass).

The number of public open spaces in each neighbourhood was identified (n=1,497) and an audit was completed for each space.

The proportion of children with access to any public open space was calculated, as was the distance from the child's home to the nearest public open space via the road network.

2.5 Objectively-measured physical activity

All participating children wore an MTI Actigraph accelerometer for eight consecutive days in order to measure their habitual physical activity. Accelerometers were worn on the right hip and measured intensity, frequency and duration of movement in real-time. These devices allow researchers to estimate the amount of activity, as well as the intensity of that activity at different times of the day.

National guidelines for children's physical activity recommend that they perform at least 60 minutes of moderate-to vigorous-intensity physical activity (MVPA) every day. The types of activities typically classified as moderate-to vigorous-intensity include brisk walking, using playground equipment and playing netball or football. Average minutes per day of MVPA on weekdays and on weekend days were calculated based on the accelerometer data.

Study findings

3.1 Characteristics of study participants

The survey was completed by parents of 591 younger children and adolescents, however, only 497 families reported the address of the family home. Thus, the sample for this particular aspect of the CLAN study consisted of 497 families. Younger children were approximately 9 years old, and older children/ adolescents were approximately 14 years old at the time the survey was completed (Table 2).

Table 2 Family characteristics of children and adolescents, 2004

	Younger children		Adolescents	
	Boys (n=90)	**Girls** (n=73)	**Boys** (n=146)	**Girls** (n=188)
Child age (mean; years)	9.1	9.0	14.6	14.4
Parents' marital status (%)				
Married / defacto	86.8	89.2	83.1	84.1
Separated / divorced	8.8	6.8	13.1	12.1
Widowed	0	0	0.6	0.5
Never married	4.4	4.1	3.1	3.4
Maternal education level (%)				
Some high school or less	29.6	25.4	31.5	34.3
High school or technical cert.	39.8	54.9	34.9	29.3
University/tertiary	30.7	19.7	33.6	36.4

3.2 How physically active were CLAN participants?

Key findings:

- **Younger children were, on average, meeting physical activity guidelines on weekdays and weekends (i.e. more than 60 mins/day).**
- **Adolescents were less active than younger children. Adolescent boys met physical activity guidelines on weekends but not on weekdays.**
- **Adolescent girls were the least active group, and did not consistently meet national physical activity guidelines on any days.**

National guidelines for physical activity recommend 60 mins/day of moderate- to vigorous-intensity physical activity for children and adolescents. Figure 1 shows the physical activity levels among study participants on weekdays and on weekends.

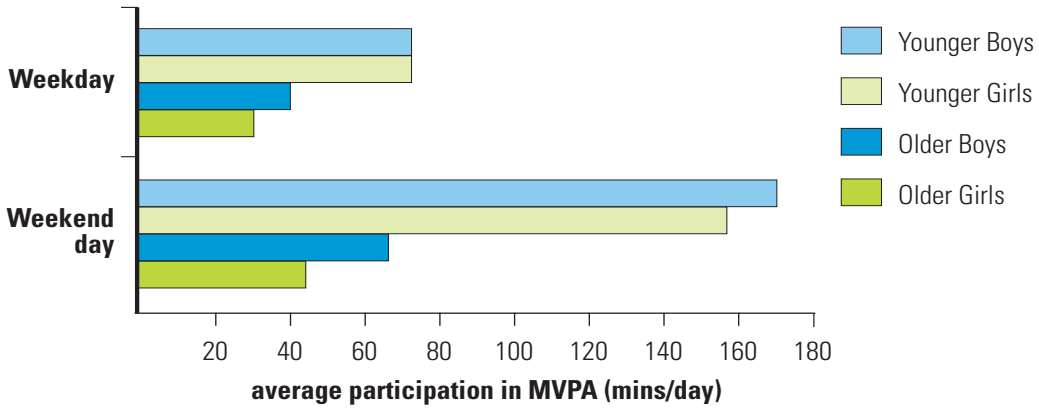
Among younger children, boys and girls both performed more than one hour/day of MVPA on weekdays. On weekend days, they were considerably more active, with boys performing approximately 170 mins/day, and girls performing approximately 155 mins/day of MVPA.

Adolescents were less active than younger children, both on week days and on weekend days. Adolescent boys performed approximately 40 mins/day of MVPA on weekdays and approximately 65 mins/day on weekend days.

Adolescent girls were less active than adolescent boys, performing approximately 30 mins/day on an average weekday and 45 mins/day on an average weekend day. This is less than the national recommendations of 60 mins/day.

There was little difference in physical activity participation according to family-level SEP [27].

Figure 1 Average participation in MVPA (mins/day) during weekdays and on weekend days



3.3 Do children and adolescents have access to public open spaces and recreational facilities in their neighbourhoods?

Key findings:

- **On average, children lived within walking distance (approximately 300m) from their closest public open space.**
- **45% of these spaces had at least one playground present.**
- **These spaces had, on average, one recreational facility such as a court, oval or an informal grassed area. They also had at least two amenities such as toilets, drinking fountains/taps or barbecue facilities.**
- **Over half of these spaces had walking or cycling paths, and two-thirds had trees that provided shade.**
- **Few of the spaces had lighting along paths, water features or signage restricting other activities such as ball games.**
- **Signage regarding dogs was present in approximately 30% of these spaces.**

Programs aiming to encourage children's physical activity often promote the use of public open spaces, however, little is known about children's ability to access these spaces in their local neighbourhood. If these programs are to be successful, establishing whether children are able to access these spaces and the characteristics of these spaces is important.

Children's access to public open spaces

Whilst a number of factors influence access to public open space, in this study distance from a child's home was established as the main measure. Utilising GIS technology, it was identified that on average, children lived approximately 300m from their closest public open space, which was well within the 800m identified through previous research as a reasonable distance to walk.

Characteristics of public open spaces

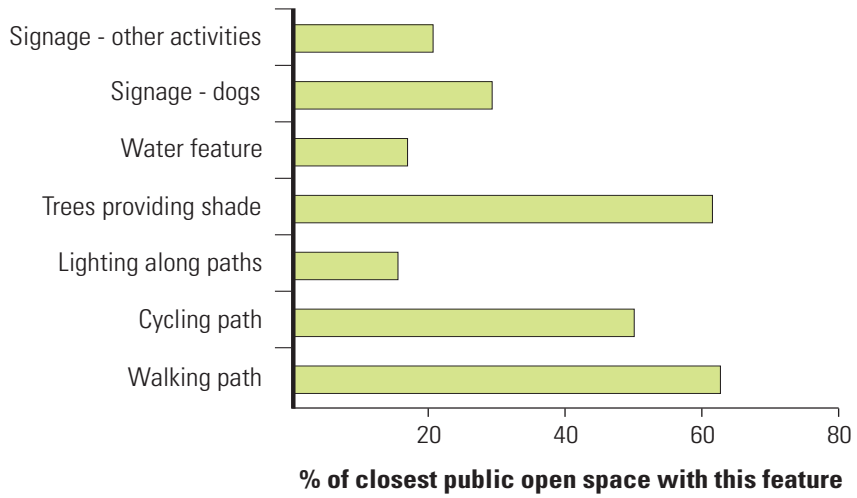
The characteristics of children's closest public open space, and the presence of any features within an 800m radius of the child's home was also examined using GIS technology and physical audit of the spaces. Table 3 shows the mean number of facilities, playgrounds and amenities within children's closest public open space. On average, there was at least one recreational facility (e.g. court, oval, informal grassed area), more than two amenities (e.g. toilets, drinking fountains/taps) within each child's closest public open space. In addition, 45% of public open spaces audited had at least one playground present.

Table 3. Characteristics of the closest public open space

Characteristic of open space	Mean number
Recreational facilities (e.g. court, oval, informal grassed area)	1.02
Amenities (e.g. e.g. toilets, drinking fountains/taps)	2.25
Playgrounds per open space	**Proportion (%)**
1 playground	41.0
2 playgrounds	3.3
3 playgrounds	0.5
4 playgrounds	0.1

The proportion of public open spaces (closest to the child's home) that had specific features including walking and cycling tracks, lighting along paths, trees providing shade, a water feature and signage regarding dogs or other activities is shown in Figure 2. Walking paths were present in approximately two-thirds, and cycling paths were present in approximately half of children's closest public open space. Trees providing shade were also present in the majority of public open spaces (61%), but fewer public open spaces had lighting along paths (15%) or water features (17%). Signage regarding dogs was present in approximately 30% of the closest public open space, while signage restricting other activities was present in 20%.

Figure 2. Characteristics of the closest public open space



3.4 Are there associations between the features of public open spaces and children's physical activity?

Key findings:

- **Associations between features of public open spaces and MVPA varied according to the day of the week, amongst boys and girls and amongst adolescents and younger children.**
- **Playgrounds were strongly associated with boys' activity on weekend days but not on weekdays. Among younger boys, if their closest public open space had a playground, they tended to be more physically active on weekend days. This was not the case among girls.**
- **Among adolescent girls, a number of features were associated with their physical activity on weekdays, including the presence of shade, a water feature and signage regarding dogs.**

Encouraging use of public open spaces is believed to be important in promoting physical activity. Therefore, it is important to examine whether children who live near public open spaces with good facilities, do in fact participate in more physical activity.

Additionally, it is important to determine whether these associations are different between boys and girls and between younger children and adolescents. Physical activity is also likely to be quite different on weekdays compared to weekend days. All analyses were therefore performed separately for boys and girls, for younger children and adolescents, and for weekdays and weekend days.

3.4.1 Features of public open spaces and younger children's physical activity

During weekdays

Features of the child's closest public open space were examined for associations with younger children's MVPA during weekdays (non-school hours).

Among younger boys:

- ***Signage regarding dogs ⟶ 5 minutes per day more MVPA ($p<0.1$)***

Whilst not statistically significant, this trend may reflect a different type of public open space that is, for example, more appealing for active games rather than dog walking.

Among younger girls:

- ***More recreational facilities present (e.g. ovals, courts) ⟶ 3 minutes per day less MVPA ($p \leq 0.05$)***

This may indicate that girls are not interested in the types of recreational facilities present at their closest public open space, and that public open spaces with fewer of these facilities may possess other features that are more conducive to physical activity among young girls.

- ***A water feature present ⟶ 5 minutes per day less MVPA ($p \leq 0.1$)***

Whilst not statistically significant, this trend may indicate that the type of public open space that is closest to these girls may not be one that is interesting or appropriate for physical activity and it may be designed for other uses.

During weekend days

On weekend days, associations between younger children's MVPA and features of the closest public open space tended to be quite different to the associations seen for weekdays.

Among younger boys:

- ***A playground present ⟶ 25 minutes per day more MVPA ($p \leq 0.05$)***

This finding suggests that nearby public open spaces with playgrounds are important for promoting young boys' physical activity.

- ***Lighting along paths ⟶ 55 minutes per day less MVPA ($p \leq 0.01$)***

This may indicate that these public open spaces have fewer opportunities for typical games and activities for young boys such as football or soccer, and instead are designed for walking or cycling activities.

Among younger girls:

- ***More recreational facilities present (e.g. ovals, courts) ⟶ 9 minutes per day less MVPA ($p \leq 0.05$)***

This finding is consistent with associations found for girls' weekday MVPA, and suggests that these facilities do not promote physical activity among these girls.

3.4.2 Features of public open spaces and adolescents' physical activity

During weekdays

Features of public open spaces were examined for associations with adolescents' physical activity on weekdays. There were no associations between any features of the closest public open space and boys' MVPA on weekdays. These findings suggest that many of the features of nearby public open spaces may not interest adolescent boys, and may not be useful or important for promoting moderate or vigorous activities among this group, particularly during weekdays.

Among adolescent girls:

- ***Trees with shade present ⟶ 6 minutes per day more MVPA (<0.05)***
- ***A water feature present ⟶ 7 minutes per day more MVPA (p<0.1)***
- ***Signage regarding dogs ⟶ 8 minutes per day more MVPA (p<0.05)***

This suggests that these sorts of features may be more appealing for older girls who may engage in non-organised activities, rather than organised or planned physical activity.

During weekend days

Among adolescent boys:

- ***A playground present ⟶ 16 minutes per day more MVPA (p<0.1)***

Whilst not statistically significant, this trend is consistent with that for younger boys, suggesting that public open spaces with playgrounds are an important destination promoting physical activity among younger and older boys.

Overall, these findings suggest that interesting and varied features of public open spaces do promote physical activity among children and adolescents. Playgrounds in particular seem to be important for promoting physical activity among boys.

3.5 Do features of public open spaces vary by neighbourhood socioeconomic status (SES)?

Key findings:

- **There were approximately equal numbers of public open spaces in all five SES neighbourhood groups.**
- **There were no differences in the number of recreation facilities or playgrounds in public open spaces between neighbourhoods of high and low SES.**
- **Public open spaces in high SES neighbourhoods had significantly more amenities (e.g toilets, barbecues, etc) than public open spaces in low SES neighbourhoods.**
- **Compared to those in low SES neighbourhoods, a higher proportion of public open spaces in high SES neighbourhoods had walking and cycling paths, lighting along paths, trees providing shade, water features, and signage relating to dogs or to other activities.**

Table 4 shows the number of public open spaces by SES (Levels 1 to 5). It also shows the average number of recreational facilities, playgrounds and amenities (e.g. toilets, barbecues, rubbish bins, drinking fountains) in the public open spaces, and the proportion of public spaces with other features (e.g. walking and cycling paths, water features, and signage regarding dogs) according to neighbourhood level.

The number of public open spaces was approximately equal across all levels of neighbourhood SES, ranging from 285 in the highest SES neighbourhood, to 314 in the lowest SES neighbourhood (not a significant difference). There were also no significant differences in the number of recreation facilities or playgrounds between high and low SES public open spaces.

However, there were differences between SES levels in terms of the proportion of public open spaces that had certain features. For example:

- almost 20% more public open spaces in higher SES neighbourhoods had walking and cycling paths compared to lower SES neighbourhoods;
- trees providing shade were approximately 40% more common in public open spaces in higher SES neighbourhoods compared with the lowest; and
- signage regarding dogs was twice as common in parks in high SES neighbourhoods compared with low SES neighbourhoods.

Table 4. Features of public open spaces according to neighbourhood-level socioeconomic status

	Neighbourhood-level socioeconomic status				
	Level 1 (Lowest SES)	**Level 2**	**Level 3**	**Level 4**	**Level 5 (Highest SES)**
Number of public open spaces (n)	**314**	**307**	**288**	**303**	**285**
Number of recreational facilities per open space (mean (SD))	0.6(1.6)	0.8(2.4)	0.9(2.1)	0.7(2.2)	1.0(3.2)
Number of playgrounds (mean (SD))	0.5(0.6)	0.5(0.6)	0.5(0.6)	0.5(0.6)	0.5(0.6)
Amenities score (mean, (SD))***	1.5(1.9)	1.6(2.2)	2.0(2.5)	1.5(2.1)	2.6(2.4)
Walking paths (%) ***	52.5	54.1	62.2	61.9	70.2
Cycling paths (%) ***	42.4	46.9	49.8	51.3	62.8
Lighting along paths (%)***	12.8	5.2	11.2	12.0	21.6
Trees providing shade (%) ***	34.7	42.3	50.7	60.9	77.5
Water feature (%) **	15.7	16.4	15.3	15.3	26.4
Signage regarding dogs (%) ***	23.6	16.6	18.8	10.6	50.9
Signage restricting other activities (%) *	8.3	14	14.3	10.4	18.9

**p≤0.01 **p≤0.001 ***p≤0.0001*

Study conclusions

This study is one of the first to objectively assess public open spaces and to specifically examine the important associations between the features of public open spaces and children's physical activity. It is also amongst the first to examine whether features of these spaces differed according to children's neighbourhood-level SES.

Features of public open spaces related to physical activity

One of the key findings suggests that playgrounds are important for children's activity. This is consistent with qualitative research in which Australian parents reported that nearby parks and the facilities and features of these parks, particularly playgrounds, are important and impact on their children's interest in using these spaces [7]. In the present study, playgrounds were particularly associated with boy's physical activity. A playground in their closest public open space meant younger boys performed approximately 25 mins/day more physical activity on weekends, which could account for almost half of their daily recommended physical activity. Although not statistically significant, adolescent boys with a playground in their nearest public open space also performed more physical activity (approximately 16 mins/day).

There was no significant association between playgrounds and physical activity among girls of either age group. This is in contrast to findings of Cohen and colleagues (2007) who found the presence of playgrounds in local parks was associated with physical activity amongst adolescent girls [22]. One explanation for these contrasting findings may be that the present study examined the closest public open space, whilst Cohen and colleagues measured all parks within a 1-mile radius (1.6km) of the girls' homes. It may be that the closest public space is not the space that is most interesting or appealing for girls. Indeed, results from a mapping study with Australian school children showed that the park that children usually visited was not necessarily the closest park to home; on average the park children usually visited was located up to double the distance from home than the closest park [28]. The parks examined by Cohen and colleagues may have captured spaces girls used or were more likely to be active at.

In the present study, features of public open spaces that were positively associated with adolescent girls' physical activity included the presence of trees providing shade, a water feature and signage regarding dogs. This suggests that these sorts of features may be more appealing for girls who are perhaps engaging in non-organised activities with friends, rather than organised or planned physical activity.

Differences between socioeconomic groups

Poor access to facilities for physical activity has been hypothesized as an important contributor to lower levels of physical activity among persons experiencing socioeconomic disadvantage [3]. This study, however, found no difference in the overall availability of public open spaces between high and low SES neighbourhoods, with most children having a public open space within walking distance of their home.

This is in contrast to some other studies. For example, Estabrooks and colleagues (2003) found that fewer physical activity facilities were available in low and mid SES areas, when compared to high SES areas [29]. A study of Australian primary school children from high, mid and low SES areas also found inverse relationships between neighborhood SES and the distance from the child's home to the closest park and to the park usually visited [28]. However, the differences between park access and SES areas in that study may have been due to geographic differences (i.e. the low SES area was located on the outer rim of Melbourne and the mid and high SES areas were located in higher population dense areas). Recent data from Glasgow, Scotland found there was actually a higher number of outdoor play spaces in more deprived areas [21].

The present study also examined the specific features of public open spaces and compared these in high and low SES areas. There were no differences in the number of recreation facilities (e.g. courts, ovals, grassed areas) or playgrounds between high and low SES areas. There were however differences for a number of other features. For example, public open spaces in high SES areas had more amenities (e.g. rubbish bins, barbecue facilities) compared to those in low SES areas. Approximately 20% more public open spaces in the high SES areas had walking and cycling paths, compared to low SES areas. Trees providing shade and signage regarding dogs were also more common in public open spaces in high SES areas compared to low.

These findings do, in part, support the hypothesis that people living in low SES areas may have fewer opportunities to be active, in interesting and attractive public open spaces with a variety of features.

It is clear that the association between physical activity and the nature and proximity of public open spaces is complex, however, the findings of this study highlight the importance of understanding the varying needs and interests of boys and girls of different ages and of providing play areas/facilities as appropriate. The study also highlights the value of local research in informing planning in this regard.

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Public open spaces – what features encourage children to be active?

Summary report