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TOWARDS THE IDENTIFICATION OF A NEIGHBOURHOOD PARK TYPOLOGY: A CONCEPTUAL AND METHODOLOGICAL EXPLORATION

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DEDICATION

This thesis is dedicated to

Roberto Pires Pinto, Ph.D., and Andraea van Hulst, R.N., M.Sc.

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RÉSUMÉ

Peu d'études ont évalué les caractéristiques des parcs pouvant encourager l'activité physique spécifiquement chez les jeunes. Cette étude vise à estimer la fiabilité d'un outil d'observation des parcs orienté vers les jeunes, à identifier les domaines conceptuels des parcs capturés par cet outil à l'aide d'une opérationnalisation du modèle conceptuel des parcs et de l'activité physique et à identifier différents types de parcs.

Un total de 576 parcs ont été évalués en utilisant un outil d'évaluation des parcs. La fiabilité intra-juges et la fiabilité inter-juges de cet outil ont été estimées. Une analyse exploratoire par composantes principales (ACP) a été effectuée en utilisant une rotation orthogonale varimax et les variables étaient retenues si elles saturaient à ≥0.3 sur une composante. Une analyse par grappes (AG) à l'aide de la méthode de Ward a ensuite été réalisée en utilisant les composantes principales et une mesure de l'aire des parcs. L'outil était généralement fiable et l'ACP a permis d'identifier dix composantes principales qui expliquaient 60% de la variance totale. L'AG a donné un résultat de neuf grappes qui expliquaient 40% de la variance totale. Les méthodes de l'ACP et l'AG sont donc faisables avec des données de parcs. Les résultats ont été interprétés en utilisant l'opérationnalisation du modèle conceptuel.

Mots clés : cohorte QUALITY, parcs, activité physique chez les jeunes, environnement bâti, outil d'évaluation des parcs, analyse exploratoire par composantes principales, analyse par grappes

ABSTRACT

Few studies have characterized park features that may be appealing for youth physical activity (PA). This study assesses the reliability of a youth-oriented direct-observation park assessment tool; identifies park domains captured by the tool using an operationalized conceptual model of parks and PA, and identifies distinct park types.

576 parks were audited using a park observation tool; intra- and inter-rater reliability were estimated. Exploratory principal component analysis (PCA) was conducted and variables were retained if they loaded at 0.3 or higher. A cluster analysis (CA) was conducted using the principal components and park area. The tool was found to be reliable and PCA yielded ten principal components explaining 60% of the total variance. The CA yielded a nine-cluster outcome explaining 40% of the total variance. PCA and CA were found to be feasible methods to use with park data. The operationalization of the conceptual model helped interpret these results.

Keywords: QUALITY Cohort, parks, youth physical activity, built environment, park audit tool, reliability, exploratory principal component analysis, cluster analysis

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

BE	Built environment
BMI	Body mass index
BRAT-DO	Bedimo-Rung Assessment Tool – Direct Observation
CA	Cluster analysis
CCC	Cubic clustering criterion
CPAT	Community Park Audit Tool
C-POST	Children's Public Open Space Tool
EARPS	Environmental Assessment of Public Recreation Spaces
GIS	Geographic information system
MCMA	Montreal Census Metropolitan Area
MEGAPHONE	Montreal Epidemiological and Geographical Analysis of Population Health Outcomes and Neighbourhood Effects
MET	Metabolic equivalent of task
MVPA	Moderate to vigorous physical activity
PA	Physical activity
PARA	Physical Activity Resource Assessment
PARK	Parks, Activity and Recreation among Kids Tool
PCA	Principal component analysis
PDA	Personal Digital Agenda
PEAT	Path Environment Audit Too
POST	Public Open Space Tool
PSF	Pseudo F
PST2	Pseudo t^2
QUALITY	Quebec Adipose and Lifestyle Investigation in Youth
SES	Socioeconomic status
SOPARC	System for Observing Play and Recreation in Communities

INTRODUCTION

> *We ought to plan the ideal of our city with an eye to four considerations. The first, as being the most indispensable, is health.*
>
> Aristotle,
>
> *Politics* (ca. 350 B.C.)

> *All parts of the body which were made for active use, if moderately used and exercised at the labour to which they are habituated, become healthy, increase in bulk, and bear their age well, but when not used, and when left without exercise, they become diseased, their growth is arrested, and they soon become old.*
>
> Hippocrates,
>
> *On the Articulations* (ca. 460-377 B.C.)

Rationale: Overweight, Obesity and Physical Activity Among Canadian Youth

The prevalence of overweight and obesity among Canadian youth has increased significantly over the past 25 years. In 1978/79, 12% of Canadian children and youth between the ages of 2 and 17 were overweight and 3% were obese, for a combined overweight/obesity prevalence of 15% based on direct measures (Shields, 2006). In 2004, the prevalence of directly measured overweight increased to 18% and the prevalence of obesity to 8% for a combined overweight/obesity prevalence of 26% among the same age group of Canadian children and youth (Shields, 2006). Notably, it was the 12 to 17 years age group that primarily carried the burden of the increase; the prevalence of overweight/obesity almost doubled in this group over the previous 25 years (14%-29%) (Shields, 2006), highlighting the need to increase preventative measures prior to or around age 12. Obesity is associated with chronic health risks during childhood that may last into adulthood (Biro & Wien, 2010) as well as cardiovascular disease in adulthood (Gunnell, Frankel, Nanchahal, Peters, & Davey Smith, 1998; Raitakari, Juonala, & Viikari, 2005). It is also associated with a high risk of developing health problems such as hypertension and type-2 diabetes, as well as some types of cancers (Larsson & Wolk, 2007, 2008; Lin et al., 2004; Moghaddam, Woodward, & Huxley, 2007; Yang et al., 2009). It can thus be stated fairly confidently that overweight and obesity in childhood should be considered a public health priority.

As the body mass index (BMI) among Canadian youth increases, fitness levels, measured by objective indicators of aerobic fitness, muscular strength, and muscular endurance and flexibility have decreased over 30 years (1981 – 2007/2009) (Tremblay et al., 2010). This trend is the same for all age groups and between both sexes in Canada (Craig, Shields, Leblanc, & Tremblay, 2012). As fitness levels are decreasing, studies are showing that youth are not meeting the recommended guidelines of 60 minutes of moderate-to-vigorous physical activity (MVPA) per day (Public Health Agency of Canada, 2011). The prevalence of physical activity (PA), defined as being compliant with Canada's Physical Activity Guide to Healthy Active Living as well as daily energy expenditure classification values, was contrasted between urban Ontario and rural Albertan school aged children. Among this study population, the prevalence of PA was only 57% (Plotnikoff, Bercovitz, & Loucaides, 2004). Across Canada more generally, the situation appears worse: only 7% of

Canadian children aged 5-17 years meet the minimum recommended guidelines of MVPA per day (Statistics Canada, 2011a).

There are a number of identified determinants of overweight and obesity including socioeconomic status, ethnicity, immigration, environmental factors, diet and PA opportunities. These upstream and complex causes of obesity are largely outside of individual control and therefore necessitate a population level approach, especially considering the poor results of individual-level approaches for population level changes (Bedimo-Rung et al., 2005; Centers for Disease Control and Prevention, 2001). A lack of PA may be an important determinant of mortality. In the United States, the estimated number of deaths caused by poor diet and physical inactivity increased by 1.6% between 1990 and 2000, representing an increase of an estimated 65 000 deaths related to these two modifiable behaviours over ten years (Mokdad, Marks, Stroup, & Gerberding, 2004). Although tobacco-related deaths remained the number one cause of death in the United States, estimated deaths caused by poor diet and physical inactivity are increasing while estimated deaths from tobacco use are decreasing, providing further evidence that poor diet and physical inactivity are important and widespread preventable public health concerns (Mokdad et al., 2004). Statistics Canada reported that PA emerged as most strongly associated with obesity at the population level while controlling for age as well as health and behavioural determinants (Statistics Canada, 2011b). PA is increasingly being recognized as a key aspect to health, with some arguing that exercise should be considered a fifth vital sign for physicians to record in patient medical records (Khan et al., 2012).

Indeed, sedentary behaviours, such as screen time, have been found to be more prevalent among overweight and obese children than normal weight children globally, with sedentary children engaging in less MVPA than their less-sedentary counterparts (Janssen et al., 2005; Vos & Welsh, 2010). However, the nature of the relationship between PA and obesity is not always clear. One prospective cohort study suggests that a higher BMI may cause lower levels of PA and fitness among youth (Pahkala et al., 2012), rather than a lack of PA causing the overweight or obesity. Nevertheless, this same study found that children who lowered their BMI over time had the same fitness levels as children who had consistently lower BMIs, indicating the importance of increasing PA and fitness for youth with higher BMIs. Although the relationship between physical inactivity and obesity is uncertain, it is widely accepted and established that increasing PA is an effective treatment for weight loss (Department of Health, 2004).

The determinants of PA among youth are multifactorial and causal relationships are often difficult to identify (Mattocks, Ness, Deere, Tilling, & Leary, 2008; Tou & Wade, 2002). A review of primarily cross-sectional studies by Sallis, Prochaska and Taylor (2000) identified a number of determinants of PA in children and adolescents including demographic and biological determinants, psychological, cognitive and emotional determinants, behavioural attributes, social and cultural factors, as well as physical environmental factors. Variables that were found to have a consistently positive association with PA among children were the following: male sex; parent overweight; PA preference; intention to undertake PA; previous PA; healthy diet;

programs and facility access; and time spent outdoors. Perceived barriers to PA (unspecified) were negatively correlated with PA among children. One prospective cohort study found that maternal PA during pregnancy and parental PA when the child was 21 months old was associated with PA levels among their children later in life, at ages 11 to 12 years (Mattocks et al., 2008).

As the Canadian population becomes less fit at all ages, they are gaining less benefit from the health outcomes accrued by PA. As children become less fit and more overweight, a worrying trend toward an unhealthy and unfit population begins to emerge. This calls for increased attention into the promoters of, as well as the barriers to PA among youth. As mentioned above, it has been consistently demonstrated that time spent outdoors and access to PA facilities are positively associated with PA among children. This being so, it is still not clear what particular aspects of outdoor spaces are most or least attractive for youth. To begin to address this problem from a public health perspective, the determinants of PA among youth must be better understood. One way to begin to approach this problem is to characterize aspects of the built environment in which youth are most likely to be physically active so that later studies may assess whether specific characteristics could be amenable to interventions designed to promote PA in this population.

The benefits that public parks may provide for increasing physical activity among youth are still poorly understood (Bedimo-Rung et al., 2005; Cohen et al., 2010; Kaczynski & Henderson, 2007) and the relationship has traditionally been measured in terms of geographic distance to parks via cross-sectional studies (Giles-Corti et al., 2005; Kaczynski & Henderson, 2007). Characteristics of the parks themselves are likely an important determinant of park use, yet they are only beginning to be described (Bedimo-Rung et al., 2005; Giles-Corti et al., 2005; Rung, Mowen, Broyles, & Gustat, 2011; Saelens et al., 2006). In addition, few studies have directly assessed physical features of parks important for PA (Cohen et al., 2010; McCormack, Rock, Toohey, & Hignell, 2010; Rung et al., 2011; Shores & West, 2008), with even less among youth. Given the potential health risks accrued by long-term obesity, children at risk for obesity and the built environment opportunities for PA in their surroundings deserves particular attention.

Objectives

Prior to understanding the relationship between park characteristics and PA, however, parks characteristics require further exploration, in particular as they appeal to youth. The objectives of this Master's thesis are the following: 1) to assess the reliability of a youth-oriented direct-observation park assessment tool; 2) to identify the park domains captured by the audit tool in an exploratory manner, based on an operationalization of the Bedimo-Rung conceptual model of parks and PA (Bedimo-Rung et al., 2005), and; 3) to identify if there are types of parks that emerge based on the park domains and a cluster analysis.

The guiding research question is: Can distinct types of parks be identified using the Bedimo-Rung conceptual model of park characteristics and PA and if so, what defining features emerge that best describe the parks based on their characteristics?

This methodological work is being conducted in order to facilitate the operationalization of park characteristics to be used in future studies assessing the association between parks and PA among youth from the Quebec Adipose and Lifestyle Investigation in Youth (QUALITY) Cohort.

CHAPTER 1: LITERATURE REVIEW

The literature review will cover two main topics: (i) the state of the evidence regarding the built environment, parks and physical activity with a focus on youth, and (ii) a review of direct-observation park audit tools. A final sub-section will review a published conceptual model of park characteristics and physical activity that is subsequently used in the present study (Bedimo-Rung et al., 2005). The search strategy involved two primary approaches: an electronic database search as well as mining the bibliographies of selected articles for additional literature. Electronic search terms used were the following, in various combinations: public open spaces, parks, youth, physical activity, built environment, direct observation, evaluation, audit tools, obesity, and health outcomes. The databases Medline (Ovid), PubMed and PsychINFO were used. Searches were limited to peer-reviewed articles and there was no limit to the years of publication included, however the majority of articles found were published in the last 10 years.

1.1. Relationships Between the Built Environment and Physical Activity Among Youth

As outlined in the introduction, the determinants of youth PA are complex and multifactorial. One aspect of these determinants, the built environment (BE), is being recognized as an important focus in efforts to increase PA. For example, a position paper from the Committee on Environmental Health (2009) declared that neighbourhoods and communities can provide opportunities to help reduce overweight among youth by focusing on or developing parks and open spaces. A growing body of literature on various facets of the BE and PA among youth is helping to provide a more detailed picture of the relationship between these factors. Organized programmes in parks and recreation centres may be an important facilitator for PA among youth and park users (Cohen et al., 2009; Cohen et al., 2010; Moody et al., 2004), and perception of easy access to parks is associated with greater activity among youth than those who perceive parks as inaccessible (Timperio, Crawford, Telford, & Salmon, 2004), evidence that supports the rationale behind continued research on the relationships between parks, park characteristics, and physical activity among this vulnerable population. One study, in which PA was prescribed to children as an intervention, found a positive relationship between PA and living near a large community park (43 hectares) as opposed to children from the same intervention study who did not live near a park (Epstein et al., 2006). In another study, healthy weight status among children, which may be an indicator of adequate levels of PA, was not found to be associated with any of the three park proximity measures assessed: number of parks within 1000 m of home, total area of parkland within 1000 m, and distance to the closest park from home. However, PA was associated with a specific park feature, notably the availability of a park playground within 1000 m of home (Potwarka, Kaczynski, & Flack, 2008), suggesting that popular measures of park access, specifically proximity and number of parks, may be too crude to capture relevant determinants of park-related PA among youth. For adolescents, the importance of access to a safe park for regular PA may be moderated by the level of urbanicity (Babey, Hastert, Yu, & Brown, 2008), with access to safe parks being important for PA among adolescents in urban but not rural areas.

McCormack and colleagues (2010) conducted a review of qualitative research studies that examined the characteristics of urban parks that are associated with park use and physical activity. Data were primarily gathered using semi-structured interviews with individuals or in focus groups among frequent park users. Overall, features that were found to be attractive for PA among youth in parks were areas or installations that supported active and passive recreational activities, playgrounds and trees, as well as amenities such as barbeques, seating, water fountains, picnic tables and toilets. The presence of shade and appropriate placement of shade-providing devices were also important. Those aspects that negatively affected park use were play structures that were age-inappropriate or not mentally or physically stimulating. Cleanliness and characteristics of playing surfaces were found to be important among youth as well as aesthetics and a sense of enjoyment of fresh air. In terms of aesthetics, graffiti and vandalism were found to discourage park use. For younger children, the presence of older children and teenagers was a safety concern, as well lighting features, the presence of law-enforcement, surveillance, secluded paths and areas, and the presence of homeless people and drug users/dealers. For girls, who tend to use parks and recreation centres less, and tend to be less physically active than boys (Moody et al., 2004; Sallis et al., 2000), a social component of parks was mentioned as being attractive – that is, parks are attractive for girls because they are able to meet their friends away from adults. Indeed, Rodríguez, Cho, Evenson et al. (2011) found that the odds of higher physical activity intensity among adolescent girls were greater in places with parks, schools, and high population density during weekdays.

Finally, an innovative study correlated children's drawings of their home and neighbourhood environments with objectively measured PA of those same children (Hume, Salmon, & Ball, 2005). The researchers asked the children to draw places and things in their neighbourhoods and homes that were important to them, and the terms "home" and "environment" were defined for the children. This study found that boys who drew sedentary opportunities at home (including a television in his bedroom) did more MVPA than boys who did not. On the other hand, girls who drew a dog at home did more moderate intensity activity than girls who did not. Also among girls, low intensity PA was positively associated with PA opportunities in the neighbourhood. These results suggest that the neighbourhood environment may be more important than the home environment for PA opportunities among children.

1.2. Public Parks as a Population Health Approach to Increasing Physical Activity Among Youth

Regular PA is part of an overall healthy lifestyle that helps to reduce morbidity and mortality by decreasing risk of excess weight, heart disease, and diabetes (U.S. Department of Health and Human Services, 1996), among other health benefits. Population health approaches to increasing PA include upstream strategies such as a focus on modifiable aspects of the BE. Public parks have the potential to facilitate or hinder behaviours that are known to affect weight status (Centers for Disease Control and Prevention, 2001; Committee on Environmental Health, 2009) and represent potentially modifiable aspects of the BE. As well, parks are a popular setting for PA among youth (McCormack et al., 2010; Rehrer et al., 2011). Parks are an interesting aspect of the BE for study because they are semi-permanent and are known to be accessible across a range of socioeconomic (SES) status neighbourhoods in Montreal, Quebec (Apparicio, Cloutier, Séguin, & Ades, 2010) with usually low to no user fees. In addition, as will be outlined in the following section, natural experiments looking at community and PA impacts from park improvements demonstrate that public parks are a promising area in the BE for interventions to promote PA at the population level, and point to useful aspects of parks on which to intervene. Unlike some more 'permanent' aspects of the BE, such as street connectivity, public parks are more malleable BE spaces because park installations, amenities, and greenery can be modified or added to with little impact on surrounding homes or businesses.

1.3. Natural Experiments: Results on Park Improvements to Increase Physical Activity

A small but growing number of researchers have taken advantage of publicly funded park interventions to conduct natural experiments. Most of them have demonstrated that improvements to park characteristics, such as the installation of Fitness Zones (Cohen, Marsh, Williamson, Golinelli, & McKenzie, 2012), a levelling of playfields with artificial turf (Tester & Baker, 2009) and adding a range of amenities and activity areas, such as a walking track, to an open space with no installations (Veitch et al., 2012) can increase MVPA among park users. One of these studies (Cohen et al., 2012) demonstrated that park improvements are a cost-effective intervention when considering dollars spent per metabolic equivalent of task (MET) gained at the population level. On the other hand, a natural experiment in which mostly gymnasiums were built or renovated in urban parks, showed decreases in MVPA (Cohen et al., 2009), however there were also decreases in the comparison parks, suggesting that recent cuts to park programming may have resulted in a reduction in park activity. These studies provide useful information on the impact that park interventions can have on PA among youth at a population level, as well as on the potential cost-effectiveness of such interventions.

1.4. Parks, Physical Activity and Health

Although an understanding of the relationships between parks and PA is developing, the literature remains sparse in objectively measured intra-park characteristics, in particular those that are appealing specifically to youth. The parks and PA literature has thus far mostly concentrated on the presence or accessibility of parks and PA. Kaczynski and Henderson (2007) reviewed 50 quantitative studies that looked at the presence of parks and recreation facilities with PA as an outcome. Although the results were mixed, there was a generally positive tendency for access to parks to be associated with PA. Only eight of the fifty studies had youth as a study population. Among these studies, a number of conflicting relationships emerged. The perception of and actual number of neighbourhood recreational facilities were inversely and significantly correlated to family levels of PA. Distance to the nearest play area was found to be associated with outdoor PA in boys but not girls, and some found no relationship between proximity to parks and time spent in sedentary activities, whereas others found that odds of walking or cycling for 10-12 year olds was lower among youth who did not live near a park.

Coen and Ross (2006) directly observed 28 parks in low, moderate, and high health status neighbourhoods in Montreal, identified by three health indicators (i) life expectancy for men at birth, 1994–1998, (ii) lung cancer incidence rate, 1994–1998, and (iii) ischemic heart disease mortality rate, 1994–1998. Using a single-rater checklist, park characteristics were observed and then compared with aggregated health data from these same neighbourhoods. Results indicated that in general, parks found in lower health status neighbourhoods had material disadvantages (incivilities, limited facilities for PA, next to high traffic zones) that were less apparent in moderate and high health status neighbourhoods. However, there was intra-neighbourhood and intra-park variation in the quality of park characteristics observed. This study provides a novel way of assessing park characteristics as a dependent variable of neighbourhood health status indicators. However, as only one rater used the evaluation tool at one time point, reliability estimates of the measure could not be assessed. In addition, the study was cross-sectional and ecological in nature, making any attempts at establishing causality between poor neighbourhood health outcomes and park characteristics untenable. Finally, it is unclear if the park observer was blinded to the health status of the neighbourhood in which the park was situated. If not, the results may have been biased toward an association when there was none.

Shores and West (2008) observed park visitation patterns and park characteristics in four parks using the System for Observing Play and Recreation in Communities (SOPARC) direct observation tool (McKenzie, Cohen, Sehgal, Williamson, &

Golinelli, 2006). They found that across all four parks, the children were the most vigorously active age group, engaged in a range of activities such as climbing on play structures, playing jumping games, and playing tennis. Overall, park visitors were most active in areas with playgrounds and courts and least active in areas with shade, while moderate-intensity PA was mostly practiced on sports fields and paths. Although the number of parks observed was low (n=8), and the design was cross-sectional, this study is among the first to look at intra-park characteristics and their relationships to PA among park users.

In another cross-sectional study, Cohen et al. (2010) explored social and physical characteristics associated with park use across 30 parks in southern California. Variables included park size, number and type of park amenities and events and programs available in the parks. Data were collected through surveys of park directors, direct observation using the SOPARC and surveys of park users and residents living near the parks. Despite the wide net cast, investigators correlated very little variation in park use with the factors under study. For example, contrary to expectation, they found no correlation between perceived safety of parks and park use, even among parks that were considered very safe. The strongest correlation of park use was park size and number of organized activities offered in the park, suggesting that social programming and park size may be an important draw for physical activity among park users over and above amenities or perceived safety.

Rung and colleagues (Rung et al., 2011) also pursued the question of which intra-park characteristics promote PA with a focus on basketball courts, sports fields, green spaces and playgrounds across 37 parks in New Orleans. Data on the quality of the sports installations were collected in a cross-sectional design using the Bedimo-Rung Assessment Tool – Direct Observation (BRAT-DO) (Bedimo-Rung, Gustat, Tompkins, Rice, & Thomson, 2006), and physical activity was assessed using the SOPARC. Using multilevel analyses with the observation of a particular park target area in that moment in time as the unit of analysis (rather than the individuals observed in the park, as would be done using the SOPARC), they found that basketball courts had the highest mean number of park users followed by sports fields, playgrounds and then green spaces. On the other hand, playgrounds were found to have the highest mean energy expenditure per user, followed by basketball courts, green spaces and then sports fields. Finally, basketball courts had the highest total amount of energy expenditure per user, with playgrounds, sports fields and greens spaces trailing far below. The condition of the activity areas was not found to be significantly associated with presence of park users. However, it was associated with number of park users per park and total energy expenditure per park user. They also found an inverse relationship between condition of green space and number of users. However, a poor quality green space may simply indicate that, as a popular spot for PA, the grass does not get a chance to grow back between uses. It must also be noted that the authors found that PA-supporting amenities such as drinking fountains and benches were associated with presence of park users after controlling for type and condition of activity area. Not surprisingly, drinking fountains were associated with high total energy expenditure per user while benches and picnic tables were associated with low energy expenditure per user. Like the Shores and West (2008) article described above, this is among the first known studies to assess the relationships between intra-park characteristics and their quality with PA. Although it is cross-sectional in design, the methods used for this study provide support for the notion that park features can promote PA in different ways and may help future work in this area.

The relationship between park characteristics, accessibility, and PA is only beginning to be understood (Bedimo-Rung et al., 2005; Cohen et al., 2010; Giles-Corti et al., 2005; Kaczynski & Henderson, 2007; McCormack et al., 2010; Rung et al., 2011). Although parks have been shown to be associated with PA, there remains only a small body of literature that assesses *intra-park* characteristics and opportunities for PA. Kaczynski and Henderson's (2007) systematic review found that the majority of quantitative studies assessing parks and PA only addressed parks in terms of access as measured in distance, providing little insight as to why the parks are used. In addition, the cross-sectional nature of most of the studies assessed does not allow for inference into causality. Of the studies that did assess parks characteristics and PA (Coen & Ross, 2006; Cohen et al., 2010; McCormack et al., 2010; Rung et al., 2011; Shores & West, 2008), perceived safety was found to be associated with park use in one study (McCormack et al., 2010), while elsewhere it was not (Cohen et al., 2010). In other cases, (Coen & Ross, 2006) the reliability of observed park characteristics were questionable due to poor inter-rater reliability. One study found associations between basketball courts and play areas and PA (Rung et al., 2011). Others reviewed only a small number of parks (n=4) (Shores & West, 2008), making the generalizability of findings unclear.

1.5. A Review of Direct-Observation Park Audit Tools

Although research is now beginning to scratch the surface of associations between intra-park characteristics and physical activity, the literature on parks and PA is still largely limited to park proximity, driving the need for direct-observation park assessment tools that can capture variation in park characteristics that may be associated with PA. In recent years, a handful of direct-observation intra-park characteristic audit tools have been created to help better understand the park variables that are associated with their use. The following is a review of these tools. Table 1-I (p.32) provides a summary of the tools reviewed here.

The Public Open Space Tool (POST) (Broomhall, Giles-Corti, & Lange, 2004; Giles-Corti et al., 2005) was developed by Broomhall, Giles-Corti and Lange and based on a literature review and focus group meetings with park users, with content validity assessed by an expert panel (Giles-Corti et al., 2005). It was created to collect data on four domains of public open spaces from the public health discipline: activities, environmental quality, amenities and safety. The tool contains 49 items and was tested on 516 parks in Perth, Australia. Inter-rater reliability per item was assessed using the kappa statistic, which was overall good and ranged from 0.6 – 1.0. The development and testing of the observation tool however, are only very generally described. For example, although the results of the reliability estimates were generally good, the tool development, data collection methods and estimation of reliability have not been published in a peer-reviewed journal.

Cavnar et al. (2004) developed an objective tool to assess the condition, safety and maintenance of amenities found in public recreation facilities, including parks, based on a literature review of evaluation tools and established industry standards for the evaluation of recreation facilities, as well as on recreation professionals' expertise and accepted professional standards for evaluation. The 61-item tool was developed specifically for facilities in a medium-sized county in the south-eastern region of the United States. The tool was tested among 27 parks. Inter-rater reliability of the tool's items was estimated using the kappa statistic, with a final overall kappa of 0.8 Although the tool could be used to assess areas of parks specifically used by youth, it was developed to help parks and recreation managers assess the quality of facilities for a wide range of park users. Finally, the tool does not assess the size or safety of adjacent streets or the neighbourhood context, which may be an important indicator of park access.

The Physical Activity Resource Assessment (PARA) instrument (Lee, Booth, Reese-Smith, Regan, & Howard, 2005) was developed to assess publicly available PA resources including quality and features of characteristics in parks, churches, schools, and fitness centers. The 34-item tool was developed and tested among 17 neighbourhoods in Kansas City by trained field coders. The tool collects information on the presence and quality of features for PA (e.g. team sports installations such as baseball field) as well as amenities (e.g. benches), and incivilities such as broken glass, or sex paraphernalia. Reliability of the tool is only generally described, using a 10% observation overlap with overall good reliability (rs >0.77). This is a simple yet comprehensive tool; however it lacks assessment of the qualitative aspects of surrounding streets. In addition, some of the items may be too subjective or difficult to identify in some contexts, such as "Evidence of alcohol use".

Table 1-I. Summary of Direct-Observation Park Tools Reviewed

Tool Name	**Author**	**Date**	**Total No. of Items**	**No. of Test Parks Audited**	**Reliability Assessment**	**Reliability Results**
Recreation Facilities Assessment Tool	Cavnar et al.	2004	61	27	Kappa	0.80
Public Open Space Tool (POST)	Broomhall et al.	2005	49	516	Kappa	0.6 - 1.0
Physical Activity Resource Assessment instrument (PARA)	Lee et al.	2005	34	22	10% overlap	rs > 0.77
Bedimo-Rung Assessment Tool - Direct Observation (BRAT-DO)	Bedimo-Rung et al.	2006	181	2	Percent agreement	≥ 78%
System for Observing Play and Recreation in Communities (SOPARC)	McKenzie et al.	2006	Based on number of people in target area	8	Percent agreement Correlation coefficient between observers on number of area participants	≥ 80% 0.99
Environmental Assessment of Public Recreation Spaces (EARPS)	Saelens et al.	2006	646	225	Kappa Intraclass correlation coefficients (ICC) or percent agreement	65.6% of 506 items were either kappa/ICC ≥ 0.60 or ≥ 75% agreement

Path Environment Audit Tool (PEAT)	Torped et al.	2006	40	6	Kappa (15 of 16 primary amenity items)	≥ 0.49
					Kappa (7 binary items)	0.19 - 0.71
					ICC (3 of 5 ordinal items)	≥ 0.49
					Percent agreement	≥ 81%
Children's Public Open Space Tool (C-POST)	Crawford et al.	2008	27	19	Inter and intra-rater reliability	not reported
Community Park Audit Tool (CPAT)	Kaczynski et al.	2012	140	59	Kappa	≥ 0.40 for all but 8 of 56 items where kappa could be calculated
					Percent agreement	> 0.70 for all but 4 items

Recognizing the potential of public parks for PA, researchers have begun to develop park measurement tools to capture park features or characteristics that may promote PA. The Environmental Assessment of Public Recreation Spaces (EARPS) (Saelens et al., 2006) is a direct-observation tool based on interviews with park and recreation professionals and frequent park users in the Greater Cincinnati area. The 646-item tool underwent two iterations of testing with observer pairs. The authors demonstrated good reliability of the items in the final tool, in particular among objective items. 65.6% of 506 items had either a kappa or Intraclass correlation coefficient (ICC) of ≥ 0.60, or ≥ 75% agreement. Nevertheless, a weakness of the tool is that it was based entirely on park users and professionals' opinions of parks, and not on park design literature or any conceptual model of hypothesized relationships between park features and PA. This may introduce considerable bias into the tool items related to regional attitudes and behaviours, given that interviews were conducted among individuals from the same region as where the parks were evaluated. In addition, the observation tool does not capture features of the neighbourhood context, notably related to adjacent streets, which may be particularly important for youth access.

Introduced earlier, the SOPARC (McKenzie et al., 2006) is a tool created to examine physical activity within community parks, with the aim of capturing the intensity of PA that occurs in different areas of parks. The tool is innovative because it links PA levels to specific areas or features of parks such as activity occurring on a track or basketball court. As such, the tool does not contain a specific number of items, but is based on the number of individuals seen in a target area during observation. Observations are conducted by independent pairs, and agreement between observers was shown to be high with ≥ 80% agreement and a correlation coefficient of 0.99 between observers on the number of participants in a target area. However, the tool development is only generally described and does not appear to be developed based on a theory or conceptual model. As its aim is to capture physical activity occurring in parks, rather than the characteristics of a park that may be amenable to PA, the tool may not be accurately measuring parks for PA, and it is unclear if the tool assesses park context features such as public transportation access or street traffic on adjacent roads. Other limitations include a possible overestimation of the tool's reported reliability. Finally, the tool may not be generalizable to parks with smaller areas as it was only tested in very large parks (mean = 7.8 acres).

The Path Environment Audit Tool (PEAT) (Troped et al., 2006) was created to evaluate how trail characteristics may influence their use. Although the 40-item tool was not developed to evaluate parks directly, trails are often found in parks and there are items on the PEAT that audit environmental characteristics found in parks such as exercise or play equipment and drinking fountains. The inter-rater reliability of items was provided, and was low for several items. For 15 of 16 primary amenities items, kappa was ≥ 0.49, for 7 binary items kappa was between 0.19 and 0.71, for three of five ordinal items, ICC was ≥ 0.49 and percent agreement was overall ≥ 81%. Some of the low reliability results may be due to the very small number of trails evaluated (n=6); there may not have been enough variation in the trails for items to produce stable results. In addition, attributes evaluated for the trails were based heavily on the opinion of trail users; consequently, the tool likely does not adequately capture items that represent barriers to trail use.

The Bedimo-Rung Assessment Tool – Direct Observation (BRAT-DO) (Bedimo-Rung et al., 2006) was developed based on a conceptual model (Bedimo-Rung et al., 2005) of park characteristics and physical activity by the same group of authors, Bedimo-Rung and colleagues. Sub-categories from five of the six domains in the conceptual model are assessed using this 181-item tool (features, condition, access, aesthetics, and safety). There are a number of limitations regarding the reported reliability estimations of this tool, however. The tool was tested in two large parks, by fifteen pairs of observers. The parks were divided into 'target areas' that were evaluated, and no single pair of observers rated more than two target areas for the study, providing too small an *N* for calculation of Cohen's kappa (Bedimo-Rung et al., 2006). Reliability estimates were therefore calculated using percent-agreement between raters (≥ 78% for all items on the tool) which may artificially inflate results because chance agreement is not considered. In addition, the very small number of parks evaluated may also make the reliability results unstable. Nevertheless, the tool is one of the few that contain items on park context such as traffic on adjacent streets, as well as neighbourhood attributes. It is also one of the few tools to attempt to capture the quality of park PA installations.

The Children's Public Open Space Tool (C-POST) was developed to assess features of parks that are hypothetically important for their influence children's PA (Crawford et al., 2008) among neighbourhoods with differing SES. Development of the 27-item tool is only very generally described. Ten auditors tested the tool in 19 parks in Melbourne, Australia on two occasions, which generated adequate reliability using either analysis of variance with Scheffe post-hoc tests for continuous variables or Pearson's χ^2 for categorical variables, however results were not reported. The C-POST assessed the presence of recreational facilities, availability of amenities and number of playgrounds as well as number of other features such as paths, lighting, water features, signage and trees.

Kaczynski and colleagues developed a 140-item park audit tool for use among non-academic community stakeholders that was somewhat focused on park characteristics important for youth (Kaczynski, Wilhelm, & Besenyi, 2012). Development of the tool included a review of existing tools and community stakeholder workshops in which 32 adults and two teenagers participated. The

Community Park Audit Tool (CPAT) was developed and tested in 66 parks by the same community stakeholders involved in the development of the tool, which may have biased reliability results, all in Kansas City, USA. The CPAT demonstrated relatively high inter-rater reliability (≥0.40 for all but 8 of 56 items where kappa could be calculated) and good percent agreement (>0.70% for all but 4 items). Follow-up surveys among the stakeholders involved indicated that use of the tool helped to raise awareness of parks for PA.

The observation tools reviewed above have all been developed within a specific geographic context and resulting tool items reflect the particular context in which they were developed. For example, there is a strong emphasis on beach and water-front areas in the POST (Broomhall et al., 2004), which was developed in Perth, Australia. It remains to be seen whether item reliability is similar in a different environmental context, making it important to both re-assess the reliability of items if they were developed in one context and then later used in a different one, and to move toward comparisons of the reliability of the same items tested in different contexts so that the estimated reliability of an item can begin to be generalized to different contexts. None of the above studies have attempted to do so.

All the tools mentioned above use on-site observation. Advances in technology are providing remote access to built environment evaluation and one such tool, an adaptation of the POST (Broomhall et al., 2004), was created to assess parks using Google Earth (Taylor et al., 2011). The authors estimated its reliability by correlating responses with those of the direct observation POST, which were highly and significantly correlated. In addition, there was a dramatic decrease in evaluation time using this tool. A caveat, however, is that Google Earth currently cannot provide its 'street view' function in areas where there are no streets, making identification of some features located far from the street or obstructed from view almost impossible to assess using this method. In addition, the presence of trees may hide some park details, such as paths. Finally, Google Earth images may be out of date. Given the difficulty of evaluating more nuanced aspects of park features such as their condition, or smaller or covered park features such as drinking fountains, paths and park benches using Google Earth, direct observation remains the method of choice for observing a wide range of park features and their condition.

1.6. Conceptualizing Park Domains and Their Relationships to Physical Activity

As outlined above, the majority of the park characteristic audit tools were developed using a combination of literature reviews, expert interviews and park user interviews and feedback. Only one park tool, the BRAT-DO, was developed based on the authors' own previously published conceptual model of park characteristics that are hypothetically associated with physical activity (Bedimo-Rung et al., 2005). The Bedimo-Rung conceptual model (Figure 1.1, p.39) posits that in order to adequately assess the park characteristics that may be associated with PA, four geographic areas should be considered: activity areas, supporting areas within the park, the overall park and the surrounding areas of the park. As described in the model, the activity areas are the sections, zones or opportunity areas in a park that are designed or commonly used for physical activity such as trails, courts, or sports fields.

Supporting areas are the facilities and equipment that make PA attractive and safe for a variety of users. Supporting areas may not be used to directly engage in PA, but are nevertheless important to the park visitation experience, such as picnic areas, parking lots and water fountains, and they support PA in parks. The overall park environment refers to the general impression a park gives, such as aesthetic appeal, size and diversity of activities. The surrounding neighbourhood includes level of traffic, crime and resident demographics. Six conceptual areas are included in the model and are the basis for operationalizing measures to assess the relationship between park characteristics and PA. These are: Features, Condition, Access, Aesthetics, Safety and Policies.

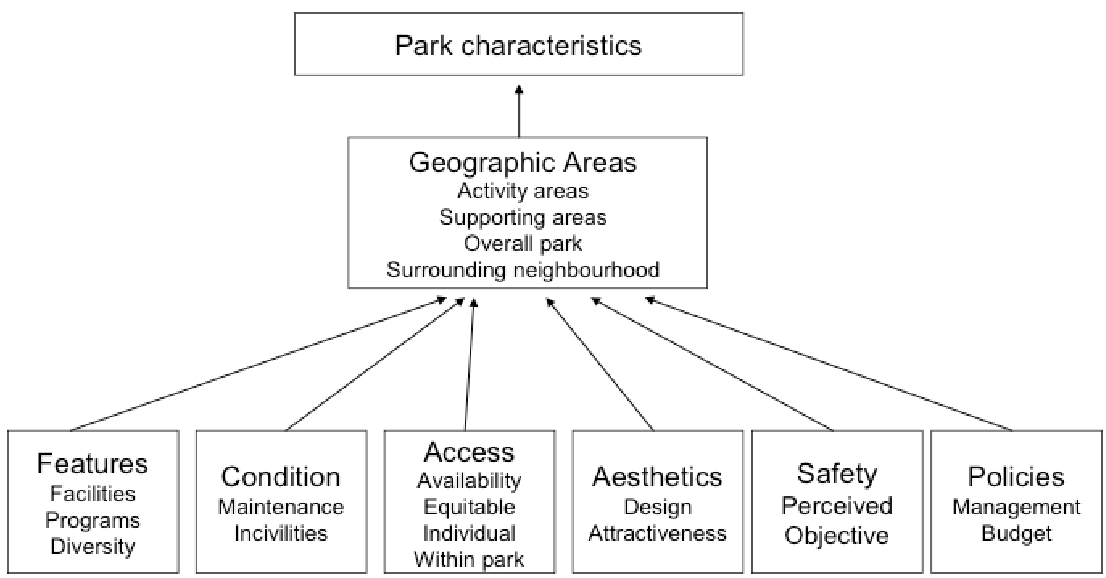


Figure 1.1. A reproduction of the Bedimo-Rung et al. conceptual model of park domains hypothetically associated with physical activity (Bedimo-Rung et al., 2005).

According to the conceptual model, each of the six conceptual areas represents the type of data that should be collected; however because some areas may overlap in their scope, specific items may contribute to more than one conceptual area.

The Bedimo-Rung conceptual model is now well established in the parks and physical activity literature. It provides a solid framework from which to think about the ways in which conceptual areas of parks, or park domains, may be related to physical activity, and facilitates the testing of relationships to this effect. Nevertheless, the notion that parks have overlapping but distinct, conceptual domains has never been empirically explored. That is, can conceptual domains characterize parks, and if so, does the Bedimo-Rung conceptual model adequately describe park conceptual domains? Are the audit tools being used to assess parks adequately capturing the domains they attempt to assess? A better understanding of what park domains are being captured with the tools used to audit them is foundational methodological work in the field of parks and PA that has thus far not been undertaken.

CHAPTER 2: STUDY CONTEXT AND METHODS

This section presents the overarching study context, the methods used for tool development and data gathering, as well as the statistical analyses applied. It also contains a section that summarizes the work specifically carried out by the student. A flow chart (Figure 2.2, p. 51) provides a visual summary of the sequence of steps undertaken in this study.

2.1. Study Context: The Quebec Adipose and Lifestyle Investigation in Youth (QUALITY) Cohort Study and the Residential Study

The parks included in this study were located near the homes of participants from the Quebec Adipose and Lifestyle Investigation in Youth (QUALITY) Cohort, an ongoing longitudinal investigation of the natural history of obesity and cardiovascular risk among youth. Subjects were considered to be at high risk for obesity because one or both biological parents were required to be obese (based on standard definitions of BMI and waist circumference) in order to participate. In addition to parental obesity, inclusion criteria required both biological parents to be available to participate in the baseline assessment and participating children to be Caucasian and aged 8–10 years at recruitment. Only Caucasian families were recruited to reduce genetic admixture. Of eligible families, a total of 630 families (one child and two biological parents) completed the baseline visit between September 2005 and December 2008. Study participants were recruited through flyers addressed to parents that were distributed to children in grades 2 to 5, in 1040 primary schools located within 75 km of each of Montreal, Quebec City, and

Sherbrooke (QC, Canada). 89 per cent of schools were approached, from which 3350 interested families contacted the research coordinator, and 1320 met the study inclusion criteria. The built environments around the homes of the families (n=512 homes) in the Montreal Census Metropolitan Area (MCMA) were audited, including park evaluations. Baseline data collection involved a clinic visit during which questionnaires were completed and biological and physiological measurements obtained. Detailed information about the cohort can be found in Lambert et al. (2011). Written informed consent was obtained from the parents, and assent was provided by the children. The Ethics Review Boards of CHU Sainte-Justine and Laval University approved the study. A detailed description of the cohort is available in Appendix I.

The Residential Study is an adjunct to the QUALITY study, the aim of which is to identify features of residential neighbourhoods that contribute to the development and maintenance of overweight/obesity in pre-adolescent youth. The Residential Study allows the possibility to determine to what extent the BE or neighbourhood features might play a role in the incidence, maintenance and change in adiposity and antecedent behaviours, including PA, active commuting, sedentary pursuits, and dietary behaviours among this at risk population.

The Residential Study uses the Neighbourhood Institutional Resource model (Leventhal & Brooks-Gunn, 2000), in part as a theoretical foundation. This model suggests that neighbourhood resources, including infrastructures, facilities, amenities, and collective resources such as parks and community centers, may affect children's health development via their availability, accessibility, affordability, and quality (Leventhal & Brooks-Gunn, 2000). In addition, the Residential Study investigates the relationship between the built environment and obesity within a social ecological perspective of behaviour (McLeroy, Bibeau, Steckler, & Glanz, 1988). This perspective posits that conditions under which features of the built environment influence overweight/obesity and related behaviours depend on predisposing individual, familial, and social characteristics or conditions. In this way, it is expected that children's behavioural and biological responses to the factors in their BE will vary according to social influences linked to family, peers, and schools.

2.2. Sources of Data for the Residential Study

Data were collected for the Residential Study from three primary sources: (i) child and parent perceptions of neighbourhood attributes (included in the QUALITY study questionnaires); (ii) a geocoded database: the MEGAPHONE (Montreal Epidemiological and Geographical Analysis of Population Health Outcomes and Neighbourhood Effects), which integrates spatial information for the entire MCMA including habitation and land use; presence of parks and other public open spaces; residential density; urban infrastructures; private businesses and services geocoded at the address and six-digit postal code level, school locations, and complete 2006 Census data, and; (iii) direct observation of the participant's neighbourhood, including a detailed audit of the 10 nearest street segments, a 'walk through' of all segments within the 500 m walking network, and audits of the three closest parks to each resident, details of which are discussed below.

2.3. Study Contributions Made By The Author

The author of this Master's thesis, made several contributions to this study, such as:

- Conceptualization of the research question and analysis;
- All cleaning of the data;
- Calculation of the area of all newly identified parks and re-calculation of the area of parks that were found on-site to be a different size than indicated on maps using ArcMap;
- The operationalization of the Bedimo-Rung conceptual model;
- All statistical analyses including park descriptions, reliability estimates, principal component analysis and cluster analysis;
- All interpretation of study results.

2.4. Parks Tool Development, Identification, Observer Training and Data Collection

2.4.1. Parks, Activities and Recreation among Kids (PARK) Tool Development

Park evaluation tools published until 2007 were identified and items were assessed for their reported reliability and applicability to measuring park characteristics as they pertain to youth, i.e. between 6 and 17 years, and physical activity. Efforts were made to draw items from existing tools that were specifically applicable for youth PA, e.g. installations for team sports, and that had reported reliability estimates. The study team endeavoured to balance selecting more nuanced items that would generate more detail about the intra-park characteristics, e.g. perceptions of safety and aesthetics, with efforts to reliably measure the intra-park characteristics between observers, e.g. presence or absence of a swimming pool. The BRAT-DO (Bedimo-Rung et al., 2006) and the POST (Broomhall et al., 2004) were retained as both contained items that had demonstrated reliability and were relevant for inclusion in a youth oriented park evaluation tool. The BRAT-DO, and the tool developed for this study, are based on the same conceptual model of parks and physical activity by Bedimo-Rung et al. (2005), facilitating analyses of specific park characteristics that may be associated with PA (Oakes, Mâsse, & Messer, 2009). The Bedimo-Rung conceptual model was selected because it is well established in the parks and PA literature and can be adapted to youth PA in parks.

In general, items on the presence of park installations and amenities were selected from the POST whereas items associated with access to, condition and restriction of installations were drawn from the BRAT-DO. A number of new items were developed (n=16), to assess features of parks that would likely appeal to or be relevant specifically to youth PA in parks but that were not present on the POST or BRAT-DO. These items include the presence of schoolyards, skate parks, play areas designed for children 6 years and older, water sprinklers, and general impression items such as overall safety and level of appeal for youth. See Appendix II for a table of the origins of the tool items. The tool underwent expert consensus and was piloted among a group of youth in their late teens and early twenties (n=12). All items went through numerous revisions by the research team prior to field-testing and were further revised during field-testing while observers were being trained.

The final result was a 92-item youth-oriented park and physical activity tool, the Parks, Activity, and Recreation among Kids or PARK tool. See Appendix III for the complete tool. The PARK tool was developed to assess five conceptual domains of parks that may be important for youth PA, based on the Bedimo-Rung conceptual model: 1) Activities (17 items and 39 sub-items); 2) Environmental Quality (9 items and 3 sub-items); 3) Services (10 items and 2 sub-items); 4) Safety (6 items), and; 5) General Impression (6 items). An example of an item that relates specifically to youth is, "Presence of a 6+ play area", which describes a play structure that is clearly designed for children 6 years and older such as those that have higher slides, do not have baby swings, and have a more challenging and/or higher structure. Some play areas also have signs at the entrance that indicate the intended target age of the play structure/area (e.g. "Only children between the ages of 2-5 may use this play area"). Another example of an item relating specifically to youth is, "Is the park appealing for youth?", which is a subjective item in which the observers were instructed to look at the park overall, and imagine if a 10 year-old would find it fun and interesting to play in.

2.4.2. Observer Training

Nine observers were recruited for data gathering, which was embedded in a larger neighbourhood assessment study around the homes of the QUALITY participants residing in the MCMA. Observer training occurred over a 9-day period beginning in May 2008. On the first day, observers were introduced to the purpose of the study and attended a presentation of the observation tool that contained photo illustrations of answers for each question. Observers were provided with the park observation tool training manual (Appendix IV) and requested to read it thoroughly prior to on-site evaluation. On training days 2 through 6, observers and trainers began running independent on-site test observations in various non-study parks in Montreal. Following each on-site training session, all observers met with the trainers in the park, and later at the research centre to compare answers. In cases of discordant answers, the group would return to the area of the park in question to identify what the “correct” answer should be, based on the trainer’s response which was considered the gold standard. Following each on-site training day, items on the PARK tool were revised and adjusted in efforts to improve clarity and inter-observer reliability. The most common change was a reduction in the response options from 4 or 3 to 3 or 2. For some items relating to park amenities, such as, “Condition of toilets” a response option “Impossible to determine”, in addition to “Good” and “Bad”, was added because some installations (e.g. public toilets) were impossible to assess qualitatively but nonetheless were visibly present.

During the iterative on-site observer training sessions, a pen-and-paper version of the tool was used to record answers. Following day 6 of training, the revised tool was sent to the co-investigators for finalization. On training day 7, the observers began to use a personal digital agenda (PDA) (Pocket PC iPaq 110) containing a programmed Microsoft Excel spreadsheet with a cell drop-down function to record answers using a stylus. Following the first training day using the PDAs, discordant answers were again discussed. This process was repeated with the PDAs for training days 8 and 9.

On day 10 (13 June 2008) observers began evaluating parks around the homes of the QUALITY participants. During the week of 16 June 2008, a reliability assessment took place in which all observer pairs assessed the same park and were unaware of the reliability check. Observer responses were compared to those of the trainers' gold standard responses (82.76% agreement). Observers formed pairs (Observer 1, or O_1, and Observer 2, or O_2) to evaluate parks but conducted observations independently. All 9 observers evaluated about 4.4 parks twice on different occasions for a total of 40 parks evaluated twice by the same observer, or about 7% of the sample.

2.4.3. Sampling Plan

Park identification was conducted using a two-stage process. First, a geographic information system (GIS) was used with land use information from CanMap (Digital Mapping Technologies, Inc., 2007) where a 'parks and open spaces' category was used to identify the three closest parks within a 500 m walking network buffer of the exact addresses of the youth participants in the QUALITY Cohort. See Appendix V for an example of a map showing a park within an identified 500 m walking buffer zone. Second, parks were identified on-site using a 'seek and assess' procedure where observers walked all the street segments in the 500 m buffer to identify possible missing parks that were not reported in the CanMap. If no parks were found within the 500 m zone, at least one park present within a 1000 m walking network buffer zone was evaluated. Parks identified in the CanMap had a unique identification number, and were indicated on maps provided to observers for use on the day of observation. When observers found a non-reported park, they would draw its spatial boundaries on the map provided and highlight the nearest intersection (Figure 2.1, p.49).

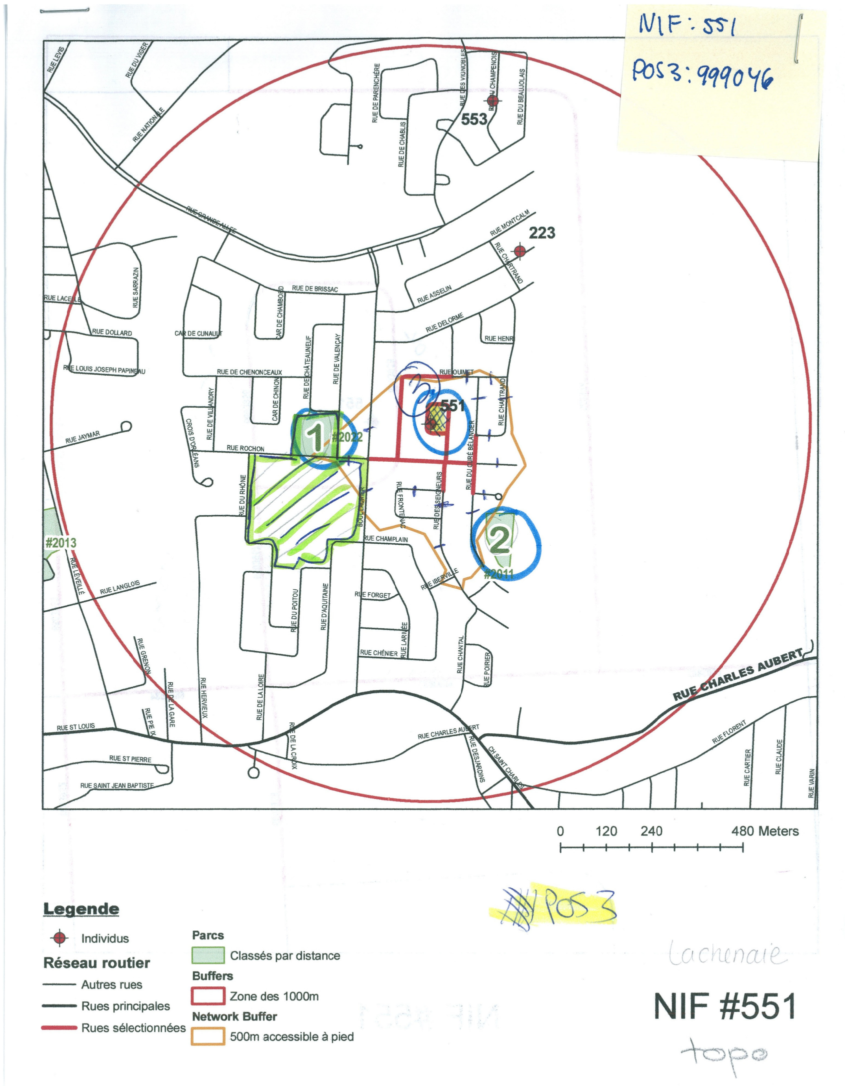


Figure 2.1. The found park, number 3, was drawn onto the map and a number 3 was circled beside it. This map shows that observers adjusted park boundaries to conform to the found park if it did not match that which was indicated on the map. The blank space is part of the image.

Observers assessed a total of 576 unique parks, 345 of which were pre-identified using CanMap (Digital Mapping Technologies, Inc., 2007) and 231 of which were identified on site. Data were directly imported into a database from the PDAs, thereby eliminating data entry errors. The parks were audited during clement weather between the hours of 8:00 and 17:00 in 2008 (76%), 2009 (21%), and 2010 (3%), between the months of June and December. No parks were evaluated when there was snow coverage on the ground.

2.4.4. Data Cleaning

Prior to using the data, it was cleaned. Data cleaning involved resolving discrepancies between some newly identified parks being mistakenly assigned the same identification number, and removal of duplicate parks in the data set.

2.4.5 PARK Tool Reliability Assessment

Before any subsequent analysis took place, the reliability of the items on the PARK Tool were estimated using both inter- and intra-rater reliability assessments. Inter-rater reliability was assessed by comparing the observations between independent observer pairs (O_1 and O_2). The statistical analyses used and results of the reliability assessment are described below. In addition, there were a number of items shared between the POST, which was assessed via inter-rater reliability in Perth, Australia, and the PARK Tool, assessed in Montreal, Canada. The opportunity was thus taken to conduct an initial and exploratory assessment into the generalizability of these shared items through a comparison of the inter-rater reliability results generated from both assessments. Results of this comparison are also presented below in the results section.

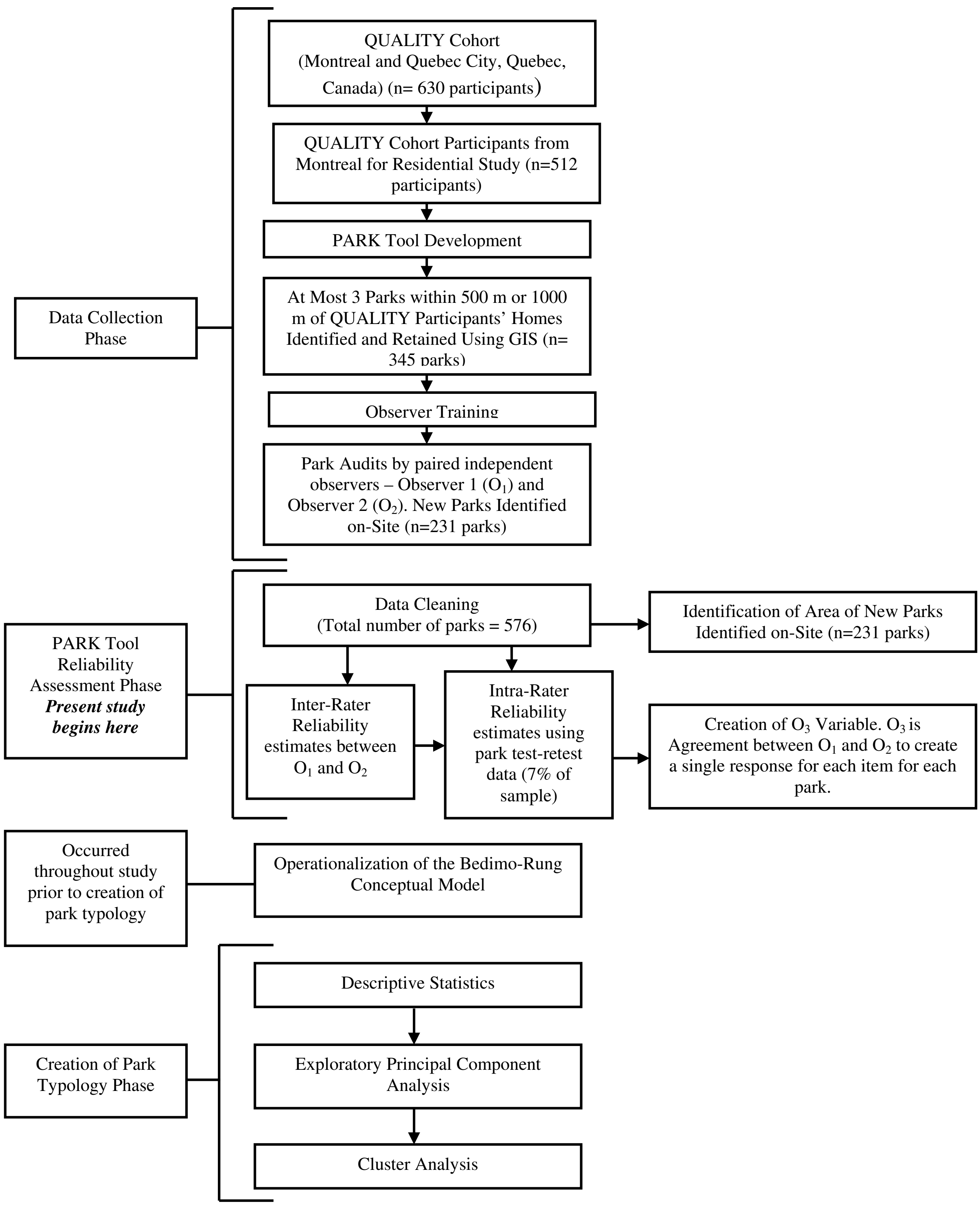


Figure 2.2. Flow chart of the four primary phases of the present study: data collection, tool reliability, operationalization of the Bedimo-Rung conceptual model,

and creation of the park typology. The methods for each phase are detailed in this section, the methods chapter.

2.4.6. Identifying Park Area for Newly Identified Parks

Almost half the parks in the dataset (n=231) were found on site by the observers, and no data on the area of these newly identified parks was available via CanMap. New parks were assigned unique identification numbers and their coordinates were verified using Google Earth. A student trained to calculate the area of parks using polygons in ArcMap (version 9.2, Environmental Systems Research Institute, Inc., Redlands, California) calculated the area of the parks (in m^2). The areas of all the newly identified parks were determined by the same individual (Madeleine Bird) to avoid systematic error between raters.

2.4.7. Identifying the O3 Variable For Subsequent Analysis

In order to conduct statistical analyses following the reliability assessment of the PARK Tool, one response variable per PARK Tool item was created based on agreement between observer 1 (O_1) and observer 2 (O_2) to create a third, O_3, variable. When there were discordant answers between O_1 and O_2, the O_3 variable was created using three hierarchical decision rules: (i) Answer based on a park re-evaluation (2.8% of O_3 data); (ii) Answer verified based on a Google Earth (version 6.2, Google, Santa Clara County, California) check of the park (1.1% of O_3 data), or; (iii) Answer selected at random (8.6% of O_3 data). All subsequent statistical analyses were then conducted using the O_3 variables. This step was taken in order to have one 'correct' answer per item per park.

2.5. Descriptive Statistics

Once the O_3 variable was established, the parks were described primarily by the frequency of installations within parks, the amenities, and the quality thereof (e.g. access, condition and restriction). Descriptive statistics were also computed for the three incivilities items (graffiti, litter, and vandalism), the items related to park safety (e.g. Is a house visible from the centre of the park?), as well as for the responses from the general impression items on the PARK tool (e.g. Is the park appealing for youth?). Details of the results from this step are discussed below in the results section, and can be found in Table 3-IV, p.71.

2.6. Methods for the Operationalization of the Conceptual Model

The PARK Tool was developed based on the Bedimo-Rung conceptual model of parks and physical activity, and then was adapted for operationalization with the Residential Study parks data. This was done by first isolating the definition of each sub-domain from the conceptual model (Bedimo-Rung et al., 2005) and then analyzing each for application to the current study. When a sub-domain was clearly not applicable to the current study, it was removed from the operationalization. For example, the park domain Features has three sub-domains: facilities, programs and diversity. To operationalize the Features domain, the sub-domains diversity (defined as the mix of park facilities, programs, users and location) and programs were removed because the study was geared towards physical audits and thus not designed to assess park programming. Then, to further operationalize each domain, some park concepts that were included in the PARK Tool, but not explicitly present in the Bedio-Rung model, were added. For example, keeping with the Features domain example, physical activity installations and activity areas sub-domains were added. Physical activity installations were added because they were explicitly measured as an important aspect of the facilities present in a park. In other words, the facilities sub-domain was further specified for the operationalization of the model. Activity areas was originally a sub-domain of the Geographic Areas domain in the model, however this domain was removed because the parks were not conceptualized as having separate target areas; they were evaluated as a single entity. Because the activity areas sub-domain is nevertheless important to keep in the model (it refers to areas where PA will take place), it was placed under the Facilities domain for the purposes of the current study. This method was applied to all the domains and sub-domains of the Bedimo-Rung conceptual model and conducted through discussion and consensus before arriving at a final operationalization. A table comparing the definitions of the Bedimo-Rung conceptual model domains and sub-domains with those of the operationalization of the model (Table 3-V, p.75), along with a figure of the operationalization of the conceptual model (Figure 3.5, p.81) are presented in the results section below.

2.7. Statistical Analyses

2.7.1. Reliability Estimates

Estimating the reliability of the PARK tool items is an important first step prior to undertaking further analyses. Reliability helps to determine if the parks were being evaluated consistently both between independent observers and over time by the same observer.

For the 90 items on the PARK tool (two text-only items were removed), both inter-rater and intra-rater reliability were examined using percent agreement and Cohen's kappa statistic.

2.7.1.1. Inter-Rater Reliability Using Percent Agreement

Percent agreement, a simple but crude way to assess agreement between raters, is calculated by adding the number of times the raters agreed on any given item and dividing this by the total number of paired observations per item. In this study, cut-offs for percent agreement categorization were selected according to criteria established by Saelens et al. (2006) as "good to excellent" (≥ 75%), "moderate" (60 - <75%), or "poor" (<60%). When there is no response variation between observers, that is, all raters give the same response to a question, percent agreement is a useful way to estimate reliability. However, when there is response variation, this method is not designed to consider chance agreement between raters, potentially leading to overly favourable estimates of reliability.

2.7.1.2. Inter-Rater Reliability Using Cohen's Kappa Statistic

Cohen's kappa is considered a more robust method than percent agreement for estimating reliability between independent raters on mutually exclusive categorical response items because it corrects for chance agreement. The kappa statistic ranges from 1, indicating perfect agreement, to -1, indicating perfectly negative agreement, however the meaning ascribed to the value of a kappa statistic changes according to what is known in a particular field of study. This refers to whether the parameters of the expected chance agreement are well known or established in a particular field. In terms of the direct observation assessment of park characteristics, there is still little known about expected chance agreement for a variety of items. Nevertheless, in the field of built environment assessment using direct observation tools, the guidelines provided by Landis and Koch (1977) are generally accepted and used, as they will be here. They are the following: <0 = poor agreement; 0 – 0.20 = slight agreement; >0.20 – 0.40 = fair agreement; >0.40 – 0.6 = moderate agreement; >0.60 – 0.80 = substantial agreement, and; >0.80 – 1 = almost perfect agreement. Simple unweighted kappas were calculated for all dichotomous variables and weighted kappas were calculated for all categorical variables where possible. Weighted kappas assign less weight to agreement as categories are more discordant.

2.7.1.3. Intra-Rater Reliability

The reliability of responses over time by the same observer is estimated using a test-retest method, where the responses from test time one are compared with the responses from test time two. This method rests on the assumption that the construct being measured does not change between test times, and that the observer is not simply recalling answers from the first test occasion. Because of these assumptions, the time interval between tests must be carefully considered. It should not be too prolonged – some physical aspects of parks can change over time such as presence of graffiti, or the replacement of a play structure. However, neither should it be too brief or the observer may evaluate the park based on what she or he recalls from the first visit. Roughly 7% of the parks were visited by the same observer on a different assessment occasion. This was done for two reasons: 1) one of the study aims was to conduct a 10% reassessment of all the neighbourhoods audited, and; 2) some study subjects lived near each other and therefore within 500 m of the same park. The reassessment of parks for estimation of intra-rater reliability, however, was not part of the study design. Nevertheless, it provides an adequate sample from which to estimate intra-rater reliability. One drawback, however, is that the time interval between tests ranged from 3 to 448 days with a mean of 163 days. The upper range of the time interval may be too long between test occasions, which may underestimate the items' intra-rater reliability due to possible substantive changes in park characteristics. Despite these drawbacks, the results are informative, particularly in terms of subjective items. Cohen's kappa statistics and percent agreement were calculated for the test-retest reliability estimates.

2.7.2. Principal Component Analysis

Although the PARK tool was developed to assess parks for physical activity in line with the Bedimo-Rung conceptual model, a more detailed, albeit exploratory, understanding of the latent constructs being assessed by the tool required further analysis. This was done using a principal component analysis. The goal of a principal component analysis (PCA) is to extract the maximum variance (including error and unique variance for each observed variable) from each data set within each component (Tabachnick & Fidell, 2007). PCA is often used as a data reduction technique, and can also be used to explore the relationships between variables in a data set. In the present study, PCA was used for the latter reason. The operationalization of the Bedimo-Rung conceptual model was used to help guide an understanding of the relationships among the variables. There were no *a priori* hypotheses about the underlying structure of the data.

Prior to conducting the PCA all categorical variables were dichotomized so that the data would be uniformly dichotomous to aid in interpretation of the results. If normality fails when conducting a PCA, as in this case, the solution is downgraded however it can still provide a worthwhile description of the relationships in a set of variables (Tabachnick & Fidell, 2007, p. 613, chapter 13). Variables with frequencies of less than 5% were removed because they were considered to be too infrequently present to be of importance for the final cluster analysis and park typology. Finally, the variables that did not apply to the entire park (i.e. those that depended on the presence of an installation such as the condition of the toilets) were also removed.

PCA was conducted using the PROC FACTOR command in SAS version 9.2 (Cary, North Carolina). A varimax orthogonal rotation was used, where the variance between components is maximized and the components are not correlated with each other. Components were retained at a minimum eigenvalue of 0.95 and variables were retained if they loaded onto a component at 0.3 or higher. Although the component loading is low (only 9% of the variance in the variable is explained by the component) it was agreed by the research team that this low loading was useful for exploratory purposes. In addition, it is generally agreed to be the lowest limit for which a component loading should be considered for inclusion (Tabachnick & Fidell, 2007). Finally, the sample size in this dataset is appropriate for PCA (Comrey & Lee, 1992). The components extracted from the PCA were then used in the cluster analysis.

2.7.3. Cluster Analysis

Cluster analysis (CA) was the final step in the analytic process, and was used explicitly to develop the park typology presented. The principal components identified in the previous step were used at this stage to carry out the CA. CA is a data mining method that groups data based on information found in the data that describes the variables and their relationships (Tan, Steinbach, & Kumar, 2005). Although there are many different types of clustering methods, Ward's minimum-variance method was used here because this method requires no initial assigned point to identify the number of clusters (Li & Chuang, 2008). There is currently insufficient literature about the expected number of park types. Ward's method assumes that a cluster is represented by its centroid and it measures the proximity between two clusters in terms of the increase in the squared standard error that results from merging two clusters (Tan et al., 2005). Application of this method results in parks that are substantively comparable because they have been grouped together on related characteristics even though they are not necessarily geographically adjacent, as has been done elsewhere (van Hulst et al., 2012).

The decision for the number of clusters selected was based on a series of figures generated by the CA procedure in SAS. The cluster tree diagram (or dendogram) is one way in which the number of clusters can be determined. Figure 2.3, p.61, shows the dendogram generated from the cluster analysis used in the present study. On the right of the graph one can see the root of the tree, representing 0% of the variance in the data. As the branches grow from the root to the left of the dendogram, more and more clusters are generated until 100% of the variance in the data is represented, and each variable is represented uniquely as its own cluster. Defining the number of clusters based on the cluster tree is not always straightforward, and compromises must be made between capturing an acceptable amount of variance and avoiding too many clusters so that they remain meaningful. Another method for determining the number of clusters is to analyze the cubic clustering criterion (CCC), pseudo F (PSF), and pseudo t^2 (PST2) plots. Figure 2.4, p.62, shows the SAS output of these three plots. The number of clusters can be determined by evaluating the results of one or all of the plots. Peaks in the CCC with values greater than two or three indicate good clusters, and those with values between zero and two indicate possible clusters, while large negative values can indicate outliers (SAS Institute Inc., 2008). The peaks of relatively large values in the PSF may indicate the number of clusters (SAS Institute Inc., 2008). The final, PST2 plot, must be assessed from right to left until the first peak is found. From a peak, one must then move back up the column or to the right, by one step in the cluster history to identify the number of clusters using this plot (SAS Institute Inc., 2008). For all iterations of the CA, all of the above techniques were used to determine the appropriate number of clusters. There can be more than one outcome for the number of clusters using Ward's method.

1A CLUSTER ANALYSIS 10 FACTORS & PARK AREA

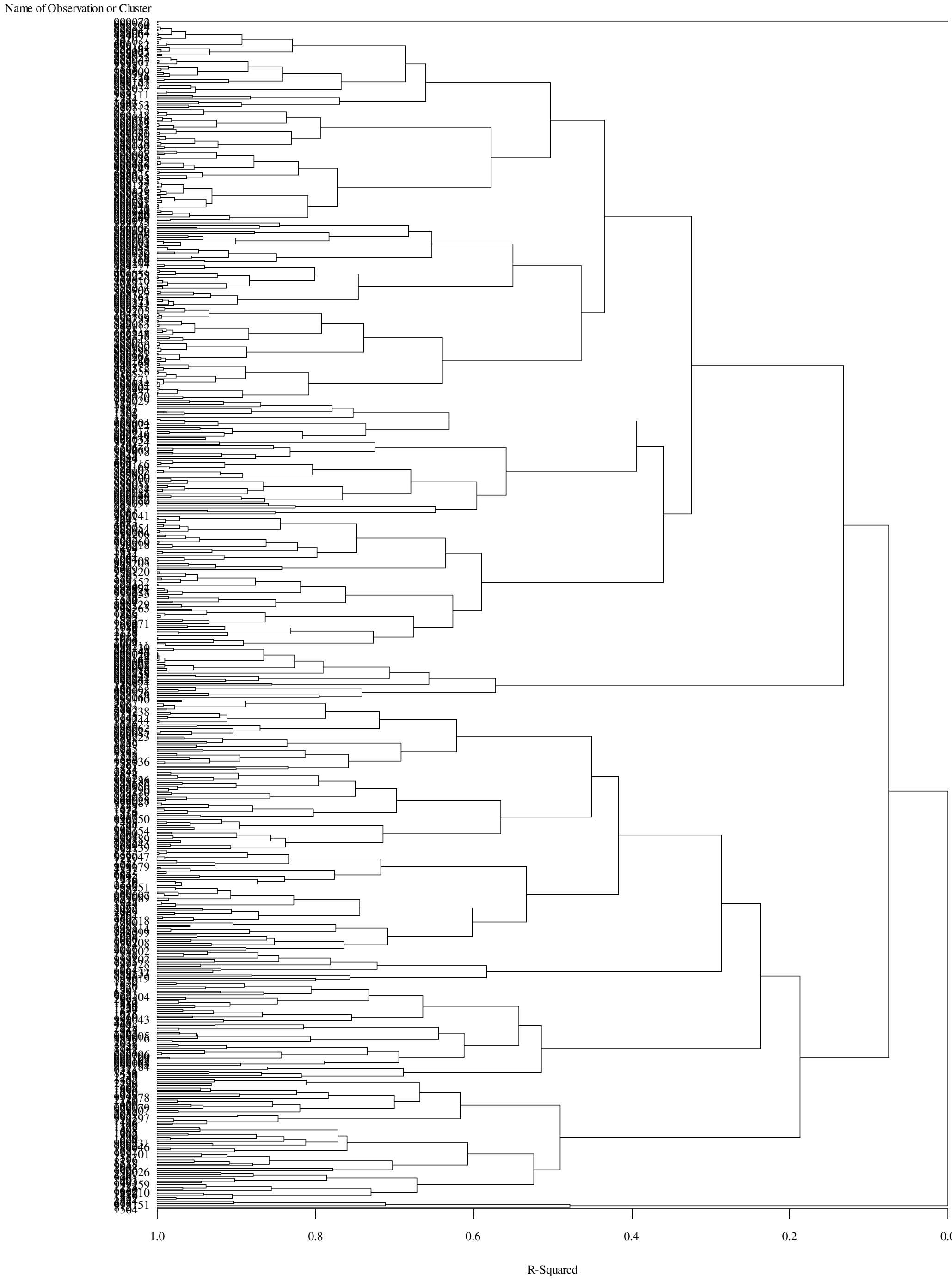


Figure 2.3. The cluster tree as an output from SAS.

Once the number of clusters had been identified, a subsequent analysis was undertaken using the number of clusters identified in the previous step. This next step allows for a qualitative analysis of the differences between the clusters generated based on the principal components used in the CA. This was done using boxplots, as well as a Bonferroni one-way ANOVA to help qualitatively assess differences between the means of components across clusters.

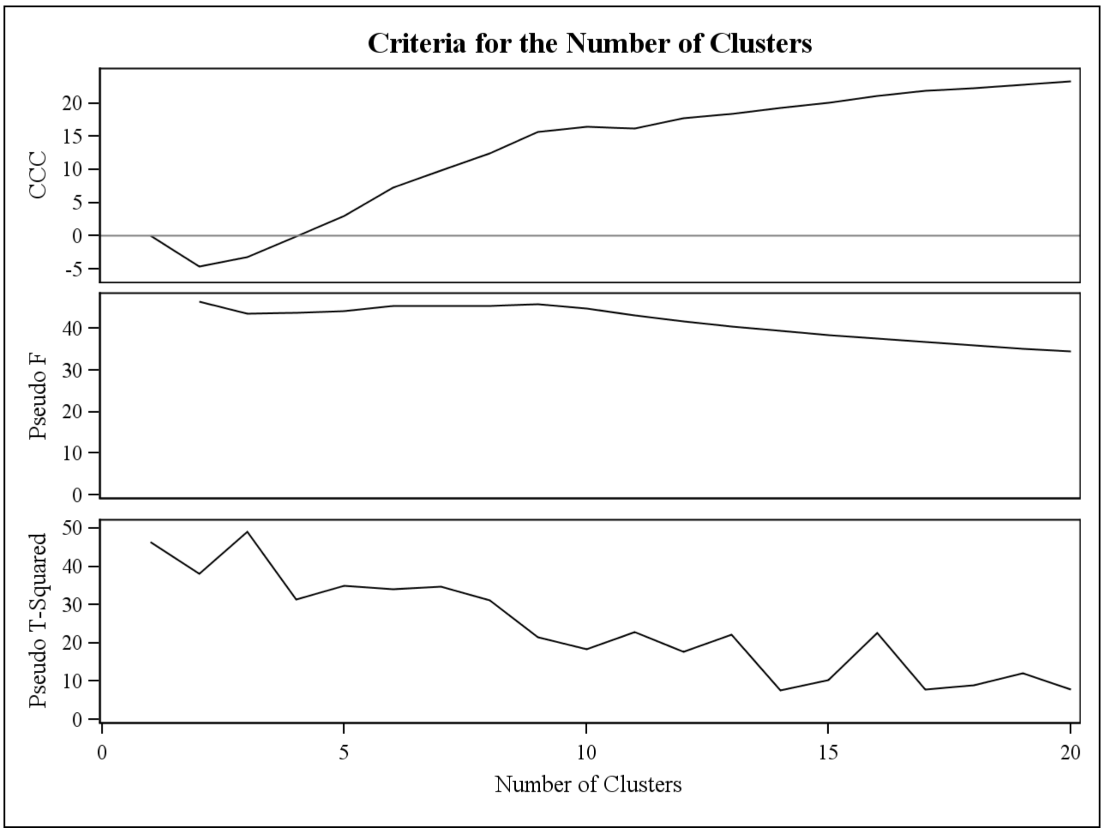


Figure 2.4. The SAS output of the cubic clustering criterion, pseudo F, and pseudo t^2 plots. These plots are used to help determine the number of clusters in a cluster analysis.

A series of CAs using a combination of the ten components generated from the PCA as well as the park area variable, were performed before a final cluster analysis was selected. For exploratory purposes, the park area variable was either included or excluded from the CA.

The CAs performed were as follows:

Set one: The entire data set was included, including 8 extremely large parks (> 200 000 m^2) identified as outliers:

1. CA including all ten components and including the park area variable.
2. CA excluding one rarely occurring park installations component (tennis courts, skate parks and water sprinklers) and excluding the park area variable.
3. CA removing the rarely occurring park installations component and including the park area variable.

Set two was the same as Set one except the data set was reduced to parks < 200 000 m^2 (n=565).

The final CA chosen was number two, from set one. This decision was based on the fact that the park types generated from this analysis were best distinguished from each other based on concepts that may be related, either positively or negatively, to youth physical activity, and because the entire data set was included. All analyses were done using SAS version 9.2.

CHAPTER 3 : RESULTS

This chapter presents the results from the reliability assessments of the PARK Tool, the descriptive statistics, the operationalization of the Bedimo-Rung conceptual model of parks and physical activity, the exploratory principal component analysis and the cluster analysis.

3.1. PARK Tool Reliability Assessment Results

The results from the reliability assessment of the PARK Tool were prepared as a manuscript that will be submitted for publication. The full manuscript is available in Appendix VI.

3.1.1. Inter-Rater Reliability of the PARK Tool

Eighty-six percent of items from the PARK Tool across all 576 parks demonstrated ≥75% agreement, indicating good to excellent overall agreement (Table 3-I, p.64). Among the items for which kappa could be calculated (n = 79), 85% were found to be between > 0.40 and 1 (28% moderate agreement, 27% substantial agreement, and 30% almost perfect agreem. Kappa coefficients could not be calculated for 11of the 90 items due to a lack of response variation, e.g. for the item "presence of aquatic activities in a pond"). Percent agreement was evaluated for these items and all were ≥75% except for one item, pool length, which had 70% agreement.

Table 3-I. Kappa and percent agreement results for all items on the PARK tool

ACTIVITIES			
ITEM	**Kappa**	**95% CI**	**% Agree**
Park Type	.720[a]	.656; .784	88.25
Tennis Courts Present	.980	.960; 1.00	99.48
Tennis Accessible	.688	.457; .920	92.94
Tennis Condition	.184	-.185; .552	91.77
Tennis Restriction	.481	.294; .667	74.12
Basketball Courts Present	.902	.856; .948	97.04
Basketball Accessible	n/a[b]	n/a[b]	97.94

Basketball Condition	.245	.031; .458	72.17
Basketball Restriction	.490	-.119; 1.00	97.94
Badminton/Volleyball Courts Present	.886	.802; .969	98.78
Badminton/Volleyball Accessible	n/a[b]	n/a[b]	96.55
Badminton/Volleyball Condition	.583	.222; .944	86.20
Badminton/Volleyball Restriction	n/a[b]	n/a[b]	88.89
Soccer/Football/Rugby Field Present	.984	.968; 1.00	99.31
Soccer/Football/Rugby Accessible	.886	.665; 1.00	99.43
Soccer/Football/Rugby Condition	.407	.205; .609	87.50
Soccer/Football/Rugby Restriction	.476	.167; .785	95.40
Baseball/Softball Field Present	.955	.927; .983	98.26
Baseball/Softball Accessible	.758	.495; 1.00	97.91
Baseball/Softball Condition	.557	.352; .762	90.21
Baseball/Softball Restriction	.436	.089; .782	95.07
Hockey/Ringette Rink Present	.980	.942; 1.00	99.83
Hockey/Ringette Accessible	1.00	1.00	100.0
Hockey/Ringette Condition	.595	.183; 1.00	88.00
Hockey/Ringette Restriction	.649	.016; 1.00	96.16
Track (Track & Field) Present	.638	.473; .802	97.21
Track Accessible	n/a[b]	n/a[b]	93.33
Track Condition	.400	-.090; .890	73.33
Trail Present	.6016	.535; .668	80.80
Trail Accessible	n/a[b]	n/a[b]	99.65
Trail Condition	.264	.034; .493	93.31
Bike Path Present	.743	.646; .839	95.65
Bike Path Accessible	n/a[b]	n/a[b]	100.0
Bike Path Condition	n/a[b]	n/a[b]	95.12
Skate Park Present	.976	.944; 1.00	99.65
Skate Park Accessible	n/a[b]	n/a[b]	100.0
Skate Park Condition	.657	.031; 1.00	97.78
Skate Park Restriction	.100	-.260; .460	82.22
6+ Play Area Present	.935	.900; .970	97.74
6+ Play Area Accessible	n/a[b]	n/a[b]	99.31
6+ Play Area Condition	.295	.116; .473	92.68
Multi-Use Area Present	.596	.529;0.664	81.01
Multi-Use Area Accessible	1.00	1.00	100.00
Multi-Use Area Condition	.235	.0605; .410	88.81
School Yard Present	.958	.929; .987	98.60
School Yard Accessible	.654	.288; 1.00	97.43
School Yard Condition	.170	-.072; .411	84.49
Equipment Rental Available	.664	.306; 1.00	99.47
Pool Present	1.00	1.00	100.00
Length of Pool	n/a[b]	n/a[b]	70.21
Pool Condition	.511[a]	.130; .893	80.44
Pool Cleanliness	.598[a]	.324; .871	76.09
Water Sprinklers Present	.882[a]	.816; .948	97.91
Water Sprinklers Condition	.893[a]	.723; 1.00	96.00
Water Sprinklers Cleanliness	.557[a]	.291; .823	76.00

ENVIRONMENTAL QUALTY			
ITEM	**Kappa**	**95% CI**	**% Agree**
Large Body of Water Present	.916	.852; .983	98.95
Sportive Aquatic Activities Present	.683	0431; .935	86.11
Pond or Fountain Present	.704	.544; .863	98.44
Aquatic Activities Present	1.00	1.00	100.00
Decorative or Cultural Features	.549	.466; .632	84.50
Garden Present	.605	.539; .671	80.84
Shady Areas Present	.523[a]	.464; .583	67.49
No Dogs Allowed Sign Present	.767	.714; .819	88.33
Graffiti Present	.514[a]	.451; .576	69.34
Vandalism Present	.224[a]	.141; .308	76.27
Litter Present	.417[a]	.343; .491	67.30
SERVICES			
ITEM	**Kappa**	**95% CI**	**% Agree**
Garbage Bins Present	.811[a]	.702; .920	97.91
Drinking Fountains Present	.918[a]	.889; .948	94.77
Picnic Tables Present	.855[a]	.813; .898	92.68
Sitting Benches Present	.679	.570; .789	94.93
Bleachers Present	.916	.883; 0.949	95.65
Public Toilets Present	.822[a]	.772; .872	92.15
Condition of Toilets	.846[a]	.771; .920	91.09
Chalet/Change Room Present	.673	.588; .758	91.46
Condition of Chalet/ Change Room	n/a[b]	n/a[b]	80.95
Parking Present	.728[a]	.675; .781	86.19
Bike Locks Present	.839	.795; .884	91.97
Public Transportation Present	.759	.704; .813	88.48
SAFETY			
ITEM	**Kappa**	**95% CI**	**% Agree**
Sufficient Lighting for Park	.591	.517; .664	83.28
At Least 1 Street Visible from Centre of Park	.644	.565; 0.722	88.49
At Least 1 House Visible from Centre of Park	.554	.466; .643	86.74
Adjacent Streets Local	.609[a]	.542; .675	82.24
Traffic Calming Measures Present	.448[a]	.382; .513	63.24
Pedestrian Safety Present	.648[a]	.596; .700	73.87
GENERAL IMPRESSION			
ITEM	**Kappa**	**95% CI**	**% Agree**
Overall Appealing for Youth	.480[a]	.424; .536	60.10
Overall Safe	.349[a]	.281; .417	59.97
Overall Attractive/ Pretty	.362[a]	.297; 0.427	58.19
Attractive for Walking	.528[a]	.470; .586	66.55
Attractive for Bicycling	.589[a]	.516; .663	81.53
Attractive for Active Play	.537[a]	.484; .588	61.85

[a] indicates kappa is weighted

[b] indicates kappa could not be calculated due to a lack of response variation between observers

3.1.2. Intra-Rater Reliability

There were a total of 40 test-retest episodes among all 9 observers (Table 3-II, p.67). Because of the relatively small n, the correlation between time one and time two could only be calculated using complete data with response variation (n=45). The median number of days between evaluation time one and two was 61, with a minimum of 3 and a maximum of 448 days. Overall, kappa agreement between test time one and two were relatively high (≥ 0.40) for all but four of the items for which kappa could be calculated. . Percent agreement was excellent (≥ 75% agreement) for all but eight items.

Table 3-II. Test-retest results for intra-observer reliability

Item	Kappa	95% CI	% Agree
Tennis Courts Present	.939	.821; 1.00	97.5
Basketball Courts Present	.827	.641; 1.00	92.5
Badminton/Volleyball Courts Present	.844	.545; 1.00	97.5
Soccer/Football/Rugby Field Present	.944	.836; 1.00	97.5
Baseball/Softball Field Present	.898	.760; 1.00	95.0
Hockey/Ringette Rink Present	-.026	-.0612; .010	95.0
Trail Present	.733	.488; .979	90.0
Bike Path Present	.448	.001; .896	90.0
Skate Park Present	.844	.545; 1.00	97.5
6+ Play Area Present	.804	.541; 1.00	95.0
Multi-Use Area Present	.595	.330; .861	82.5
School Yard Present	.942	.830; 1.00	97.5
Pool Present	.787	.385; 1.00	97.5
Water Sprinklers Present	…	…	92.5
Large Body of Water Present	.844	.5451; 1.00	97.5
Decorative or Cultural Features	.571	.268; .875	85.0
Garden Present	.495	.224; .767	78.0
No Dogs Allowed Sign Present	.696	.477; .916	85.0
Bleachers Present	…	…	87.5
Chalet/ Change Room Present	.731	.514; .948	87.5

Bike Locks Present	.632	.385; .878	82.5
Public Transportation Present	.688	.460; .917	85.0
Sufficient Lighting for Park	.479	.097; .861	87.5
At Least 1 Street Visible from Center	.521	.215; .826	82.5
At Least 1 House Visible from Center	.319	-.035; .673	80.0
Park Type	.793 [a]	.548; 1.00	92.5
Shady Areas Present	.406 [a]	.110; .702	70.0
Pond or Fountain Present	1.00 [a]	1.00	100.0
Public Toilets	.725 [a]	.516; .934	85.0
Parking Present	.643 [a]	.382; .904	87.5
Graffiti Present	.470 [a]	.224; .716	67.5
Vandalism Present	.503 [a]	.167; .839	82.5
Litter Present	.377 [a]	.150; .604	52.5
Drinking Fountain Present	.629 [a]	.422; .835	72.5
Picnic Tables Present	.546 [a]	.270; .821	80.0
Adjacent Streets Local	.743 [a]	.566; .920	82.5
Traffic Calming Measures Present	.379 [a]	.132; .626	55.0
Pedestrian Safety Present	.461 [a]	.231; .691	65.0
Overall Appealing for Youth	.492 [a]	.279; .705	60.0
Overall Safe	.479 [a]	.266; .693	70.0
Overall Attractive/Pretty	.658 [a]	.455; .861	77.5
Attractive for Walking	.593 [a]	.398; .787	67.5
Attractive for Bicycling	.844 [a]	.673; 1.00	92.5
Attractive for Active Play	.646 [a]	.446; .846	75.0

[a] Indicates kappa is weighted.
CI = Confidence interval.

3.1.3. Comparison of Kappa Results from Items on the PARK Tool and the POST

Twenty-one items on the PARK Tool were drawn directly from the POST. Inter-rater reliability of the POST, assessed in Perth, Australia, was estimated by calculating Cohen's kappa and percent agreement between raters. Inter-rater reliability estimates for items from the PARK Tool shared with the POST were compared and found to be of a similar magnitude (Table 3-III, p.69).

Table 3-III. Comparison of inter-rater reliability of items shared between the PARK Tool and the POST

	PARK [d] (n=576)		POST [c] (n=47)	
Item	Kappa	% Agreement	Kappa	% Agreement
6+ Play Area Present	.935	97.74	1.00	100.00
Large Body of Water Present	.918	98.95	.876	97.70
Drinking Fountain Present	.918	94.77	.746	87.20
Public Toilets Present	.822	92.15	.849	95.60
Picnic Tables Present	.855	92.68	.956	--
Parking Present	.728	86.19	.744	87.20
Garbage Bins Present	.811	97.91	.691	93.60
No Dogs Allowed Sign Present	.767	88.33	.849	95.70
Public Transportation Present	.759	88.48	.539	76.00
Sitting Benches Present	.679	94.93	.877	97.70
Chalet/ Change Room Present	.673	91.46	1.00	100.00
At Least 1 Street Visible from Center	.644	88.49	.789	97.90
Trail/ Walking Path Present	.602	80.80	.707	85.10
Sufficient Lighting for Park	.591	83.28	.675	85.10
At Least 1 House Visible from Center	.554	86.74	.486	89.30
Graffiti Present	.514	69.34	.565	78.26
Litter Present	.417	67.3	.495	76.00

[c] Data printed with permission from the author, B. Giles-Corti.
[d] All categorical items have been dichotomized.

3.2. Parks Descriptions: An Overview of the Parks' Characteristics

The descriptive statistics of the measured intra-park characteristics across all parks by park size are shown in Table 3-IV, p.71. Park installations were highly accessible, in overall good condition and unrestricted. Installations were defined as accessible if the observer could easily walk around, go into, and/or on them. Installations were defined as in good condition if they were functioning adequately (e.g. swings were intact and moved appropriately) and had no visible wear or vandalism that would impede their use. Installations were defined as unrestricted if there were no restricted opening hours, and membership for use was not required. As expected, the installations that required more space, such as baseball diamonds, tennis courts and swimming pools were present more frequently in larger parks than in smaller parks. The larger parks had on average more PA installations and areas than the smaller parks, with the exception of play areas for children 6 years and older, which were highly and almost equally prevalent in both types of parks (Figure 3.1, p.70).

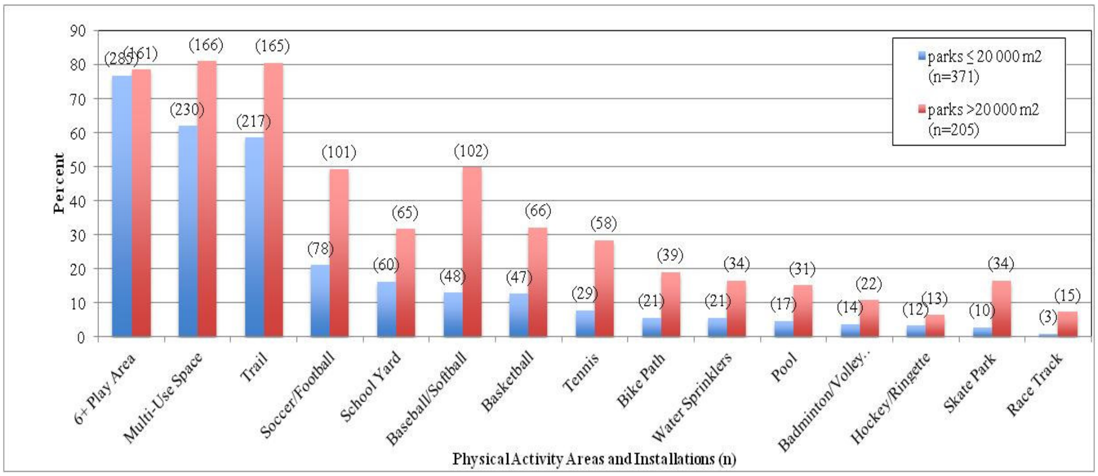


Figure 3.1. Frequency of physical activity areas and installations across all parks by park size.

There were also many differences between larger and smaller parks in terms of park amenities, with larger parks having a higher average number of amenities present than smaller parks. The average percentage of amenities across all smaller parks was 39% vs 64% across all larger parks (Figure 3.2, p.71), with one specific exception: smaller parks were more likely to ban dogs than larger parks. Both sets of parks were similar regarding the very low levels of incivilities observed (Figure 3.3, p.73), although the larger parks tended to have more signs of incivilities, as measured by the presence of graffiti, vandalism, and litter, than the smaller parks most likely by virtue of the greater number of surfaces and larger area. The general impression items from the PARK tool were included to gather information about the park as a whole: whether it seemed safe, was appealing for physical activities as well as for youth. Compared to the smaller parks, the larger parks tended to give an overall impression of being more appealing for physical activities for youth, as well as being more aesthetically pleasing; the smaller parks gave an impression of being overall safer than the larger parks (Figure 3.4, p.74).

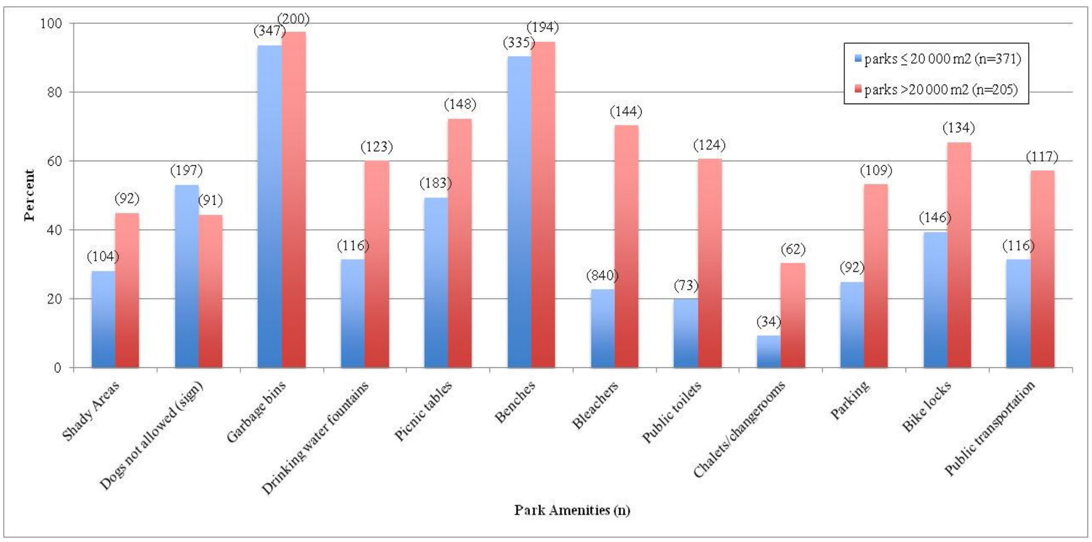


Figure 3.2. Frequency of park amenities across all parks by park size.

Table 3-IV. Frequency and percentage of park characteristics across all parks

	Small Parks		Large Parks	
Physical Activity Installations & Areas	**n**	**(%)**	**n**	**(%)**
Tennis	29	(8)	58	(28)
Basketball	47	(13)	66	(32)
Badminton/Volleyball	14	(4)	22	(11)
Soccer/Football	78	(21)	101	(49)

Baseball/Softball	48	(13)	102	(50)
Hockey/Ringette	12	(3)	13	(6)
Race Track	3	(1)	15	(7)
Trail	217	(58)	165	(80)
Bike Path	21	(6)	39	(19)
Skate Park	10	(3)	34	(17)
6+ Play Area	285	(77)	161	(79)
Multi-Use Space	230	(62)	166	(81)
School Yard	60	(16)	65	(32)
Pool	17	(5)	31	(15)
Water Sprinklers	21	(6)	34	(17)
	Overall %		**Overall %**	
Accessibility of Installations	98		96	
Condition of Installations	87		89	
Restriction of Installations	24		12	
Amenities	**n**	**(%)**	**n**	**(%)**
Shady Areas	104	(28)	92	(45)
Dogs not allowed (sign)	197	(53)	91	(44)
Garbage bins	347	(94)	200	(98)
Drinking water fountains	116	(31)	123	(60)
Picnic tables	183	(49)	148	(72)
Benches	335	(90)	194	(95)
Bleachers	84	(23)	144	(70)
Public toilets	73	(20)	124	(60)
Chalets/Change Rooms	34	(9)	62	(30)
Parking	92	(25)	109	(53)
Bike locks	146	(39)	134	(65)
Public transportation	116	(31)	117	(57)
Aesthetics	**n**	**(%)**	**n**	**(%)**
Important body of water	18	(5)	24	(12)
Pond or fountain	7	(2)	14	(7)
Decorative or cultural elements	65	(18)	60	(29)

Garden	150	(40)	107	(52)
Incivilities	**n**	**(%)**	**n**	**(%)**
No Graffiti	219	(59)	107	(52)
No Broken Items/ Vandalism	319	(86)	165	(80)
No Garbage/ Litter	266	(72)	119	(58)
Safety Features	**n**	**(%)**	**n**	**(%)**
Sufficient lighting	256	(69)	162	(79)
At least 1 street visible from center	319	(86)	144	(70)
At least 1 house visible from center	329	(89)	149	(73)
Adjacent streets are local	294	(79)	120	(59)
Traffic calming measures	202	(54)	109	(53)
Pedestrian facilitators	69	(19)	55	(27)
General Impression	**n**	**(%)**	**n**	**(%)**
Very Appealing for youth	47	(13)	110	(54)
Overall Very Safe	195	(53)	82	(40)
Overall Very Aesthetically Pleasing	87	(24)	87	(42)
Overall Very Appealing for Walking	31	(8)	57	(28)
Overall Very Appealing for Cycling	20	(5)	40	(20)
Overall Very Attractive for Active Play	41	(11)	109	(53)

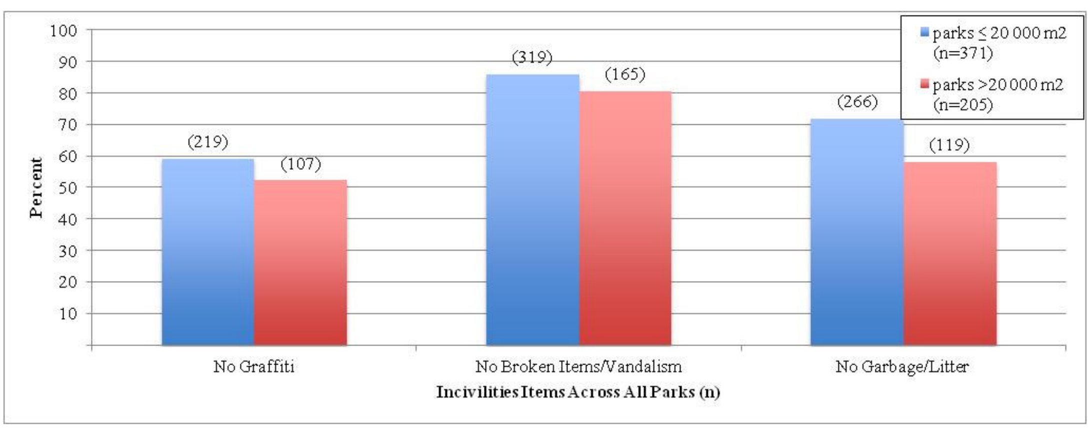


Figure 3.3. Frequency of parks that did not have signs of graffiti, litter or vandalism across all parks by size.

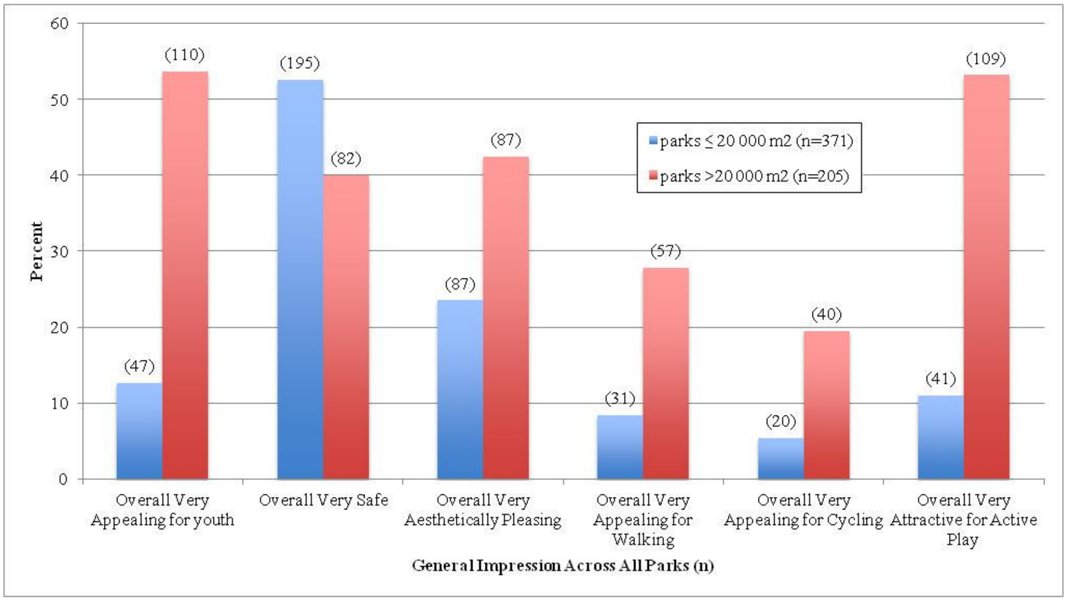


Figure 3.4. General impression items across all parks by size.

3.3. Results from the Operationalization of the Bedimo-Rung Conceptual Model

As introduced in the methods section, the sub-domains from the Bedimo-Rung conceptual model of park characteristics hypothetically associated with physical activity were adapted to the present study prior to all data analyses. Table 3-V, p.75, contains the results of this adaptation.

In terms of park access, the PARK tool assessed whether the PA installations were accessible, essentially capturing the "within park" access described from the Bedimo-Rung model. Although the operationalization of the model does not include the other aspects of the access sub-domain (available, equitable and proximity-related) these concepts have been considered for this particular study. It is known, for example, that the city of Montreal has a high number of parks that are available and equitably distributed across a range of socioeconomic status neighbourhoods, based on a study by Apparicio and colleagues (Apparicio et al., 2010). Regarding proximity-related access, it has been incorporated into this study by design: the parks are located within a maximum 1000 m walking buffer zone around the homes of the youth in the QUALITY Cohort.

Table 3-V. Sub-domain definitions from the Bedimo-Rung conceptual model and definitions from the operationalization of the Bedimo-Rung model

Bedimo-Rung Conceptual Model (2005)			Residential Study Operationalization of Bedimo-Rung Model		
Domain	**Sub-Domain**	**Definition**	**Domain**	**Sub-Domain**	**Definition**
Condition	Maintenance	Condition and maintenance of the play equipment in the park including the safety of the equipment.	**Condition**	Maintenance	Condition of the physical activity installations and supporting areas, e.g. benches, race tracks, toilets, and water sprinklers.
	Incivilities	Low-level breaches of community standards that signal an erosion of conventionally accepted norms and values such as trash, graffiti, or drinking and loitering.		Incivilities	Low-level breaches of community standards that signal an erosion of conventionally accepted norms and values such as trash, graffiti, and vandalism.
Features	Facilities	The physical facilities that are available to users, such as tennis courts, picnic tables, or security lighting.	**Activity Features**	Physical Activity Installations	The physical and built installations that are available to users explicitly for promotion of or aid in physical activities, such as a pool, basketball courts, play structures, etc.

	Programs	Recreation programs or organized activities that take place within a park.		Activity Areas	The sections, zones, or opportunity areas within a park that are designed or commonly used for physical activity but that do not contain any installations (e.g. fields, paved school yard).
	Diversity	The mix of park facilities, programs, users, and location. A park with diversity is used for a variety of purposes at different times of the day, week, and year.			
Access	Availability	The amount of park space available in a given city, measured either as park space per capita or per acre.	**Access**	Physical Activity Installation and Activity Area	The ability of people to move easily inside, outside, and within the boundaries of a physical activity installation or activity area.
	Equitable	The equitable distribution of parks across different types of neighbourhoods. Including if they are equally maintained.			
	Individual	The distance that an individual must travel to get from her home to the closest park.			

	Within Park	The ability of people to move around easily inside the boundaries of a park. E.g. the distance of a parking lot area to an area of active play. Social access is also considered by Bedimo-Rung, such as whether there are basketball courts with loud teenagers that are placed too near playgrounds serving young children.			
Aesthetics	Design	E.g. the size of the park, layout, landscaping, the balance between sun and shade, topography, ease of access, visual appeal, ponds or sculptures.	**Aesthetics**	Design	Includes park design elements such as presence of gardens, decorative elements or ponds or fountains.
	Attractiveness	Enjoyable scenery.		Attractiveness	Attractive for youth and parents for both aesthetic and physical activity purposes.
Safety	Perceived	People's perceptions and feelings of safety.	**Safety**	Perceived	Features that increase the perception and feeling of safety.
	Objective	Actual incidents of crime.		Objective	Actual incidents of crime.
Policies	Management	Park design policies, park management practices, and budget procedures. E.g. are policies written or unwritten? Operating hours of the park, costs of programs and rules of behaviour.			

	Budget	Operating and capital budget, calculated as public expenditures on parks/resident.			
Geographic Areas	Activity Areas	The sections, zones or opportunity areas within a park that are specifically designed or commonly used for physical activity. Can include sports fields, tennis courts, swimming pools, paths or trails, or other areas where physical activity occurs.	**Amenities**	Supporting Areas	Facilities and installations that make physical activity in parks attractive and safe to a variety of users. E.g. chalets/changing facilities, picnic areas, benches, drinking fountains.
	Supporting Areas	Facilities and equipment that make physical activity in parks attractive and safe to a variety of users. E.g. shelters, restrooms/changing facilities, picnic areas, parking lots, etc.		Amenities for Vehicle Access	Amenities that facilitate access to the park via a vehicle such as parking lots, street parking, public transportation or bike locks.
	Overall Park	Overall impression and meaning ascribed to the park as a whole. E.g. aesthetic appeal, size and diversity of programs, overall park usage and accessibility to the park.	**Context**	Surrounding Neighbourhood	Neighbourhood type based on Residential Study neighbourhood typology.
	Surrounding Neighbourhood	Traffic, blighted or abandoned housing, crime and resident demographics.	**Area**	Park Area	Park size in m2.

There were few adaptations to the condition domain. Maintenance and incivilities remain sub-domains with definitions of each slightly, and only superficially, modified to reflect the present study. For example, the maintenance sub-domain definition is adapted to apply specifically to physical activity installations rather than "play equipment" from the original model, which is essentially the same concept.

The features domain was adapted by first removing the diversity and programs sub-domains, as explained in the methodology section. Then, the facilities sub-domain was parceled out into two sub-domains: 1) physical activity installations, and; 2) activity areas. The physical activity installations sub-domain definition is essentially a refined and adapted definition of the facilities sub-domain, and specifies that "physical facilities" (from the Bedimo-Rung definition) should be understood for this study as "the physical and built installations that are available to users explicitly for promotion of or aid in physical activities". The activity areas sub-domain is an extension of the physical activity installations domain to include areas that do not contain physical installations (e.g. a basketball court), but that are nonetheless available for PA, such as an open field in which PA can take place (e.g. Frisbee or a game of tag). The operationalization of the features domain has been adapted to focus specifically on the features of a park that promote PA, and has hence been labelled Activity Features.

Like the condition domain, the aesthetics domain underwent very few modifications. The operationalized design sub-domain definition was adjusted to address the design aspects that study investigators wanted captured by means of the PARK tool. The operationalization of the attractiveness sub-domain was adapted to include attractiveness for PA specifically, as well as aesthetically.

The operationalized perceived safety sub-domain, from the safety domain, was specified to include the physical features in a park that increase perceptions of safety. The definition of objective safety remains the same, however this data was not collected for the present study.

Because this study was designed to assess the built environment, the park policies domain was not carried over to the operationalization of the conceptual model, much like the programs sub-domain. Nevertheless, it is recognized that park policies are likely an important domain of determinants of PA in parks.

Finally, the geographic areas domain underwent a number of changes. The domain itself was replaced with amenities, context and area, which is a different conceptualization of the Geographic Areas domain. In the original conceptual model, the domains of Features, Condition, Access, Aesthetics, Safety and Policies "feed" into the Geographic Areas domain (see Figure 1.1, p.39), which is a higher-level latent concept, and works to separate the park space into different types of within-park areas (i.e. activity areas and supporting areas). In the operationalization of the model, the idea of differing park areas within a single park is parceled out under more discrete conceptual domains to aid in interpretation of the results of the principal component analysis. In doing so, together the sub-domains from the

Bedimo-Rung model describe the park directly, and not through an intermediary Geographic Areas domain, as can be seen in the operationalization of the conceptual model (Figure 3.5, p.81).

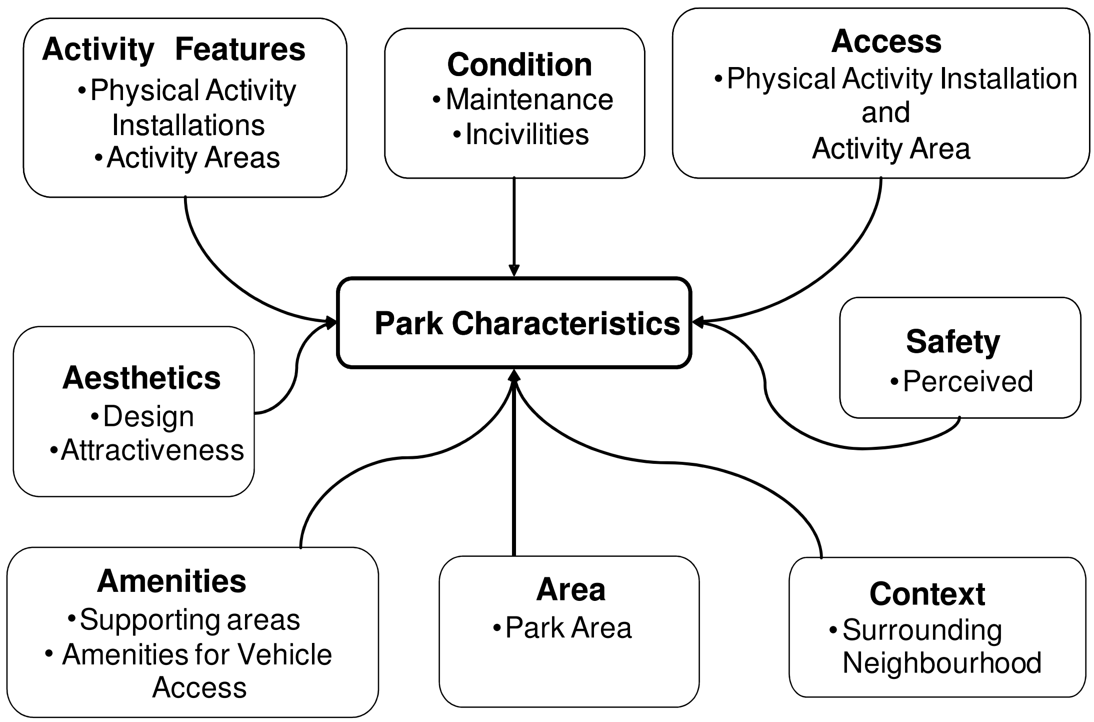


Figure 3.5. The operationalization of the Bedimo-Rung conceptual model

To further help in interpretation, each item from the PARK tool was assigned under a unique domain. See Table 3-VI, p.82, for the results of item assignment to park conceptual domains. A final note, data on the park context, meaning the neighbourhood surrounding the park including housing, commercial businesses, and traffic levels, was not gathered using the PARK tool, however it was gathered in the broader context of the Residential Study and may be considered in its relationship to parks and physical activity in a subsequent analysis.

Table 3-VI. PARK tool item assignment to conceptual model domains

Domain Name	PARK Tool Item
Features	Tennis Present; Basketball Present; Badminton/Volleyball Present; Baseball/Softball Present; Hockey/Ringette Present; Race Track Present; Cycle Path Present; Skate Park Present; 6+ Play area Present; Pool Present; Sprinklers Present;
	Path; Multi-Use Space; School Yard; Soccer/Football/Rugby Field
Condition	Tennis Condition; Basketball Condition; Badminton/Volleyball Condition; Soccer/Football/Rugby Condition; Baseball/Softball Condition; Hockey/Ringette Condition; Track Condition; Path Condition; Cycle Path Condition; Skate Park Condition; 6+ Play Area Condition; Multi-Use Space Condition; School Yard Condition; Pool Condition; Pool Cleanliness; Sprinkler Condition; Sprinkler Cleanliness; Toilet Condition; Chalet Condition
	Graffiti; Vandalism; Litter/Trash
Access	Tennis Access; Tennis Restriction; Basketball Access; Basketball Restriction; Badminton/Volleyball Access; Badminton/Volleyball Restriction; Soccer/Football/Ruby Access; Soccer/Football/Rugby Restriction; Baseball/Softball Access; Baseball/Softball Restriction; Hockey/Ringette Access; Hockey/Ringette Restriction; Track Access; Path Access; Cycle Path Access; Skate Park Access; Skate Park Restriction; 6+ Play Area Access; Multi-Use Space Access; School Yard Access
Aesthetics	Gardens; Fountains/Ponds; Decorative or Cultural Elements
	Is the POS Attractive for Youth?; Is the POS Aesthetically Pleasing?; Is the POS Appealing for Walking; Is the POS Appealing for Cycling?; Is the POS Appealing for Active Play?
Safety	Sufficient Lighting to Light the Majority of the POS; At Least 1 Street Visible from Centre of POS; At Least 1 House Visible from Centre of POS; Are Adjacent Streets Local?; Do Adjacent Streets Have Traffic Calming Measures?; Do Adjacent Streets Have Measures to Facilitate Pedestrians?; Is the POS Safe Overall?

Amenities	Important Body of Water; Shade; No Dogs Allowed Sign; Garbage Bins; Picnic Tables; Drinking Fountains; Benches; Bleachers; Public Toilets; Chalets/ Change rooms	
	Parking; Bike Locks; Public Transportation	
Context	………..	

3.4. Results from the Exploratory Principal Component Analysis

Fourteen principal components were extracted (Table 3-VII, p.85), which together explained almost 60% of the variance in the data. Although the minimum eigenvalue was set at 0.95, the minimum eigenvalue retained was 0.992. Variables were retained if they loaded onto a component at 0.3 or higher. Prior to interpretation of the principal component analysis (PCA), variables that crossloaded were assigned to the component on which they loaded the highest. When this step was complete, four components (numbers 6, 7, 13 and 14) were dropped from the final results because they had less than three variables loading onto them. The final result is a PCA with ten components extracted (Table 3-VIII, p.86). All but one component (number 11) could be meaningfully described by the variable loadings. For example, the three incivilities items from the PARK tool (graffiti, vandalism and litter) loaded highly and uniquely onto one component (number 10). The same was true for the perceived safety component (number 3), the pool features component (number 2), the cycling oriented features (number 4), and the aesthetically pleasing component (number 9). The one component that was less easily interpretable was component number 11, which contained the tennis court, water sprinkler and skateboard park variables. A reasonable interpretation is that these variables are loading together because they appear infrequently in parks. The crossloading items were not removed due to the exploratory nature of the analysis and because the goal was not to identify park concepts to the exclusion of others, but to describe the variables that correlated with each other. The ten components from the PCA were then used in the subsequent cluster analysis.

Table 3-VII. Principal component results

Orthogonal Varimax Rotation

	Component													
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Tennis Court	29	27	1	6	-10	0	-6	4	5	-3	**41**	-6	**30**	**34**
Basketball Court	**40**	-6	-1	-8	-13	9	-16	**39**	-3	5	**33**	17	-9	17
Badminton/Volleyball Court	11	9	-11	7	6	-1	2	4	-8	1	-1	11	2	**73**
Soccer/Football/Rugby Field	**80**	-2	2	-7	1	1	5	5	1	8	0	12	-1	0
Baseball Diamond	**53**	24	-7	8	-4	-13	-6	-3	-12	6	21	-1	**34**	7
Walking Trail	1	6	-27	20	16	5	-18	**49**	15	14	-13	1	27	3
Bike Path	-1	1	-7	**71**	9	-16	17	-6	3	-5	5	12	6	9
Skateboard Park	22	-8	-13	3	5	-15	4	-4	3	10	**70**	5	16	3
Play Area for Children 6 Years and Over	8	15	-5	7	**43**	21	**-54**	10	-12	4	12	14	-5	8
Multi-Use Area	20	15	18	**50**	-15	-1	**-35**	11	-18	16	-1	-15	-25	3
School Yard	**35**	2	-9	-7	-13	-9	-12	15	-15	3	0	**59**	1	9
Pool	16	**67**	3	-10	-5	-8	-6	-4	5	10	-6	3	16	17
Water Sprinkler	-4	**47**	3	6	9	-3	-16	20	6	0	**50**	0	-5	-17
Large Body of Water	-11	14	-19	24	1	0	**67**	13	0	-7	-8	-9	-9	6
Pond or Fountain	2	-4	-8	-1	-3	-15	-9	4	**72**	-11	7	4	-4	-5
Decorative or Cultural Elements	-4	-3	0	12	7	-20	25	22	27	12	19	4	-13	**43**
Gardens	-7	11	12	-2	14	-14	22	**69**	12	3	6	-6	1	7
Shady Areas	-21	11	-27	7	-4	-9	-1	0	**49**	23	-5	-3	**31**	-9
No Dogs Sign	-11	20	-5	**-35**	**30**	16	-3	-20	13	18	-1	13	-13	25
Graffiti	8	7	-3	1	14	-2	-6	-1	1	**65**	28	3	3	5
Vandalism	6	-3	-6	6	3	-12	-5	8	-10	**68**	-24	-5	0	18
Litter	21	15	6	-1	-5	3	6	15	1	**58**	10	14	5	**-30**
Garbage Bins	14	-7	-1	-1	**79**	-11	1	6	-1	3	2	7	3	-4
Drinking Fountain	27	15	-4	12	22	-22	-24	23	7	2	-8	2	**37**	-7
Picnic Tables	2	**36**	-21	9	26	-6	5	27	-18	0	15	17	6	-8
Benches	0	5	9	6	**70**	1	-4	12	7	7	0	-18	11	10
Bleachers	**82**	17	-8	3	6	-12	2	-3	-4	5	11	5	19	2
Public Toilets	**50**	**45**	-8	20	5	-9	10	-3	15	0	4	7	3	-4
Chalet/Change Room	23	**73**	1	2	1	-4	16	13	1	4	3	-1	3	3
Parking	**37**	15	-13	10	-4	-6	**48**	8	-10	4	**37**	7	1	14
Bike Locks	22	**31**	-10	5	10	-9	-3	**38**	-4	13	6	24	11	1
Public Transportation	6	7	1	5	6	**-75**	1	0	12	16	7	6	2	15
Sufficient Lighting	3	12	19	3	8	3	2	10	-2	3	15	8	**70**	-1
At Least 1 Street Visible from Centre of Park	-9	3	**74**	-12	4	-1	0	-5	-13	2	0	10	11	-17
At Least 1 House Visible from Centre of Park	-10	0	**73**	-13	6	-3	-6	4	-16	4	-9	1	-5	-8
Adjacent Streets are Local	-7	-8	9	-10	-1	**78**	-11	-9	-7	4	-6	9	1	8
Traffic Calming Measures	0	4	19	13	9	28	9	-14	4	12	4	**70**	1	4
Pedestrian Safety	18	6	2	11	-6	**-33**	-23	14	10	-10	7	**51**	13	8
Overall Attractive for Youth	**50**	19	-10	**30**	**35**	7	-18	10	6	2	1	19	-12	2
Overall Safe	5	-7	**61**	9	-7	21	-17	-5	18	-13	-6	-3	18	18
Overall Aesthetically Pleasing	-1	14	-3	24	15	-2	27	18	**57**	-6	-3	-10	-5	11
Overall Attractive for Walking	21	4	-33	**39**	6	3	1	**40**	28	14	-3	6	14	-1
Overall Attractive for Cycling	13	-5	-26	**63**	6	0	9	9	25	10	4	6	8	7
Overall Attractive for Active Play	**65**	18	-4	20	15	-2	-18	3	-4	14	11	3	-17	9

Values are multiplied by 100 and rounded to the nearest interger. Values greater than 0.3 are printed in bold.

Table 3-VIII. Interpretation of the principal components, items, and their loadings

Component Number	Name	Items	Loading
1	Team Sports Oriented Features	Basketball*	0.40
		Soccer	0.80
		Baseball	0.53
		Bleachers	0.82
		Toilets*	0.50
		Parking*	0.37
		Attractive for Youth*	0.50
		Attractive for Active Play	0.65
2	Pool Oriented Features	Pool	0.67
		Picnic Tables	0.36
		Chalet/ Change Room	0.73
3	Perceived Safety	At Least 1 Street Visible from Centre	0.74
		At Least 1 House Visible from Centre	0.73
		Overall Safe	0.61
4	Cycling Oriented Features	Cycle Path	0.71
		Multi-Use Area	0.50
		Attractive for Cycling	0.63
5	Play Area Features	Play Area for Children 6 Years and Over	0.43
		No Dogs Sign*	0.30
		Bins	0.79
		Benches	0.70
8	Walking Oriented	Walking Trail	0.49
		Gardens	0.69
		Bike Locks*	0.38
		Overall Attractive for Walking*	0.40
9	Aesthetically Pleasing	Pond or Fountain	0.72
		Shady Areas	0.49
		Overall Aesthetically Pleasing	0.57
10	Incivilities	Graffiti	0.65
		Vandalism	0.68
		Litter	0.58
11	Infrequent Park Installations	Tennis	0.41
		Skateboard Park	0.70
		Water Sprinkler*	0.50

12	Schoolyard Features	School Yard* Traffic Calming Measures Pedestrian Facilitators	0.59 0.70 0.51

An * denotes that the item crossloaded at 0.3 or higher onto more than one component.

3.5. Cluster Analysis Results

All ten components generated from the principal component analysis and the individual park area variable (in m^2) were included in the cluster analysis. The CCC, PSF and PST2 plots, as described in the methodology section, are goodness of fit statistics, which together and/or independently can help determine the number of clusters. In this case together they favoured both a nine and six cluster solution. The six-cluster solution was represented by half the principal components from the PCA and explained 30% of the total variance. The nine-cluster solution explained almost 40% of the total variance (0.394), with all principal components represented in the solution except for the schoolyard features component. The nine-cluster solution was chosen over the six-cluster solution because it explained more of the total variance and, in particular, because it identified substantively contrasting typologies, providing some initial face validity. Each park type is summarized in Table 3-X, p.90. Table 3-IX, p.88, shows a matrix of the principal components with the park types and how high (+), low (−) or non-distinguishing (●) a principal component is on each park type from the nine-cluster solution.

Table 3-IX. Matrix of components on park type

Principal Component Label	Park Type (n) I (25)	II (181)	III (64)	IV (122)	V (56)	VI (47)	VII (59)	VIII (15)	IX (4)
1 Team Sports Features	–	–	–	++	–	+	+	–	–
2 Pool Features	●	●	●	●	●	●	++	●	●
3 Perceived Safety	●	●	●	●	–	●	●	●	●
4 Cycling Features	●	●	●	●	+	●	●	●	++
5 6+ Play Area Features	––	●	●	●	●	●	●	●	●
8 Walking Features	●	–	●	●	●	●	●	●	●
9 Aesthetically Pleasing	●	●	●	●	●	●	●	++	+
10 Incivilities	●	●	++	●	●	+	●	●	●
11 Infrequent Installations	●	●	●	●	●	++	●	●	●
12 School Yard Features	●	●	●	●	●	●	●	●	●
Park Area	●	●	●	●	●	●	●	●	+++

Park type I is low on physical activity installations including teams sports installations and play areas for children six years and older. These park areas are smaller, with a strong right skew (μ = 18 159.18 m^2, median = 4 937.81 m^2). Park type II, the largest cluster (n=181), also comprises smaller parks that are more homogeneous in size than type I (μ = 9 154.82 m^2, median = 5 457.77 m^2), with few team sports installations, and few walking features. Park type III has few to no team sports installations, but is very high on incivilities, indicating there were signs of vandalism, litter and/or graffiti present when these parks were evaluated. Park type III also tended to be slightly larger than the first two types, with the park area generally distributed around the mean (μ = 16 639.06 m^2, median = 12 175.52 m^2). Park type IV groups mostly mid-sized parks with a slight skew to the right (μ = 29 210.32 m^2, median = 21 193.21 m^2) and is described as being very high on team sports related installations. The next park type, V, also scores low on the team sports principal component and on the perceived safety principal component, but high on the cycling features principal component. The distribution of park area of type V has a strong right skew, and the mean area is larger than other park types except type IX (μ = 52 714.77 m^2, median = 20 370.48 m^2). Park type VI is high on the team sports installations principal component which includes tennis courts, water sprinklers and skateboard parks – the installations that likely appear infrequently – as well as being high on the incivilities principal component. The areas of these parks are also mid-sized with a slight right skew (μ = 42 639.94 m^2, median = 34 837.80 m^2). Park type VII can be described as high on team sports installations and very high on pool features, i.e. pools and change rooms. The area of the parks in this type tend to be more homogeneous than many of the other park types and slightly smaller than types V and VI (μ = 28 693.73 m^2, median = 23 609.93 m^2). Park type VIII, scores low on the team sports installations principal component but very high on the aesthetically pleasing principal component. The areas of these parks are also skewed right and are generally mid-sized (μ = 44 040.93 m^2, median = 24 330.31 m^2). Park type IX groups together extremely large parks (μ = 1 335 481.44 m^2, median = 1 110 748.23 m^2). This park type is described as good for cycling and aesthetically pleasing.

Table 3-X. Mean scores and standard deviation results for components describing park types

Park Type	*N*	Area (m2)		Team Sports		Pool Features		Perceived Safety		Cycling Features		6+ Play Features		Walking Features		Aesthetically Pleasing		Incivilities		Infrequent Installations		School Yard Features	
		Mean	**Median**	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
I Smaller parks low on team sports and play area features	25	18159.18	4937.81	-0.73	0.59	-0.05	0.33	-0.17	1.17	0.07	0.75	-3.57	0.95	-0.26	0.71	0.04	0.88	-0.11	0.81	-0.01	0.30	-0.34	1.05
II Smaller parks low on team sports and walking features	181	9154.82	5457.77	-0.71	0.47	-0.30	0.44	0.37	0.65	-0.13	0.83	0.28	0.65	-0.27	0.94	-0.14	0.69	-0.32	0.67	-0.07	0.50	0.04	0.91
III Smaller parks low on team sports and very high on incivilities	64	16639.06	12175.52	-0.32	0.87	-0.27	0.66	0.10	0.71	-0.20	0.62	0.27	0.39	0.34	0.79	-0.30	0.72	1.62	0.70	-0.31	0.64	-0.33	0.68
IV Mid-sized parks very high on team sports features	122	29210.32	21193.21	1.21	0.65	-0.32	0.73	0.16	0.86	-0.02	0.86	-0.01	0.68	0.11	1.13	-0.15	0.62	-0.27	0.77	-0.48	0.58	0.15	1.17
V Mid-sized parks low on team sports features and high on perceived safety	56	52714.77	20370.48	-0.47	0.67	0.01	0.68	-1.55	1.10	0.74	1.56	0.20	0.50	0.13	0.87	0.13	0.78	-0.10	1.06	-0.40	0.71	0.12	0.92
VI Mid-sized parks high on team sports and infrequent installations features and high on incivilities	47	42639.94	34837.80	0.58	0.77	-0.24	1.05	-0.29	0.92	0.13	1.08	0.24	0.57	-0.10	0.97	-0.10	1.13	0.35	0.87	2.34	0.82	0.06	1.05
VII Mid-sized parks high on team sports and very high on pool features	59	28693.73	23609.93	0.29	0.82	2.18	0.82	0.25	0.77	-0.21	0.93	-0.02	0.76	0.26	1.11	-0.05	0.69	-0.12	0.99	0.06	1.22	-0.23	1.08
VIII Mid-sized parks low on team sports features and very aesthetically pleasing	15	44040.93	24330.31	0.16	0.78	-0.50	0.66	0.02	1.35	-0.38	1.25	0.01	0.40	0.31	1.12	3.86	0.54	-0.63	0.58	0.08	0.88	0.44	0.99
IX Very large parks low on team sports features, very high on cycling features and aesthetically pleasing	4	1335481.44	1110748.23	-0.36	0.77	0.36	0.95	-0.91	0.85	1.75	1.33	0.46	0.61	-0.27	0.77	1.32	2.50	-0.98	0.35	-0.06	0.48	0.22	0.79

CHAPTER 4 : DISCUSSION

Several important and novel findings were produced from this study: estimation of the reliability of the items on the PARK tool, operationalization of the Bedimo-Rung conceptual model, validation of the parks database through on-site identification, components emerging from the principal component analysis, and finally a park typology resulting from the cluster analyses. Results from each step merit a closer look, and are discussed in detail below.

4.1. Item Reliability and the PARK Tool

Item reliability was assessed using three different but complementary methods: percent agreement, Cohen's kappa, and test-retest. As explained by Zenk et al. (2007), patterns of results from Cohen's kappa and test-retest can help researchers better understand the reliability of their observational data. When there is little response variation, the results from percent agreement can also be analyzed alongside test-retest results to provide insights into the reliability of observational data. When inter-rater (Cohen's kappa, and when there is low response variation, percent agreement) and intra-rater results are both high for an item, this suggests a stable and clearly visible park characteristic, an adequate operational definition, sufficient observer training, and/or proficient observers (Zenk et al., 2007). When both are low, this suggests that there may be problems with one or more of these aspects. An item with high inter-rater reliability and low intra-rater reliability suggests that there was likely a substantial change over time in the item being measured. Items with high intra-rater reliability and low inter-rater reliability suggest the need for more objective operational definitions, better training, possibly fewer options on the response scale, or highly subjective items. Overall, use of more than one reliability estimate is preferable to help address the deficiencies of each method alone as discussed in the methodology section.

The present study found that percent agreement was generally very high. However, although percent agreement was calculated for each item, it was only considered for items where there was low response variation between observers. Twelve items fell into this category and all had very high percent agreement (>80%) except for one item, pool length, at 70% agreement. Considering there was low response variation for these items, it is understandable that percent agreement would be very high. The pool length item likely had a lower percent agreement because it had three response options instead of two, and because observers were not equipped with measurement tools. These results, and others, suggest that for items where kappa statistics could not be calculated, percent agreement may be used as an alternative method to calculate inter-rater agreement (Saelens et al., 2006).

Cohen's kappa has been used routinely as a measure of inter-rater reliability for built environment direct-observation categorical response items (Kaczynski et al., 2012; Saelens et al., 2006; Troped et al., 2006; Zenk et al., 2007). As expected, reliability estimates from the kappa statistic tend to be lower than those from percent agreement, highlighting the importance of using a statistic that takes into consideration chance agreement between observers whenever possible. The kappa results show that the majority of items from the PARK tool were estimated to be highly reliable, particularly for objective items, which is similar to results found elsewhere (Giles-Corti et al., 2005; Kaczynski et al., 2012; Saelens et al., 2006; Troped et al., 2006; Zenk et al., 2007). There was overall less agreement between observers for the park installation evaluation items, i.e. the installation accessibility, restriction, and particularly the condition items, despite efforts to improve inter-rater reliability through a lengthy and iterative observer training process. These items were removed from subsequent analysis for two reasons: (i) they could not be applied to the entire park space because they were dependent on the presence of an installation, and; (ii) they demonstrated lower reliability estimates in general than the presence of installation items alone. The other group of items that demonstrated overall lower inter-rater reliability were the general impression items. These were considered the most subjective group of items, because they depended on the observer's opinion of how the park 'seemed' (e.g. "Does the park seem attractive overall?"). In addition, as these are new items, the parameters for chance agreement are still unclear, which may affect the kappa results as being either higher or lower. Nevertheless, the reliability results of the general impression items were either in the fair or moderate agreement range. They were considered important for inclusion because they allowed for a better overall understanding of how the park space was perceived, and because they were thought to indicate distinctions between park types.

Test-retest, or intra-rater reliability, was the final reliability estimate used for the PARK tool. Although intra- and inter-rater reliability have been suggested to be used in tandem when assessing the reliability of built environment direct-observation tools

(Zenk et al., 2007), test-retest has rarely, if ever, been used with data gathered on parks. The present study was not designed to undertake test-retest reliability, nevertheless 7% of the parks in the data set were re-evaluated, making this estimate possible for items that did not depend on the presence of a park installation. The test-retest results are most interesting for subjective items, and provide complimentary results to the kappa reliability estimates for the general impression items. The kappa estimates between observations from test time one and test time two for these items show that overall, there is better intra-rater reliability than that between raters, but only marginally so. In addition to the presence of random error, intra-rater reliability may have been lower than expected due to substantive changes in the park (leading, for example, to an increased or reduced perception of safety) and/or to individual changes over time in the observers (leading, for example, to greater skill as a result of gaining better experience in auditing over time). Although perfect agreement on subjective items, even within-subject agreement, is unrealistic, improvements can be achieved through clarifying item definitions, thorough training, and good control of the time period between observations, among others.

This is the first study known to compare inter-rater reliability results of the same items tested in two unique contexts, specifically Perth, Australia (using the POST) and Montreal, Canada (using the PARK tool). Despite the differences in study date, geographic context, observers, trainers, training methods, and number of parks evaluated, the results are almost all of very similar magnitude. Where items were found to be highly reliable in Australia, such as the presence of a 6+ play area, or the presence of public toilets, they were also found to be highly reliable in Canada. Where items were found to be less reliable in Australia, such as presence of litter and graffiti, they were similarly found to be less reliable in Canada. These findings show that the reliability of the 19 items can be considered somewhat stable in different environments, making them candidates for a standardized park evaluation tool that may be useful and reliable in a variety of geographic contexts. They also respond to a call for much needed comparisons between results from similar BE audit studies (Oakes et al., 2009) so as to help develop a better understanding of the generalizability of results.

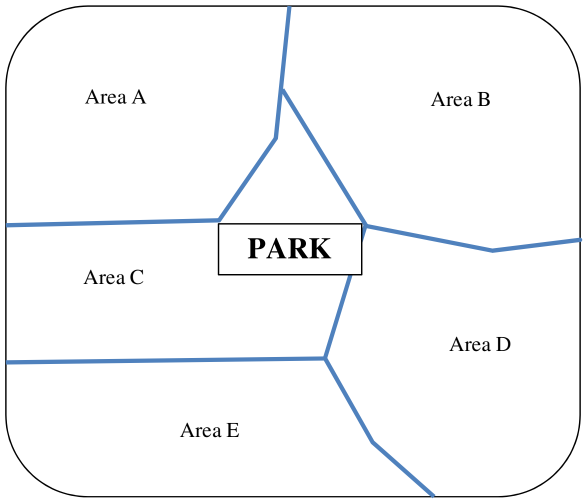
The PARK tool is a composite of items from the BRAT-DO and the POST, along with sixteen new items, all selected or developed specifically to assess park characteristics that are likely attractive specifically for children and youth. There is also a recently published tool developed for community stakeholders to assess parks, with a youth focus, the CPAT (Kaczynski et al., 2012), which was reviewed earlier, as well as the C-POST (Crawford et al., 2008). The CPAT was developed specifically for use by community groups, and based on consultation with, and testing by the same community stakeholders, which may have inflated the reliability estimates of the tool. The CPAT also had a secondary aim, which was to increase awareness of parks as a place for PA among these same individuals. The community stakeholder group consisted of 34 individuals, of which only two were teenagers. The development of the C-POST was only very generally described, and youth were not consulted in the development of the tool. The PARK tool, on the other hand, was developed to assess parks, not for a range of community stakeholders including youth, but specifically for a youth population to later assess relationships between park characteristics and PA among the same youth that have access to these parks. In addition, the PARK tool was piloted among youth. Conceptually, the PARK tool is therefore different, making it a unique and important contribution to the field of direct-observation park audit tools.

Finally, Taylor et al. (2011) demonstrated that Google Earth can be used as a reliable and cost-effective way to assess a number of park characteristics. However, there are a number of drawbacks to this approach that limit the effectiveness of virtual audits compared to direct-observation, particularly for smaller items that may be difficult to see. Google Earth images may not be up to date, they may have poor resolution, or tree coverings over parks, hiding paths or water fountains, it is also impossible to evaluate graffiti on play structures, for example, or the quality of park benches. It is for these reasons that direct-observation audits remain the gold standard in built environment observation, and should be used over virtual audits whenever possible.

4.2. Operationalization of the Bedimo-Rung Model

The Bedimo-Rung model was operationalized for use in this study. One substantial conceptual difference between the original and operationalization of the model bears further discussion here. The Bedimo-Rung model conceptualized parks as having somewhat distinct geographic areas (e.g. activity areas and supporting areas), that are each to be evaluated separately based on the domains of features, condition, access, aesthetics, safety and policies (Figure 4.1*a*, p.98). Bedimo-Rung asserts that the domain and geographic areas may correlate or overlap with each other (Bedimo-Rung et al., 2005), however the geographic areas domain presents parks as having divisible areas that should be evaluated distinctly from each other, and the BRAT-DO tool (Bedimo-Rung et al., 2006) was developed to evaluate parks in this way. For the present study, the parks have been conceptualized holistically, so that the parks have each been evaluated as one unit (Figure 4.1*b*, p.98).

a)



b)

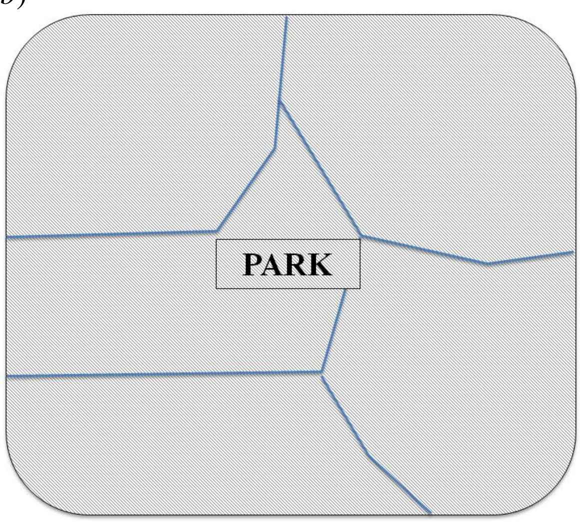


Figure 4.1. According to the Bedimo-Rung conceptual model, a park has different geographic areas that should be evaluated more or less distinctly (panel *a*). In the operationalization of the Bedimo-Rung conceptual model, parks were conceptualized as a whole, without distinct areas, and were evaluated as such (panel *b*).

This conceptual difference changes the way parks are thought of as being appealing for PA. In the Bedimo-Rung model a park is not conceptualized as its whole, but different areas of parks can be thought of as being appealing for PA for different types of PA, or different age groups of people. For example, a swing set and sandbox area will likely be appealing for parents with young children, an area with tennis courts will likely be appealing for adults or older youth, and an area with picnic tables and benches for families. In this study, because the focus is only on youth, the park is seen as an entire space, through the lens of its appeal for youth. That is, the entire space should be sufficiently appealing for youth taking into consideration the PA installations and amenities within. On a pragmatic level, the Bedimo-Rung conceptual model is likely more useful for much larger parks, whereas the operationalization of the model is more useful for mid to smaller sized parks. The parks in this present study are by and large medium to small in size, making the conceptual changes applied here useful for this data set. This type of conceptual change may be interesting for future studies assessing park characteristics for PA, depending on the study population as well as the size of the parks being evaluated.

4.3. Parks Identified On -Site

Studies in which parks are evaluated use different methods to identify the parks. Some have used GIS (Saelens et al., 2006; Troped et al., 2006), some ask a local parks and recreation department to provide a list of parks (Giles-Corti et al., 2005; Kaczynski et al., 2012), whereas others do not specify how the parks were identified (Bedimo-Rung et al., 2006; Crawford et al., 2008; McKenzie et al., 2006). This study used a two-step approach to identify up to three closest parks, within a 500 m or 1000 m buffer zone, to the homes of the youth in the QUALITY Cohort. What is novel about this approach is that parks were pre-identified using CanMap and observers were instructed to evaluate parks that had not been pre-identified if they were found to be within the designated 500 m buffer zone. In addition, if a park area was significantly different from the one found using CanMap (as printed on maps provided to observers prior to going on the field), the observers were instructed to draw the park boundaries as they found them directly on the map. CanMap was used to pre-identify as many parks as possible. Nevertheless, 40% of the parks in the final data set were found on-site. The two-step method allowed for a much more representative and valid sample of parks than would have been found using CanMap alone. Like Google Earth, GIS images can be out of date, or they can have poor approximations of park size particularly in suburban areas with new developments. Future studies using CanMap satellite imaging that relies on GIS technology to identify parks should be aware of the limitations of this method, and may not have a valid or representative sample if CanMap is the only method used to identify parks in a particular area.

4.4. Principal Component Analysis

This is the first time, to the knowledge of the author, that a conceptual model of parks and PA has been empirically tested. The initial operationalization of the Bedimo-Rung conceptual model was later used to interpret the results of an exploratory principal component analysis with interesting results that may help glean some further insight as to how parks may be conceptualized and audited for PA. Once the analysis was complete, each principal component was thought of as possibly fitting under a domain from the operationalization of the model based on the individual variables that loaded onto that principal component. For example, the first principal component is labeled 'Team-sports oriented features' because it is the only principal component to have team-sports oriented installations loading onto it (basketball courts, soccer/football fields, and baseball diamonds), in addition, it has amenities that support team sports activities (toilets and parking), and finally two general impression items indicate that this component is likely appealing for active PA among youth (attractive for youth and attractive for active play). Because this principal component seems to be a collection of variables that describe a park amenable to PA, it was seen as fitting well under the "Activity Features" domain. In this way, each principal component was assigned to a conceptual domain from the model. Six principal components were assigned to the Activity Features domain (Team sports oriented features, Pool oriented features, Cycling oriented features, Play area features, Walking oriented features and Infrequent park installations) because each of these principal components contained at least one PA installation that thematically dominated the principal component when considering PA as a primary objective (Figure 4.2, p.102). The other domains that were assigned principal components were Safety, Aesthetics, and Condition. The School Yard Features principal component was assigned to the Safety domain because it contained two variables (Traffic calming measures and pedestrian facilitators) that were used to assess the safety of the surrounding park streets.

Figure 4.2. Components assigned to domains from the operationalization of the Bedimo-Rung conceptual model.

This helps glean possible insight into the ways in which parks can be thought of conceptually, as well as measured for PA for two reasons: (i) because of the conceptual domains that represent the principal components, and those that do not, and; (ii) because of the combinations of variables that load together. As mentioned above, the domains of Activity Features, Safety, Aesthetics and Condition seemed to, at least in an exploratory way, best describe the principal components that emerged suggesting that these four domains may be somewhat unique conceptual domains of parks that can be measured indirectly. The Amenities domain, on the other hand, is missing from this group, suggesting the inverse – that is, that amenities may not be a unique conceptual domain of parks, and cannot be measured as such. This is supported by the ways that the variables loaded together to generate the principal components. What can be seen is that many of the principal components under the Activity Features domain contain both PA installations as well as amenities that one would likely see in conjunction with each other. For example, the Pool oriented features principal component captures swimming pools, as well as change rooms and picnic tables. One would expect to see a park amenity such as a change room next to a pool, for the pool would become an almost inaccessible installation if no change rooms were present. As well, park benches and garbage bins loaded with children's play areas, suggesting that these park amenities (the benches and bins) are often found alongside children's play areas, where caretakers can comfortably keep an eye on the children playing, and help maintain the area free of litter. Activity Features may be present without amenities (e.g. the infrequent park installations principal component contains only tennis courts, skateboard parks, and water sprinklers), however amenities are unlikely to be found clustered together on their own in a park, but rather present to support a PA installation.

The principal components themselves may also help develop a better understanding of what variables need to be measured in a park to capture certain conceptual domains. For example, it may be that a park can be considered aesthetically pleasing when it contains a pond or fountain along with shady areas (suggesting many trees), and these may be the only two variables necessary to capture this construct. The principal components may also help researchers better understand the combination of variables that should be found and measured together in a park. For example, it may be important that parking lots and bleachers are present along with team-sports installations, to allow teams, which likely have equipment, to easily access the space and for spectators, such as parents of youth teams, to be comfortably present. Although this is an exploratory study, future studies should continue to assess the combination of installations and amenities that are found present together in parks, which may help generate a better understanding of measureable park characteristics that may be amenable to PA.

4.5. Cluster Analysis Results

Although cluster analysis has been used with neighbourhood data (Charreire et al., 2012; Dupéré & Perkins, 2007; Li & Chuang, 2008; van Hulst et al., 2012), to the knowledge of the author, this is the first time cluster analysis has been used with park characteristics data to develop a typology of parks. As was done with the results of the PCA, the results from the CA were interpreted using the operationalization of the Bedimo-Rung conceptual model. In general, results show that a number of the conceptual domains from the model are measurable. The parks types were found to be primarily characterized by two or three conceptual domains each, and not more (Table 4-I, p.105). For example, park types I, II, IV, and VII were characterized by Activity Features, and Area, with Activity Features either considered low (types I and II) or high (types IV and VII). This may indicate that perhaps some types of parks are predominantly characterized by only a few of the conceptual domains from the model. This is not to suggest that the other conceptual domains are not present in a park, however it may be that some domains trump others as predominantly characterizing the overall park.

Table 4-I. Conceptual domains that predominantly characterize each park type

Park Type	Park Description	Conceptual Domain
I	Smaller parks low on team sports and play area features	↓ Activity Features ↓ Area
II	Smaller parks low on team sports and walking features	↓ Activity Features ↓ Area
III	Smaller parks low on team sports and very high on incivilities	↓ Activity Features ↑ Condition (Incivilities) ↓ Area
IV	Mid-sized parks very high on team sports features	↑ Activity Features • Area
V	Mid-sized parks low on team sports features and high on perceived safety	↓ Activity Features ↑ Safety • Area
VI	Mid-sized parks high on team sports and infrequent installations features and high on incivilities	↑ Activity Features ↑ Condition (Incivilities) • Area
VII	Mid-sized parks high on team sports and very high on pool features	↑ Activity Features • Area
VIII	Mid-sized parks low on team sports features and very aesthetically pleasing	↓ Activity Features ↑ Aesthetics • Area
IX	Very large parks low on team sports features, very high on cycling features and aesthetically pleasing	• Activity Features ↑ Aesthetics ↑ Area

↑ indicates the park type is high on a domain
↓ indicates the park type is low on a domain
• indicates the park type is neither high nor low on a domain

It remains to be seen whether any relationship exists between the conceptual domains and PA among youth, although there is some evidence that larger park areas may be associated with youth PA (Cohen et al., 2010; Epstein et al., 2006). Future research should test possible associations among the youth in the QUALITY Cohort. The park typology can therefore be said to be, at least initially, useful for its intended purpose: to help identify park characteristics that may be associated with PA among youth. Further, the principal components add a layer of detail to the outcome of the park typology, which may later be useful for identifying specific characteristics that underlie associations between park types and PA. For example, park types I and II are similar in terms of how they are characterized by conceptual domains, however they differ on one principal component each. If one park type is found to be associated with PA but the other is not, the detail from the principal components may help interpret the results with greater insight.

Although future studies that assess the relationship between the park types identified here and PA among the youth who live near them is necessary, the present park typology was able to succinctly describe a very large number of parks by their dominant features that are possibly attractive for PA among youth. In doing so, this study helps to further develop an understanding of the characterizing features of parks that may be of interest to and associated with youth PA. In particular, the park typology features a number of parks that are either high or low on team sports features. This is likely an important park feature – one that includes both team-sports related physical activity installations as well as supporting amenities – that is likely to have a strong influence on park use among youth. It may also be that for the age group of interest, aesthetically pleasing aspects of parks may not be relevant, nor may the presence of incivilities be a concern when there are team-sports related activities available. It may also be that park type VII, those with team-sports feature and with pool features, is found to be associated with the highest amount of PA among youth, as pools are likely very attractive features of parks for youth. Future studies may help identify the differences in association between park type IV, those only high on team-sports features, and park type VII with physical activity in order to parse out whether the association is driven primarily by the presence of team-sports installations or pool features. Nevertheless, it is clear from the park typology that there are at times subtle but possibly important differences between types of parks that are likely important for their appeal and use among youth.

LIMITATIONS, IMPLICATIONS FOR FUTURE RESEARCH AND CONCLUSIONS

Limitations

Several limitations of this study must be taken into consideration. The PARK tool underwent expert consensus and was piloted among youth in their late teens and early twenties. The tool therefore may not have captured all aspects of parks that are interesting for PA among pre-teens as this age group was not consulted. The study was not designed to estimate intra-rater reliability, resulting in a very large range of days between the first and second test, as well as few parks that underwent test-retest, resulting in significantly fewer opportunities to estimate intra-rater reliability (n=40) than inter-rater reliability (n=576). The large range in days between test occasions may lead to an underestimation of the correlations between responses, whereas the limited number of test-retest occasions reduced the number of items for which this test could provide results because many of the items depend on the presence of an installation for a response.

The operationalization of the Bedimo-Rung model made one important change to the way parks are conceptualized for PA, as explained above in the discussion section (Figure 4.1, p.98). This change was applied because the parks were assessed uniquely for their appeal to youth PA. It may be erroneous to assume that a park can be appealing for youth in its entirety, and it may be that some areas of parks are more appealing for youth than others, and that parks should be evaluated as such. Nevertheless, the results of the principal component analysis and cluster analysis did identify different types of parks on key features that are hypothetically associated with PA among youth (e.g. team sports features and safety). Future testing may be able to shed light on whether this conceptualization of parks can help reveal differences between park types for PA.

The exploratory PCA was conducted with binomial data. This is a limitation to the extent that normally distributed variables will enhance a solution. However, if normality fails, the solution is downgraded but can still provide a worthwhile description of the relationships in a set of variables (Tabachnick & Fidell, 2007, p. 613, chapter 13). In the present study, the components were interpretable based on the variables that correlated with each other, providing support for the use of this method. Variables were retained if they loaded at 0.3 or higher. This may be adequate for exploratory purposes, however the lower-loading variables may not explain enough of the variance in a component to be meaningful. Principal components that contain lower loading variables should be interpreted with some caution. A small number of variables crossloaded onto other components. This is not surprising in a PCA using parks data, because park characteristics are unlikely to be present to the exclusion of others. Nevertheless, crossloading variables are often removed from a principal component result. They were not in this case because of the exploratory purposes of the study. Finally, the principal components were assumed to be uncorrelated, which may not be a valid assumption for parks data.

A CA can be cross validated, either with a similar set of data, or by randomly splitting the dataset, as was done by Li and Chuang (2008). The cluster analysis results were not validated in this way here, and therefore generalizability of the park typology to parks in other cities, or to other parks in Montreal not included in this data set, is unknown. The cluster analysis outcome from this study could be validated in a future study, using data from other parks not found in this dataset located in Montreal or a similar sized Canadian city.

Finally, the parks in the study are near the homes of youth who are overall from higher income families than the average Quebec household (Lambert et al., 2011). Because this is not a random sample of neighbourhoods, the parks themselves are not a representative sample of Montreal parks and should not be thought of as such. Nevertheless, the parks are in neighbourhoods that range in socioeconomic status, allowing a comparison of characteristics between contrasting neighbourhoods in future research. In addition, the youth are specifically a population at high-risk for obesity. Identifying park characteristics that may help promote PA among this population may be particularly important.

Implications for Future Research

This study presents a novel and innovative approach toward a better understanding of the characteristics of parks that may be associated with PA among a population of youth at risk for obesity. Future research should explore possible associations between the park types found in the park typology and physical activity among youth from the QUALITY Cohort. This should include assessing whether, and if so which, of the latent conceptual domains are more or less associated with PA, as well as assessing associations between PA and the more detailed principal components (e.g. Team Sports Installations or Aesthetically Pleasing components), that make up the park types. Although the primary goal of this work was to develop a park typology specifically for future research on associations with PA among youth, a number of other areas for future research have been introduced throughout this study.

The reliability of the tool was assessed among a select, non-representative sample of parks in Montreal. An understanding of the reliability of the items on the PARK tool could be improved by auditing a random and representative sample of parks in Montreal, as well as parks in other jurisdictions. If these studies are to be undertaken, inter- as well as intra-rater reliability should be incorporated into the assessment by design. The principal component analysis was conducted using an orthogonal rotation in which components are not correlated. Future research may want to explore the outcome of a principal component analysis using an oblique rotation in which the components are correlated for a better understanding of the relationships between components derived from parks data. Finally, the cluster analysis results should be validated using data from a random sample of parks in a similar context.

Conclusions

Worrying trends toward increased weight and reduced fitness among Canadian youth call for a better understanding of factors that can help promote physical activity among this population. Aspects of the built environment, specifically public parks, hold potential for promoting physical activity among youth at a population level because they are accessible, typically cost-free, and often designed to be appealing for physical activity among youth. However, few studies have assessed the specific park characteristics that may be appealing for youth physical activity.

The purpose of this methodological study was to estimate the reliability of a direct observation park audit tool, to develop a park typology of parks from the Greater Montreal Area and to interpret the results using an operationalization of the Bedimo-Rung conceptual model of parks and physical activity (2005).

In order to do this, the three closest parks within a 500 m or 1000 m buffer zone near the homes of participants in QUALITY Cohort were identified. Parks were identified through a two-step sampling plan in which parks were pre-identified using a GIS and identified on-site by observers. The parks were audited using the PARK Tool, which was assessed for reliability using both intra and inter-rater reliability. The Bedimo-Rung conceptual model was operationalized through discussion and consensus. An exploratory principal component analysis was conducted using an orthogonal varimax rotation and variables were retained if they loaded on to components at 0.3 or higher. A cluster analysis using Ward's method was then conducted using the principal components and the park area variable. The principal component analysis and cluster analysis were subsequently interpreted using the operationalization of the Bedimo-Rung conceptual model. A total of 576 parks were assessed around the homes of 512 study participants.

The PARK tool was found to be feasible and generally reliable. The principal component analysis yielded ten principal components explaining 60% of the total variance and components were well described by their variable loadings. Some components could be explained by domains from the conceptual model (i.e. Features, Condition, Safety and Aesthetics) however the Amenities domain could not be explained by the components. Park amenities (e.g. change rooms) loaded with physical activity installations (e.g. pools) and were not found together in one component as a unique conceptual domain. The cluster analysis yielded a nine-cluster outcome explaining 40% of the total variance. The operationalization of the Bedimo-Rung conceptual model was able to help interpret the results of the cluster analysis. Park types were found to be described by two or three predominant conceptual domains each.

This study lays the foundation for future research into possible associations between physical characteristics of parks, summarized in a park typology, and PA among youth at risk for obesity. As demonstrated, the built environment and public parks are a promising area of research because they are often designed for youth physical activity, they are accessible spaces in which to be active, and some natural experiments have shown investment in park infrastructure improvements to be cost-effective interventions for improved physical activity at a population level.

An adequate understanding of the characteristics of parks as they may be related to youth PA is an essential first step in studies that wish to identify associations between park characteristics and PA among youth. With an increasing prevalence of overweight and obesity among Canadian youth, foundational work such as this has become important in efforts to help clearly identify ways in which public health can intervene to increase PA and reduce overweight status among youth at risk. The park typology presented in this study may provide keys to particular park characteristics that are attractive to youth at risk of becoming overweight or obese, and at the same time, it may help identify those characteristics of parks that are not attractive to this population. By doing to, it may be possible to identify ways in which public parks can be modified to help reduce future negative health impacts related to long term inactivity and overweight beginning in youth. This work is therefore important in a public health research context for it has characterized one of the structural elements that determine health – that of parks in the urban built environment. This work sets the stage for future research that may later help inform park intervention projects in order to maximize their appeal for PA.

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APPENDIX I

The QUALITY Cohort

The QUALITY Cohort is described in detail by Lambert et al. (Lambert et al., 2011). The cohort was not intended to be representative of the Quebec population of families with children aged 8-10 years. Comparison of the Cohort with a representative sample of Quebec children of similar ages shows that the children in the QUALITY cohort are of higher socio-economic status, more likely to live with both parents, to reside in urban regions, more likely to have parents with higher levels of education, to be overweight or obese, to have a worse lipid profile overall, and to report less time watching television (Lambert et al., 2011).

In terms of recruitment and participation in the QUALITY Cohort, 387 377 pamphlets were distributed in 1040 primary schools. 89% of the schools approached accepted to distribute the pamphlets. From this initial distribution, 3350 families contacted the research coordinators to assess their eligibility, of which 61% were not eligible. 1320 families met the eligibility criteria, and 52% (n=686) choose not to participate. 634 families (48% of eligible families) were seen for Visit 1, and 4 of these families were removed from the study by the research team because the child or parent were unable or refused to complete most of the data collection for baseline assessment after providing consent to participate. 630 families were invited for Visit 2, of which 47 refused to participate, and 19 were loss to follow-up. In total, 564 families completed Visit 2, for 89% retention (Lambert et al., 2011).

APPENDIX II

Origins of Items on the PARK Tool

	ADAPTED FROM		
ITEM	**POST**	**BRAT-DO**	**NEW**
ACTIVITIES			
Park Type	●		
Tennis Courts Present	●	●	
Tennis Accessible/Condition/Restriction		●	
Basketball Courts Present	●	●	
Basketball Accessible/Condition/Restriction		●	
Badminton/Volleyball Courts Present			●
Badminton/Volleyball Accessible/Condition/Restriction			●
Soccer/Football/Rugby Field Present	●	●	
Soccer/Football/Rugby Accessible/Condition/Restriction		●	
Baseball Field Present	●	●	
Baseball Accessible/Condition/Restriction		●	
Hockey/ Ringette Rink Present	●		
Hockey/ Ringette Accessible/Condition/Restriction			●
Track (Track & Field) Present	●		
Track Accessible/Condition			●
Trail Present	●	●	
Trail Accessible/Condition		●	
Bike Path Present	●	●	

Bike Path Accessible/Condition		●	
Skate Park Present			●
Skate Park Accessible/Condition/Restriction			●
6+ Play Area Present	●	●	
6+ Play Area Accessible/Condition		●	
Multi-Use Area Present		●	
Multi-Use Area Accessible/Condition		●	
School Yard Present			●
School Yard Accessible/Condition			●
Equipment Rental Available			●
Type of Equipment Rental			●
Pool Present		●	
Length of Pool/Condition/Cleanliness		●	
Water Sprinklers Present			●
Water Sprinklers Condition/Cleanliness			●
ENVIRONMENTAL QUALITY			
Large Body of Water Present	●	●	
Sportive Aquatic Activities Present		●	
Pond or Fountain	●		
Aquatic Activities Present		●	
Decorative or Cultural Features	●	●	
Type of Decorative Items			●
Garden Present	●		
Shady Areas Present	●		
No Dogs Allowed Sign Present	●	●	
Graffiti Present	●	●	
Vandalism Present	●		
Litter Present	●	●	
SERVICES			
Garbage Bins Present	●	●	

Drinking Fountain Present	●	●	
Picnic Tables Present	●	●	
Sitting Benches Present	●	●	
Bleachers Present		●	
Public Toilets	●		
Condition of Toilets		●	
Chalet/ Change Room Present	●		
Condition of Chalet/ Change Room		●	
Parking Present	●	●	
Bike Locks Present		●	
Public Transportation Present	●		
SAFETY			
Sufficient Lighting for Park	●		
At Least 1 Street Visible from Center	●		
At Least 1 House Visible from Center	●		
Adjacent Streets Local	●	●	
Traffic Calming Measures Present		●	
Pedestrian Safety Present	●	●	
GENERAL IMPRESSION			
Overall Appealing for Youth			●
Overall Safe			●
Overall Attractive/Pretty		●	
Attractive for Walking	●		
Attractive for Bicycling	●		
Attractive for Active Play			●

APPENDIX III

The PARK Tool

Family PIN	
Observer ID.	
ID of co-observer	
Observer code. (A or B)	
Date	
Park ID	
Park address	
Start time	
1. Type of Usage	
Physical activity structured	1
PA non-structured	2
PA struct. and non-struct.	3
Passive activities – gardens	4
Passive only	5 (skip to Q11)
2A1. Tennis: Check if present	
2A2. Check if accessible	
2A3. Check if in good condition	
2A4. Check if restricted	
2B1. Basketball: Check if present	
2B2. Check if accessible	
2B3. Check if in good condition	
2B4. Check if restricted	
2C1. Badminton/Volleyball:	
Check if present	
2C2. Check if accessible	
2C3. Check if in good condition	
2C4. Check if restricted	
2D1. Soccer/Football/Rugby: Check if present	
2D2. Check if accessible	
2D3. Check if in good condition	
2D4. Check if restricted	
2E1. Baseball/Softball: Check if present	
2E2. Check if accessible	
2E3. Check if in good condition	
2E4. Check if restricted	
2F1. Hockey/Cosom/Ringette: Check if present	
2K2. Check if accessible	
2F3. Check if in good condition	
2F4. Check if restricted	
2G1. Race Track: Check if present	
2G2. Check if accessible	
2G3. Check if in good condition	

2H1. Foot Path: Check if present	
2H2. Check if accessible	
2H3. Check if in good condition	
2I1. Bicycle/Rollerblade Path: Check if present	
2I2. Check if accessible	
2I3. Check if in good condition	
2J1. Skate Park: Check if present	
2J2. Check if accessible	
2J3. Check if in good condition	
2J4. Check if restricted	
2K1. 6+ Play Area: Check if present	
2K2. Check if accessible	
2K3. Check if in good condition	
2L1. Multi-Use Space: Check if present	
2L2. Check if accessible	
2L3. Check if in good condition	
2M1. School Yard: Check if present	
2M2. Check if accessible	
2M3. Check if in good condition	
3.a) Equipment Rental: Check if present	
b) Specify: **TEXT**	

4. Pool Check if present	
5. Pool Length:	
Under 25m	1
Longer or equal to 25m	2
Impossible to evaluate	3
6. Condition Around the Pool:	
No deterioration	1
Presence of deterioration without need for repairs	2
Significant deterioration requiring repairs	3
Under construction	4
Impossible to evaluate	5
7. Cleanliness of Pool:	
Very clean	1
Clean enough	2
Not at all clean	3
Impossible to evaluate	4
8. Water Sprinklers: Check if present	
Water sprinklers under construction	3
9. Water Sprinklers Condition:	
No deterioration	1
Presence of deterioration without need for repairs	2
Significant deterioration requiring repairs	3
Under construction	4
Impossible to evaluate	5
10. Cleanliness of Water Sprinklers:	

Very clean	1
Clean enough	2
Not at all clean	3
Impossible to evaluate	4

11A. Important Body of Water: (if no skip to Q12) Check if present	
11B. Sportive Aquatic Activities: Check if present	
12A. Pond or Fountain: (if no skip to Q13) Check if present	
12B Sportive Aquatic Activities: Check if present	
13A. Decorative or Cultural Physical Elements: (if no skip to Q14) Check if present	
13B. If present, specify: TEXT	
14. Gardens: Check if present	
15. Shade:	
Many places	1
Some places	2
None	3
16. No Dogs Allowed Sign: Check if present	
17. Graffiti:	
None	1
Some	2
A lot	3
18. Broken Items/	

Vandalism:	
None	1
Possibly	2
Definitely	3
19. Litter/Garbage:	
None	1
Some	2
A lot	3
20. Garbage Bins:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
21. Drinking Fountains:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
22. Picnic Tables:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
23. Sitting Benches:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
24. Bleachers:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
25A. Public Toilets:	
Yes	1
No	2 (Skip to Q26)
Impossible to determine	3 (Skip

	to Q26)
25B. Condition of Toilets:	
Good	1
Bad	2
Impossible to determine	3
26A. Chalet/Change rooms:	
Yes	1
No	2 (Skip to Q27)
26B. Condition of Chalet/Change rooms:	
Good	1
Bad	2
Impossible to determine	3
27. Parking:	
Yes, reserved for the park	1
Yes, on the street only	2
No	3
28. Bicycle Locks:	
Check if present	
29. Public Transportation:	
Check if present	
30. Sufficient Lighting to Light the Majority of the Park:	
Check if present	
31. At least 1 Street Visible from the Centre of the Park:	
Check if yes	
32. At least 1 House Visible from the Centre of the Park:	
Check if yes	
33. Adjacent Streets are Local:	
All	1
Some	2
None	3
34. Adjacent Streets have Traffic Calming Measures:	
All	1
Some	2
None	3
35. Adjacent Streets have Pedestrian Facilitation Measures:	
All	1
Some	2
None	3
36. Is the Park Attractive for Youth?	
Very attractive	1
Attractive enough	2
Not attractive	3
37. Is the Park Safe?	
Very safe	1
Safe enough	2
Not safe	3
38. Is the Park Pretty/ Attractive?	
Very pretty/ attractive	1
Pretty/ attractive enough	2
Not pretty/ attractive	3
39. Is the Park Appealing for Walking?	
Very appealing	1
Appealing enough	2
Not appealing	3

40. Is the Park Appealing for Cycling?	
Very appealing	1
Appealing enough	2
Not appealing	3
41. Is the Park Appealing for Active Play?	
Very appealing	1
Appealing enough	2
Not appealing	3
42. Time of Completion:	

APPENDIX IV

The Park Observation Training Manual

A. Aperçu global

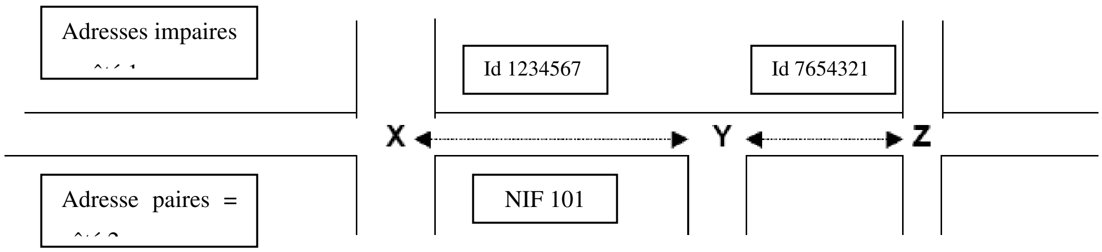
L'Étude Résidentielle a pour but d'investiguer les liens potentiels entre les caractéristiques des quartiers résidentiels et les habitudes de vie chez des jeunes.

Les caractéristiques des quartiers résidentiels sont mesurées de plusieurs façons. La source principale de ces informations découle des données collectées par les observateurs. Ces observateurs évaluent jusqu'à 10 tronçons de rue, ainsi que tous les tronçons qui se retrouvent dans la zone de 500 mètres autour de la résidence de chaque participant. Jusqu'à 3 espaces publics (parcs, terrains sportifs, etc.) situés dans une zone de 1000 mètres autour de la résidence du participant sont également évalués. Ces informations sont collectées sous forme de grilles d'évaluation à l'aide d'un agenda numérique personnel (ANP).

Deux définitions importantes :

Tronçon de rue : chaque rue est composée de plusieurs tronçons de rue, un tronçon correspond à une section de la rue entre deux intersections, chaque tronçon est identifié par un numéro d'identification unique. Par exemple, les tronçons X-Y et Y-

Z portent le même nom de rue mais ils ont un numéro d'identification différent, et une évaluation sera complétée pour chacun.



Coté de rue : certaines questions demandent une évaluation spécifique à un côté du tronçon (ex : largeur du trottoir sur le *côté 1* vs. sur le *côté 2* du tronçon). Pour tous les tronçons, le *côté 1* correspond au côté avec des adresses impaires, et le *côté 2* correspond au côté avec des adresses paires.

L'évaluation des quartiers se fait en équipe de deux mais de façon indépendante, c'est-à-dire que les deux observateurs font simultanément l'évaluation du quartier **sans toutefois se consulter sur ce qu'ils ont observé ou sur leurs impressions**. Pour ce faire, chaque observateur marchera sur les côtés opposés des rues. L'évaluation des espaces publics se fait aussi de façon indépendante, en restant à plusieurs mètres mais toujours en vue l'un de l'autre. Chaque observateur doit porter en tout temps sa carte d'identification de l'hôpital Sainte-Justine. De plus chaque observateur doit signer l'entente de confidentialité.

B. Journée « type » de collecte de données

Puisque l’évaluation des quartiers implique la nécessité de parcourir de grandes distances à pied, il est important que les observateurs soient reposés et en forme et qu’ils soient équipés de façon appropriée (bonne paire de chaussures, des vêtements adéquats selon les conditions climatiques, chapeau, crème solaire, de l’eau/collation, sac-à-dos).

Voici ce à quoi ressemble une journée type :

Se rendre au Centre de recherche du CHU Sainte-Justine pour 8:00 AM. La coordonnatrice du projet vous assigne un co-équipier et vous remet le matériel nécessaire pour la collecte de la journée :
Une carte détaillée pour chacun des quartiers à évaluer indiquant les tronçons de rue à évaluer (en rouge), le tronçon où demeure le participant, les noms des rues et un identifiant pour les 10 tronçons à évaluer, une zone (network buffer) de 500 mètre autour de la résidence (en jaune) et tous les espaces publics à l’intérieur d’un rayon de 1000m de la résidence indexe numérotés à partir de celui qui est le plus près de la résidence indexe;

Un agenda numérique personnel (ANP : Pocket PC IPaq 110) qui contient les questionnaires électroniques à compléter pour chaque quartier; des copies papier des questionnaires (au cas où l’ANP fait défaut), un pince-note et des stylos seront aussi remis en cas de problème technique avec l’ANP.

Le transport et les déplacements entre les quartiers seront organisés selon les besoins et les situations particulières, mais se feront surtout en transport en commun. Les observateurs se rendent en équipe de deux dans le premier quartier à évaluer. Au point de départ, chaque observateur fait individuellement son évaluation, **sans se consulter au sujet des items de réponse du questionnaire.** Notez que les observateurs marchent toujours dans la même direction mais sur les côtés opposés de la rue.

Le questionnaire NBE est complété pour chaque tronçon identifié sur la carte (jusqu'à dix tronçons par NIF). Dans certains cas, un tronçon peut-être éliminé de l'évaluation :

Si le tronçon n'existe pas

Si le tronçon est très court ou est un rond-point

S'il y a seulement des côtés de maison sur le tronçon (pas d'adresses)

Si c'est une artère majeure où c'est dangereux de marcher

Si le tronçon est privé (camping, chemin ou entrée privée)

Si c'est un tronçon industriel (compléter le questionnaire NBE jusqu'à la question cinq)

Ensuite, les observateurs parcourent l'ensemble des tronçons situés à l'intérieur de la zone délimitée de 500 mètre pour compléter de façon indépendante le questionnaire sur l'Impression générale du quartier. **Avant de procéder à l'Impression générale,**

vérifiez que tous les tronçons ont été évalués/parcourus. En plus de noter les éléments faisant partie de l'impression générale, voici les autres aspects à identifier sur la carte :

Les parcs ou espaces publics récréatifs pas identifiés sur la carte : hachurer la zone couverte par l'espace public. Si nécessaire, évaluer le parc à l'aide du questionnaire POST-adapté (voir point 5).

Les pistes et voies cyclables

Les centres/complexes sportifs intérieurs ou extérieurs

Tout autre élément relié à la pratique de l'activité physique visant particulièrement les jeunes

Les observateurs évaluent jusqu'à trois espaces publics par NIFs, incluant les parcs identifiés sur la carte et les « nouveaux » parcs découverts sur le terrain lors de l'évaluation de l'Impression générale. Les observateurs doivent marcher toutes les rues à l'intérieur du 500m afin de s'assurer d'identifier tous les parcs présents dans la zone du 500m. Les parcs situés dans cette zone sont priorisés. S'il y a plus de 3 parcs dans la zone, sélectionner et évaluer les 3 parcs les plus près de la résidence. Dans les cas où il n'y a pas de parc dans la zone de 500 mètres, évaluer le parc qui est le plus près de la résidence et qui est situé à moins d'un kilomètre de la résidence. Il est important de clairement identifier quels parcs sont évalués et d'inscrire sur la carte le nom du nouveau parc ainsi que le numéro du POS correspondant questionnaire complété dans l'ANP (POS1, POS2, ou POS3). Pour chaque espace public, les observateurs répondent individuellement au questionnaire POST-adapté qui mesure différents aspects caractérisant ces espaces.

Après chaque étape (dix tronçons, Impression générale, 3 POS), les observateurs doivent vérifier que tous les items pertinents ont été répondus. NOTE : L'ordre dans lequel l'évaluation est faite peut varier selon le quartier de façon à ce que les parcs soient évalués au moment qui convient le mieux. Par exemple, le questionnaire NBE et l'Impression générale peuvent être entrecoupés d'évaluation des parcs. Par contre, le NBE doit être entièrement complété à la fin de chaque tronçon, et l'Impression générale peut seulement être complétée lorsque tous les tronçons de la zone de 500 mètres ont été évalués.

Dans la majorité des cas, les observateurs doivent revenir à Sainte-Justine à la fin de la journée. (Pour des quartiers plus éloignés, d'autres modalités seront à discuter selon le besoin). La coordonnatrice s'occupera de transférer les données de l'ANP, de télécharger les prochains fichiers-quartiers et de recharger l'appareil. S'ils retournent à la maison avec l'ANP, il est **très important de charger l'ANP** pour la prochaine journée de collecte.

Voici quelques trucs qui assureront que les évaluations soient les plus justes et précises possible :

Consultez le manuel souvent et dans tous les cas où vous hésitez sur la manière de répondre à une question;

Dans le cas d'incertitude vis-à-vis un aspect particulier du quartier, noter les questions avec le plus de détails possible dans un cahier prévu à cette fin. Vous pourrez alors discuter de la situation avec la coordonnatrice du projet. Toujours inscrire le NIF et le numéro de la question. Vous pouvez également y inscrire des informations additionnelles qui vous semblent pertinentes.

À la fin de chaque évaluation, vérifier à ce que vous avez répondu à toutes les questions.

Dans les prochaines pages, les questions sont décrites et dans plusieurs cas, des clarifications et spécifications additionnelles sont données. Il est essentiel de lire et bien comprendre toutes les situations décrites.

C. Questionnaire Public Open Space Tool adapté (POST)

Le POST est complété pour un maximum de trois espaces publics par NIFs, incluant les parcs identifiés sur la carte et les « nouveaux » parcs découverts sur le terrain lors de l'évaluation de l'Impression générale (complétée pour la zone de 500 mètres). Pour les « nouveaux » parcs, ne pas oublier de les situer sur la carte et d'identifier le nom du parc et le numéro du POS correspondant au questionnaire électronique de l'ANP (ex. POS1, POS2, ou POS3).

L'évaluation des parcs situés à l'intérieur de la zone de 500 mètres est priorisée. S'il y a plus de 3 parcs dans cette zone, sélectionner et évaluer les 3 parcs les plus près de la résidence indexe. Dans les cas où il n'y a pas de parc dans la zone de 500 mètres, évaluer le parc qui est le plus près de la résidence mais qui est situé à moins d'un kilomètre de la résidence.

SECTION 1 : INFORMATION DE BASE

1.	**NIF** ***(Information pré-complétée)***	
2.	Identification de l'observateur (XX)	
3.	Identifiant du coéquipier (XX)	
4.	Code de l'observateur (A ou B) *(Information pré complétée)*	
5.	Date (JJ/MM/AAAA)	____ / ____ / ________

NIF : s'assurer que ce numéro correspond au NIF indiqué sur la carte de l'observateur ainsi qu'au numéro du nom du fichier PTab (ex. POST-183-A).

Identification de l'observateur et du coéquipier (liste 01 à 15) : Inscrire le numéro qui vous a été assigné ainsi que celui de votre coéquipier.

01	J. B.-M.	06	L. M.	11	A. V. H.
02	M. B.	07	A. P.	12	S. G.
03	F. B.	08	J. P.-L.		
04	M.-E. D.	09	M.-C. G.		
05	M. E.	10	T. B.		

Code de l'observateur (A ou B) : Chaque POS sera évalué par deux observateurs identifiés comme observateur A et observateur B. Vérifier à ce que les deux ANP utilisés pour une équipe d'observateur soient identifiés comme « Obs A » et « Obs B ». Les deux derniers chiffres du nom du fichier PTab correspondent au code de l'observateur (ex. POST-183-A).

Date (JJ/MM/AAAA) : Inscrire le jour, le mois et l'année de l'évaluation dans les trois cases appropriées.

SECTION 2 : INSTALLATIONS

Cette section doit être complétée pour chaque parc évalué.

5.	**Identifiant du POS** ***(Information pré complétée)***	
6.	Adresse du POS *(Information pré complétée)*	
7.	Heure au début de l'évaluation (00:00)	

<u>Identifiant du POS :</u> Chaque POS est identifié par un numéro d'identification unique. S'assurer que l'identifiant entré dans le questionnaire électronique correspond à l'identifiant indiqué sur la carte pour le POS a évalué (Information pré-complétée). Si un « nouveau » parc est évalué, laisser cette case vide.

<u>Adresse du POS :</u> Une des intersections du POS sera entrée dans le questionnaire électronique, s'assurer que l'intersection correspond à l'adresse du POS a évalué. (Information pré-complétée)

<u>Heure au début de l'évaluation (00:00) :</u> Inscrire l'heure (système de 24 heures) et les minutes au moment de commencer l'évaluation du POS dans les deux cases appropriées.

Activités:

Type d'usage : (POST-7)

Actif – AP structurées (buts, tableaux d'affichage, courts de tennis)… 1

Actif – AP non structurées (sentiers de marche, terrains de jeu, espace multi-usage).. 2

Actif – AP structurées et non-structurées…………………………… 3

Activités passives – jardinage………………………………………… 4

Activités passives seulement (espace pour s'assoir)………………… 5 (aller à Q11)

Actif – activités physiques structurées : présence de terrains de sport ou d'autres installations permettant des activités physiques structurées (matchs sportifs) (ex. buts de soccer ou autres buts, terrain de basketball).

Actif – activités physiques non-structurées : présence de sentiers de marche et/ou de course à pied, de terrains de jeu, de piste cyclable ou pour le patin à roues alignées, d'une piscine/jeux de jets d'eau, panier de basketball (sans terrain), d'espaces multi-usages etc.

Actif – activités physiques structurées et non structurées : présence d'éléments des deux premiers items.

<u>Activités passive – jardinage :</u> cocher cette réponse lorsqu'il n'y a pas activités physiques structurées ou non-structurées mais qu'il y a des jardins communautaires.

<u>Activités passives seulement :</u> cocher cette réponse lorsqu'aucune des réponses précédentes ne s'appliquent. Il pourrait y avoir des espaces pour s'assoir, souvent avec jardins de fleurs, il pourrait aussi y avoir un petit sentier pour se rendre aux bancs mais le sentier ne permet pas la « marche active » et ne forme pas un « circuit ».

Pour les activités/aménagements suivants, indiquer s'ils sont présents. Si oui, évaluer l'accès à l'espace désigné, sa condition générale et lorsque cela s'applique, indiquer s'il y a des restrictions d'utilisation. (adapté du POST-8).

	Présent (1=Oui, 2=Non)	**Accessible (1=Oui, 2=Non)**	**Bonne condition (1=Oui, 2=Non)**	**Restriction (1=Oui, 2=Non)**
COURS DE SPORTS (herbe/terre battue/sable/asphalte)				
Tennis	Oui / Non	Oui / Non	Oui / Non	Oui / Non
Basketball	Oui / Non	Oui / Non	Oui / Non	Oui / Non

Badminton/Volleyball	Oui / Non	Oui / Non	Oui / Non	Oui / Non
TERRAINS DE SPORT (herbe/turf)				
Soccer/Football/Rugby	Oui / Non	Oui / Non	Oui / Non	Oui / Non
Baseball/Balle molle	Oui / Non	Oui / Non	Oui / Non	Oui / Non
Hockey cosom/Ringuette	Oui / Non	Oui / Non	Oui / Non	Oui / Non
AUTRES				
Piste de course	Oui / Non	Oui / Non	Oui / Non	
Sentier*	Oui / Non	Oui / Non	Oui / Non	
Piste cyclable et/ou pour le patin à roues alignées**	Oui / Non	Oui / Non	Oui / Non	
Skate Park	Oui / Non	Oui / Non	Oui / Non	Oui / Non
Terrain de jeu pour enfants âgés de 6 ans et plus	Oui / Non	Oui / Non	Oui / Non	
Espace multi-usage	Oui / Non	Oui / Non	Oui / Non	
Cour d'école	Oui / Non	Oui / Non	Oui / Non	

Présent : Cocher « oui » si les installations nécessaires pour ce type d'activité sont présentes, peu importe si les installations sont accessibles et peu importe la condition.

Accessible : Cocher « oui » si vous pouvez entrer « à l'intérieur » de l'espace désigné pour la pratique de l'activité et que vous pouvez y marcher

« librement ». Si l'espace est verrouillé et que vous ne pouvez pas y entrer, cocher « non » et faites l'évaluation à partir de l'extérieur du mieux que possible.

<u>Bonne condition</u> : « Bonne condition » signifie que les installations sont en assez bonne condition pour faire une partie de sport sur le terrain sportif ou pour les autres activités, que les installations soient en assez bonne condition pour rendre l'usage « attirant ». Voici les éléments à considérer pour chacune des activités : équipements brisés ou manquants, rouille sur les structures, terrain détériorés, etc.

<u>Restrictions</u> : Les frais d'utilisation, la nécessité d'être membre ou de faire une réservation pour l'utilisation de l'espace sont des exemples de restrictions. Cocher « oui » s'il y a une indication qu'il y a des restrictions. S'il n'y a pas de restrictions ou s'il n'y a pas d'information sur les restrictions possibles, cocher «non ».

*** Inclure tous les sentiers, même s'ils ne sont pas très long/diversifiés, dans l'impression générale du POS, on évaluera à quel point le POS est intéressant pour la marche.**

**** S'il y a une piste cyclable qui longe le parc (i.e. le long de la rue) mais que la piste cyclable <u>ne passe pas</u> dans le parc, cocher « non » à la question sur la**

présence d'une piste cyclable mais identifier sur la carte l'endroit où elle passe. Si la piste cyclable passe dans le parc, cocher « oui » et répondre aux autres questions concernant la piste cyclable.

A) Est-il possible de louer de l'équipement sportif dans le POS?

Oui…... 1

Non….. 2

B) Si vous avez répondu « oui » à Q3-A, indiquer le type d'équipement : ___________________

Indiquer tout équipement sportif qu'il est possible de louer (bicyclette, patin à roues alignées, pédalo, kayak, canot, raquette de tennis, etc.)

Y'a-t-il une piscine (>4 pieds de profondeur) dans le POS?

Oui…... 1

Non….. 2 (aller à Q8)

Inclure les piscines extérieures municipales seulement ainsi que les piscines adjacentes au POS (ex. piscine Westmount).

Quelle est la longueur approximative de la piscine? (BRAT-03-G-03)

Moins de 25 mètres………… 1

Plus ou égal à 25 mètres…….. 2

Impossible à évaluer………… 3

Pour estimer la longueur de la piscine, compter le nombre de pas requis pour marcher sur toute la longueur de la piscine (deux pas correspond environ à un mètre). Si la piscine est en forme de « L » ou autre, estimer la longueur totale de la piscine.

Évaluer la condition du parterre autour de la piscine. (BRAT-03-G-05)

Pas de détérioration…………………………………… 1

Présence de détérioration sans besoin de réparation…. 2

Détérioration importante nécessitant réparation……… 3

Sous construction……………………………………... 4

Impossible à évaluer………………………………….. 5

Le parterre pourrait être en béton, en asphalte et/ou avec de l'herbe. Évaluer l'égalité du terrain, la présence de failles/fentes dans le béton/dalles de béton, de trous dans le parterre, la longueur de l'herbe, les endroits où l'herbe ne pousse pas, etc. Le parterre autour de la piscine est impossible à évaluer lorsqu'il est sous construction ou lorsque la piscine est fermée. Les piscines sont ouvertes généralement de la fin juin jusqu'à la fin du mois d'août.

Évaluer la propreté générale du parterre autour de la piscine. (BRAT-03-G-06)

Très propre…………………………………….   1

Assez propre………………………………..   2

Pas du tout propre………………….................   3

Impossible à évaluer…………………………...   4

Marcher sur le terrain de la piscine (ou regarder de l'extérieur si vous n'y avez pas accès) et noter la présence de déchets (plastique, papier, canettes, feuilles d'arbres, graines, excréments d'oiseaux, etc.) sur le parterre.

Un parterre « très propre » équivaut à l'absence de tous déchets. Un parterre « pas du tout propre » équivaut à un parterre où plusieurs des éléments mentionnés ci-haut sont présents.

Si la piscine est sous réparation ou si vous ne pouvez pas y avoir accès (piscine fermée, clôturée), cocher « impossible à évaluer ».

Est ce qu'il y a des jeux de jet d'eau dans le POS?

Oui…....................................   1

Non…………………………...   2 (aller à Q11)

En construction……..........   3

Des jeux de jet d'eau sont parfois inclus avec une pataugeuse, s'il y a une pataugeuse sans jet d'eau cocher « non ». Cocher « oui » si les installations de

jet d'eau sont présentes même si elles ne sont pas en usage. Ne pas inclure une fontaine décorative.

Si vous avez répondu « Non », ***aller à la question 11***

Évaluer la condition de l'espace où se trouvent les jets d'eau. (ex. failles, inégalités, trous dans la surface, rouille ou parties manquantes sur les structures, etc.)

Pas de détérioration………………………………… 1

Présence de détérioration sans besoin de réparation... 2

Détérioration importante nécessitant réparation…….. 3

Sous construction…………………………………… 4

Évaluer l'égalité du terrain autour des jets d'eau, la présence de failles/fentes dans le béton (si en béton), regarder pour des parties manquantes ou de la rouille sur les structures de jet d'eau, la longueur de l'herbe, les endroits où l'herbe ne pousse pas, etc.

Évaluer la propreté générale de l'espace où se trouvent les jets d'eau.

Très propre……………………………… 1

Assez propre……………………………. 2

Pas du tout propre………………………. 3

Impossible à évaluer…………………... 4

Marcher autour de l'espace des jets d'eau et noter la présence de déchets (plastique, papier, canettes, feuilles d'arbres, graines, excréments d'oiseau etc.) sur le parterre ou sur les installations.

Un espace « très propre » correspond à l'absence de déchets tandis que dans un espace « pas du tout propre », plusieurs de ces éléments sont présents.

La propreté générale est impossible à évaluer (option 4) lorsque les jeux d'eau sont sous construction ou lorsque les installations sont fermées généralement entre la fin août et la fin du mois de juin.

SECTION 3 : QUALITÉ DE L'ENVIRONNEMENT

A) Est-ce que le POS est situé le long d'une étendue ou d'un cours d'eau important (lac, rivière, fleuve)? (POST-9)

Oui…..... 1

Non……. 2 (aller à la Q12)

B) Est-il possible d'y faire des activités aquatiques sportives?

Oui….... 1

Non…… 2

Ne pas inclure les étangs, les fontaines d'eau et les ruisseaux. Si l'extrémité du parc touche directement aux bords du cours d'eau important, cocher « oui ». Si le cours d'eau est visible à partir du POS (ex. une rue sépare le POS du cours d'eau) et que le bord de l'eau est facilement accessible aux piétons, cocher « oui ».

Pour les activités aquatiques sportives, cocher « oui » s'il y a des activités telles que le canot, le kayak, le pédalo ou autres activités aquatiques non motorisé qui sont praticables sur l'étendue ou cours d'eau à partir du POS

A) Est-ce qu'il y a un étang ou une fontaine d'eau dans le POS? (POST-10)

Oui….... 1

Non…… 2 (aller à la Q13)

B) Est-il possible d'y faire des activités aquatiques sportives?

Oui…... 1

Non….. 2

Cocher « oui » s'il y a un étang ou une fontaine d'eau qui est présent dans le POS. Parfois il est possible de faire du pédalo (ou autres activités aquatiques) sur un étang s'il est assez grand (ex. Lac des castors). Si c'est le cas, cocher « oui » pour les activités aquatiques sportives (ne pas inclure les activités motorisées).

A) Y a-t-il des éléments physiques décoratifs et/ou culturels présents dans le POS (fontaine, art)? (POST-13B)

Oui…....   1

Non……   2 (aller à la Q14)

B) Spécifier : ____________________________

Voici des exemples d'éléments physiques décoratifs et/ou culturels : statue, art, monument, roches sculptées ou décoratives, sculptures, gazebo, théâtre extérieur, musée, bibliothèque, expositions extérieures, etc.

Y'a t'il des jardins (plates-bandes) dans le POS? (POST-17)

Oui…...   1

Non…..   2

Répondre « oui » s'il y a au moins un espace aménagé ou poussent des fleurs, des plantes ou des arbustes bas. Inclure les fleurs et autres plantes qui sont plantées dans des pots/bacs à fleur.

Note : Si l'évaluation est faite au mois de mai ou tôt en juin, il est possible que les plates-bandes ne soient pas encore aménagées. Dans ce cas, si vous voyez une bande de terre qui semble être prévue pour planter des fleurs, cocher « oui ».

Est-ce qu'il y a des endroits dans le POS qui offrent un abri du soleil (de l'ombre) (POST-18B)

Beaucoup d'endroits……………... 1

Quelques d'endroits……………… 2

Aucun endroit…………..………… 3

Inclure tous les endroits où l'on peut se mettre à l'abri du soleil dans le POS, par exemple sous de grands arbres, dans un gazebo, ou autre structure avec un toit et les espaces intérieurs.

<u>Beaucoup d'endroits :</u> la majorité du POS est à l'ombre, il y a plusieurs grands arbres et espaces couverts offrant de l'ombre, il pourrait aussi y avoir un espace intérieur (ex. chalet).

<u>Aucun endroit :</u> le POS est pratiquement toujours au soleil, il n'y a pas ou très peu d'arbres, les arbres sont généralement petits de sorte qu'ils offrent très peu d'ombre et il n'y a pas de structures avec un toit ou d'espaces fermés (ex. pas de chalet, gazebo, etc.).

Y'a-il une enseigne indiquant que les chiens sont interdits dans le POS? (POST-21)

Oui…... 1

Non….. 2

Regarder près des entrées du POS pour une enseigne qui interdit complètement l'accès aux chiens. Ne pas se fier à la présence de chiens dans le POS. S'il y a une enseigne indiquant que les chiens sont permis dans tout le POS, dans certains endroits seulement ou s'ils sont permis en laisse, cocher « non ». S'il n'y a pas d'enseigne, cocher « non ».

Présence de graffiti? (POST-23)

Pas du tout………………. 1

Un peu…………………… 2

Beaucoup.......................... 3

S'assurer de vérifier les endroits suivants pour la présence de graffitis :

- **structures de jeux pour enfants**
- **les poubelles**
- **les tables à pique-nique, bancs et estrades**
- **édifices/bâtisses (faire un tour complet des édifices, il y'a souvent des graffitis sur les murs et portes arrières)**

- **Puisqu'il est très commun que les structures dans les « skatepark » soient couvertes de graffitis et de « tags », ne pas inclure ces graffitis dans l'évaluation de la présence de graffitis dans l'ensemble du parc.**

Présence de bris/vandalisme possible ou structures laissées à l'abandon? (POST-24)

Aucun………...................... 1

Possiblement………………... 2

Définitivement………………. 3

Regarder pour des signes de vandalisme et de structures laissées à l'abandon sur les éléments naturels (arbres, jardins, branches cassées, etc.) et les éléments « bâtis » dans le POS (ex. fenêtre/verre brisés, signes/mots gravés sur les tables et banc, etc.). Parfois ce n'est pas clair s'il s'agit d'un acte de vandalisme ou d'un éléments/structure qui n'a pas été réparé/ramassé (ex. branche d'arbre cassé). Dans ces cas, cocher « possiblement ».

Présence de déchets/ordures? (POST-25)

Pas du tout….. 1

Un peu………. 2

Beaucoup……. 3

Regarder pour la présence de déchet partout dans le POS. Regarder aussi autour des poubelles pour les déchets qui sont tombés de la poubelle ou qui ont été laissés autour de la poubelle. Cocher « Pas du tout » s'il y a aucun déchet dans le POS et cocher « Beaucoup » s'il y a assez de déchets pour remplir un petit sac d'épicerie en plastique.

SECTION 4 : SERVICES

Présence de poubelles? (POST-38)

Oui et en condition d'usage... 1

Oui, mais inutilisable...…….. 2

Non…………………………… 3

Cocher « Oui, mais inutilisable » si toutes les poubelles sont pleines ou si elles débordent.

Présence de fontaines d'eau pour boire? (POST-42)

Oui et en condition d'usage.... 1

Oui, mais inutilisable...…….. 2

Non…………………………… 3

Cocher « Oui, mais inutilisable » si la fontaine d'eau ne fonctionne pas ou si elle est en si mauvaise condition qu'il n'est pas agréable, voire possible, d'y boire (jet trop faible, trop sale, etc.).

Présence de tables à pique-nique? (POST-31)

Oui et en condition d'usage….. 1

Oui, mais inutilisable...……..... 2

Non…………………………… 3

Cocher « Oui, mais inutilisable » si les tables à pique-niques sont en si mauvaises conditions qu'il n'est pas agréable, voire possible, de s'y assoir pour manger (ex. bris, sale, etc.).

Présence de bancs pour s'assoir? (POST-36)

Oui et en condition d'usage..... 1

Oui, mais inutilisable...……..... 2

Non…………………………… 3

Cocher « Oui, mais inutilisable » si les bancs sont en si mauvaises conditions qu'il n'est pas agréable, voire possible, de s'y assoir.

Présence d'estrades?

Oui et en condition d'usage...... 1

Oui, mais inutilisable...……..... 2

Non…………………………… 3

Cocher « Oui, mais inutilisable » si les estrades sont en si mauvaises conditions qu'il n'est pas agréable, voire possible, de s'y assoir.

A) Présence de toilettes publiques? (POST-33)

Oui…………………………. 1

Non……..………………….. 2 (aller à la question 26)

Ne peut pas déterminer…….. 3 (aller à la question 26)

Inclure les toilettes intérieures et les toilettes chimiques. Cocher « Ne peut pas déterminer » s'il y a un bâtiment où il pourrait y avoir des toilettes publiques mais vous ne pouvez pas confirmer la présence ou l'absence des toilettes parce que le bâtiment est sous clé.

B) Condition des toilettes :

Bonne………………………. 1

Mauvaise…………………... 2

Ne peut pas déterminer…….. 3

Si vous avez répondu « oui » à la question 25A, évaluer la condition des toilettes. « Bonne » signifie que les toilettes sont propre (vous l'utiliseriez), qu'il y a du

papier de toilette ainsi que de l'eau et du savon (dans les toilettes chimiques il devrait y avoir du liquide désinfectant pour les mains). Cocher « Ne peut pas déterminer » si vous savez qu'il y a des toilettes publiques mais qu'elles ne sont pas accessible au moment où vous vous trouvez dans le POS.

A) Présence d'un chalet/vestiaire ouvert au public? (POST-37)

Oui…… 1

Non….. 2 (aller à la question 27)

B) Condition du chalet/vestiaire

Bonne………………………. 1

Mauvaise…………………... 2

Ne peut pas déterminer….. 3

Inclure les endroits fermés qui sont ouvert au public et qui sont aménagés pour recevoir les gens (ex. il pourrait y avoir des tables et des chaises, des salles pour se changer, des douches, etc.). S'il s'agit d'un bâtiment où il y a seulement des salles de bain, ne pas les inclure dans cette question.

Cocher « Ne peut pas déterminer » à la question 26B s'il y a un chalet/vestiaire mais que vous n'y avez pas accès pour évaluer la condition.

Présence d'espace de stationnement pour les utilisateurs du POS? (POST-32A)

Oui, espaces réservés pour le parc…......... 1

Oui, mais sur la rue seulement………...... 2

Non……………………………………….. 3

S'assurer de vérifier tous les côtés du POS pour voir s'il y a des espaces de stationnement accessibles aux utilisateurs du POS. S'il n'y a pas de stationnement réservés au POS, vérifier les restrictions pour le stationnement dans les rues adjacentes au POS (stationnement interdit durant le jour/fin de semaine, stationnement résidentiel seulement, etc.). Cocher « Oui, mais sur la rue seulement » s'il y a au moins 10 espaces de stationnement tous les jours de la semaine.

Présence d'installation pour verrouiller des vélos? (BRAT-02-D-02)

Oui…..... 1

Non……. 2

Cocher « oui » s'il y a au moins un support à vélo qui est utilisable. Utilisable signifie que vous considérez le support sécuritaire. Une autre bonne indication est la présence de vélos verrouillés sur le support.

Est-ce que le POS est accessible par un moyen de transport en commun (visible à partir du POS)? (POST-35)

Oui…….. 1

Non…..... 2

Cocher « oui' s'il y a un arrêt d'autobus (avec ou sans abris), de train ou une station de métro qui est visible à partir du POS (même s'il n'est pas dans un des coins du POS).

SECTION 5 : SÉCURITÉ

Y'a-t-il de l'éclairage qui semble fonctionnel et en quantité suffisante pour éclairer la majeure partie du POS? (inclure les lampadaires qui sont dans la rue s'ils illuminent aussi le POS) (POST-43)

Oui…... 1

Non….. 2

Cocher « oui » si les principales aires d'activités du POS sont éclairées (les aires d'activités identifiées à la question 2 du questionnaire). Inclure les lampadaires qui sont dans la rue s'ils illuminent aussi le POS.

À partir du centre(s) des aires d'activités du POS, y'a-t-il toujours au moins une rue qui est visible? (POST-45)

Oui……… 1

Non……… 2

Les aires d'activités correspondent à celles qui ont été identifiées à la question 2. Évaluer si, à partir du centre de ces aires d'activités, il y a toujours au moins une rue qui est clairement ou partiellement visible.

À partir du centre(s) des aires d'activités du POS, y'a-t-il toujours au moins une maison qui est clairement visible? POST-46A)

Oui……… 1

Non…….. 2

Évaluer si, à partir du centre des aires d'activité, il y a toujours au moins une maison qui est clairement ou partiellement visible. Cocher « oui » s'il est possible de voir au moins une fenêtre de la maison à partir du centre des aires d'activité.

Est-ce que toutes les rues (adjacentes) autour du POS sont des rues locales (tranquilles)? (POST-47)

Toutes…………….. 1

Quelques unes ……. 2

Aucune……………. 3

Les rues locales (circulation locale seulement) sont principalement situées dans les secteurs résidentiels. Inclure toutes les rues qui sont adjacentes au POS.

Combien de rues (adjacentes) autour du POS sont munies de mesures d'apaisement de la circulation?

Toutes……………. 1

Quelques unes …… 2

Aucune…………… 3

Des mesures pour calmer le trafic sont : dos d'âne, arrêt toutes directions, arrêt mi-tronçon, limite de vitesse à 30 km/heure ou moins, obstacles importants sur la chaussée et avancées de trottoir. Compter le nombre de rues adjacentes au POS qui sont munies d'au moins une mesure pour ralentir le trafic.

Combien de rues (adjacentes) autour du POS sont munies de mesures pour faciliter l'accès aux piétons?

Toutes……………. 1

Quelques unes……. 2

Aucune…………… 3

Des mesures pour faciliter l'accès au POS pour les piétons sont : feux de signalisation pour piétons et passage piétonnier (blanc ou jaune). Compter le nombre de rues adjacentes au POS qui sont munies d'au moins une mesure pour faciliter l'accès au POS pour les piétons.

SECTION 6 : IMPRESSION GÉNÉRALE DU POS

En général, pour les jeunes de 10 à 12 ans, le POS est il attrayant? (BRAT-01-A-02)

Très attrayant…………….. 1

Assez attrayant…………… 2

Pas attrayant……………… 3

Considérer tout ce que vous avez vu dans le POS pour évaluer s'il est attrayant pour les jeunes. Penser aux activités qui y sont praticables. Est-ce qu'elles sont appropriées pour des jeunes de 10-12 ans? Est-ce qu'il y a une variété d'activité possible? Est-ce que l'environnement est attirant (couleur, propreté, absence de graffiti et vandalisme)? Est-il sécuritaire?

En général, le POS est-il sécuritaire?

Très sécuritaire……….. 1

Assez sécuritaire……… 2

Pas sécuritaire………… 3

Il s'agit de tenir compte des points suivants :

- **nombre d'endroits du parc sans vue sur les maisons et rues avoisinantes;**

- **impression des gens croisés dans le POS;**
- **présence de chiens sans laisse;**
- **présences de déchets « dangereux »**

En général, le POS est-il joli/agréable?

Très joli/agréable………… 1

Assez joli/agréable………. 2

Pas joli/agréable…………. 3

Il s'agit de tenir compte des points suivants :

- **Présence de jardins/plates bandes, sculptures, fontaine, l'aménagement et autres éléments décoratifs**
- **L'entretien du POS**
- **Les odeurs et les bruits**

En général, le POS est-il intéressant pour la marche?

Très intéressant pour la marche………… 1

Assez intéressant pour la marche……….. 2

Pas intéressant pour la marche…………. 3

Penser au sentier que vous avez vu dans le POS. Est-ce qu'ils sont assez longs pour permettre la marche active, agréables et pas trop escarpés? Est-ce que la

condition des sentiers était assez bonne? Est-ce qu'il y a des choses intéressantes à regarder le long des sentiers?

En général, le POS est-il intéressant pour la bicyclette?

Très intéressant pour la bicyclette……… 1

Assez intéressant pour la bicyclette…….. 2

Pas intéressant pour la bicyclette……….. 3

Penser aux pistes cyclables et aux autres sentiers où le vélo est praticable dans le POS. Est-ce qu'ils sont assez longs et pas trop escarpés? Est-ce la surface est assez égale et sans trous? Est-ce que c'est sécuritaire (pas de voiture)? Est-ce que la bicyclette est permise dans le POS?

En général, le POS est-il intéressant pour les jeux actifs?

Très intéressant pour les jeux actifs…. 1

Assez intéressant pour les jeux actifs.. 2

Pas intéressant pour les jeux actifs…. 3

Est-ce que le POS est suffisamment grand et offre une variété d'endroits où il est possible de pratiquer des jeux actifs structurés (ex. terrains sportifs accessibles) ou non-structurés (ex. espace multi-usage suffisamment grand et sans obstacles, terrain de jeu, sentiers, etc.)?

Heure à la fin de l'évaluation (00:00) : _________

Inscrire l'heure (système de 24 heures) et les minutes au moment de terminer l'évaluation du POS.

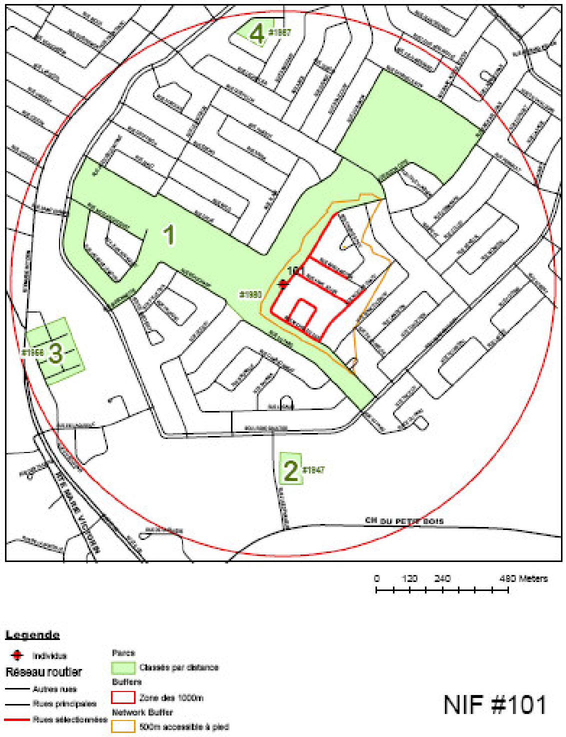
D. PRÉPARATION DU FICHIER DE SAISIE

SECTION 1 : LECTURE DES CARTES

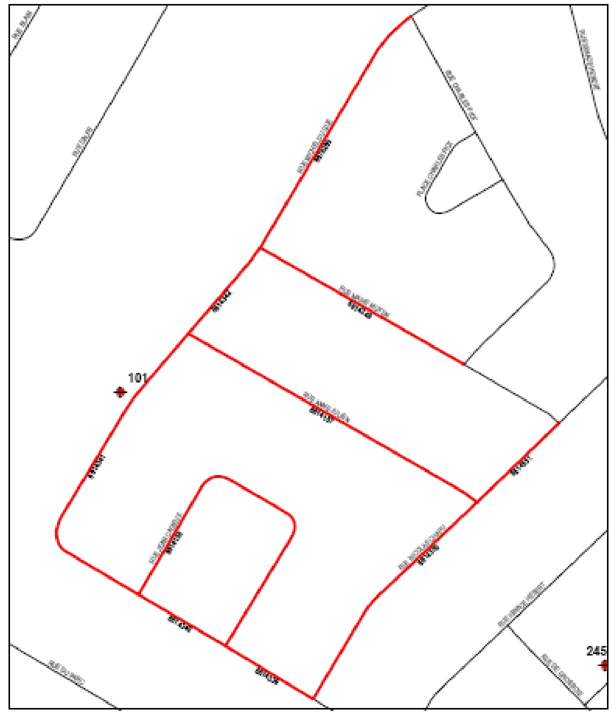
Pour chacun des NIFs qui sont situés dans la région métropolitaine de recensement (RMR), un collaborateur géographe a conçu des cartes qui seront utilisés pour travailler sur le terrain. Elles sont situées dans : C:\Documents and Settings\genmar05\Mes documents\Projet OBE\CartesTopology_BENOIT.

Voici l'une de ces cartes :

Recto **Verso**

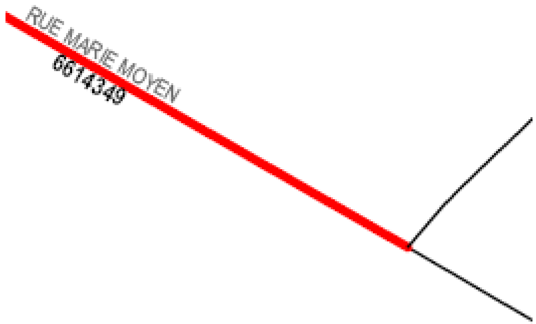


NIF #101

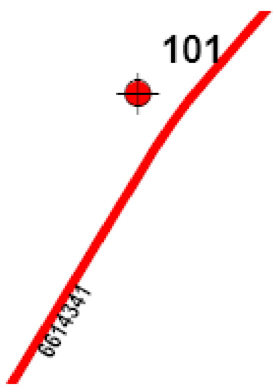


NIF #101

Au verso de la carte, on aperçoit des tronçons sélectionnés en rouge. Ce sont ces tronçons en rouges qui doivent être évalués. En regardant de plus près on remarque que pour chacun de ces tronçons, on peut lire juste au-dessus du tronçon le nom de la rue et juste en dessous le numéro d'identification à sept chiffres. Dans l'exemple suivant, la rue est Marie Moyen et le numéro d'identification est le 6614349.



Le tronçon avec une cible (voir l'exemple suivant) correspond au **tronçon résidentiel** ce qui signifie que c'est sur ce tronçon que le participant de l'étude QUALITY habite. La cible nous permet aussi de connaître le coté de la rue où habite le participant. Dans cet exemple, le résidant habite sur le coté gauche de la rue.

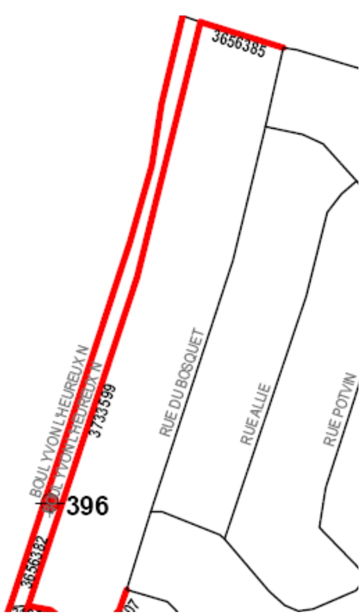


Sur le verso de la carte, on retrouve en bas à droite le numéro du NIF auquel correspond la carte. La zone à l'intérieur du périmètre rouge correspond au « buffer » de 1000 mètres et le périmètre en jaune correspond au « buffer » de 500 mètres de la résidence du participant. Les POS identifiés par le géographe sont colorés en verts sur la carte et ils sont numérotés en ordre de proximité à partir de la résidence du NIF. Le # à quatre chiffre en vert correspond au numéro d'identification du POS.

SECTION 2 : PRÉPARATION DES CARTES

Tout d'abord, on inscrit les chiffres de un à dix sur la carte pour chacun des dix tronçons sélectionnés en rouge au verso de la carte. Le « tronçon résidentiel » doit toujours être numéroté par le chiffre un parce qu'on s'intéresse à la ruelle du tronçon résidentiel seulement. Le numéro des neuf autres tronçons n'a pas d'importance puisqu'il s'agit du même questionnaire pour ces tronçons.

Dans certains cas, il faut annuler des tronçons lorsqu'il y a des erreurs de sélection sur la carte. C'est le cas notamment de l'exemple suivant :

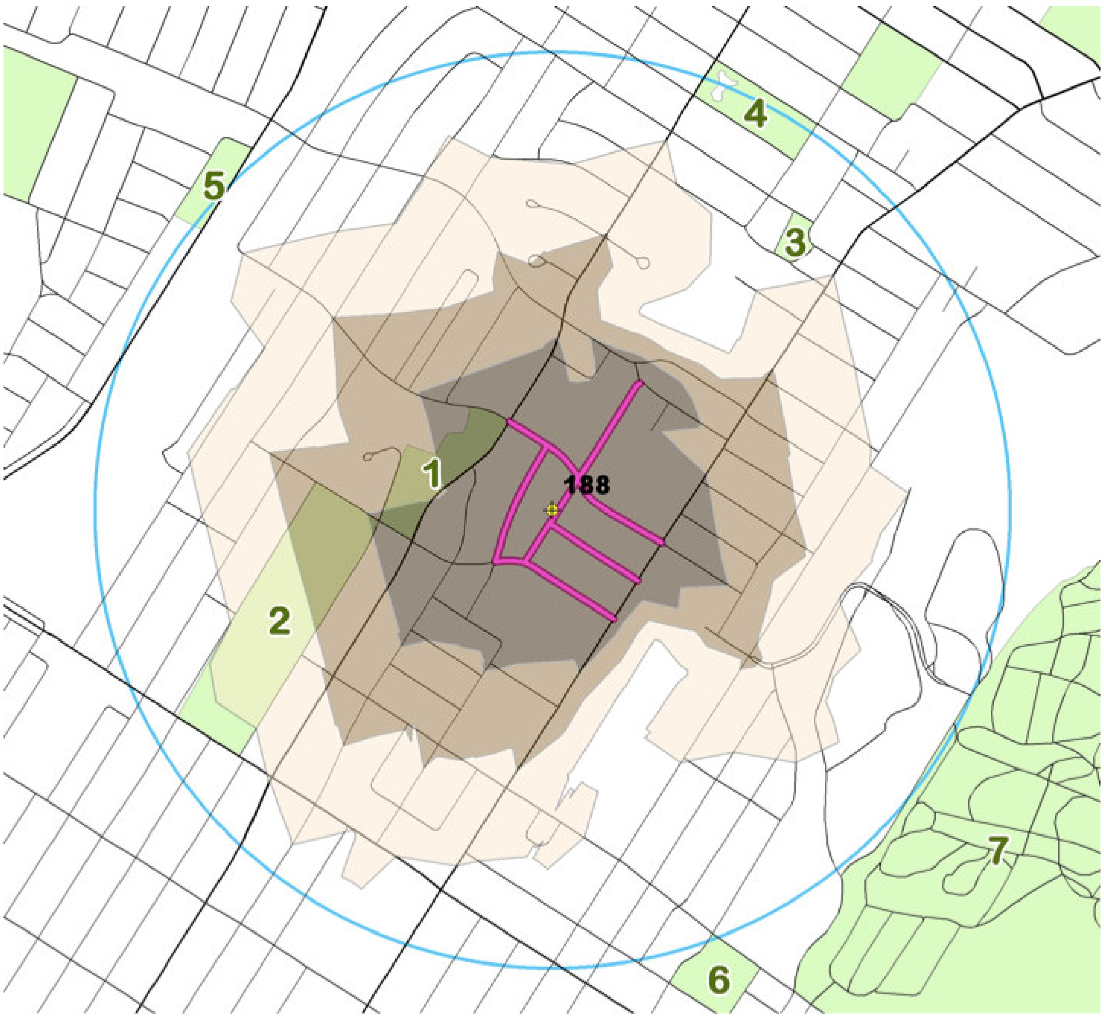


Le boulevard Yvon l'heureux correspond à un tronçon seulement et non deux comme c'est indiqué sur la carte. Ce type d'erreur apparaît en présence d'un terre-plein sur le tronçon. Il faut donc supprimer l'un de ces tronçons. Alors dans ce cas-ci seulement neuf tronçons sont à évaluer au total pour ce NIF. Il peut arriver aussi que par erreur des ruelles soient sélectionnées comme étant des tronçons à évaluer.

Dans certains cas, il faut aussi annuler des POS. La raison la plus commune est parce qu'il s'agit d'un cimetière. On peut facilement les reconnaître par leurs lignes noires à l'intérieur du POS, c'est le cas notamment du POS 3 du NIF 101 ci-haut. Il peut aussi s'agir d'une forêt ou d'un golf. On va vérifier le NIF avec Google Earth au moment de préparer les cartes pour annuler d'avance ces parcs et pour possiblement en identifier d'autres qui ne l'avaient pas été auparavant. On inscrit un « X » sur le parc annulé et un « ? » à l'endroit où il pourrait en avoir possiblement un, ainsi l'observateur pourra, au moment de l'évaluation sur le terrain, identifier s'il y a un parc ou non et ensuite tracer son périmètre sur la carte.

APPENDIX V

Example of a 500 m, 750 m, and 1000 m Walking Network Buffer Zone Around the Home of a QUALITY Participant



The above figure shows the network of walkable streets surrounding the residence of a participant indicated by the yellow crosshairs. Using GIS, every destination from the residence that can be reached by walking 500 m is located. The 500 m boundary and corresponding neighbourhood, in dark gray, is defined by connecting the 500 m walkable destinations. This same procedure is repeated to define the 750 and 1000 m boundaries and corresponding neighbourhoods. All parks located within 1 km of the residence marked in green, numbered according to the nearest distance from the residence.

APPENDIX VI

The PARK Tool Reliability Manuscript

Title: Reliability Assessment of the Parks, Activity and Recreation among Kids (PARKS) Tool

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3.1. Abstract

Background: Little is known about intra-park characteristics associated with youth physical activity (PA) and there are currently few existing tools to assess park characteristics specifically for youth PA.

Purpose: This study describes the development of a youth-oriented park audit tool, the Parks, Activity and Recreation among Kids, or PARK Tool, estimates its reliability and compares reliability results of items shared with the Public Open Space Tool (POST).

Methods: Items were drawn from the POST and the Bedimo-Rung Assessment Tool – Direct Observation, and 16 new items were developed for the tool. Parks were pre-identified using a GIS software and found on-site by observers in the greater Montreal area. Nine observers underwent extensive training. Inter-rater reliability was assessed by calculating percent agreement and Cohen's kappa. Intra-rater reliability was assessed by calculating Pearson's product-moment correlations and Cohen's kappa. The inter-rater reliabilities of seventeen items shared with the POST were compared.

Results: 576 parks were evaluated, 36% of which were newly identified on-site by observers. 86% of items had ≥ 75% agreement and 83% had kappa coefficients between 0.41 and 1. Among 40 test-retest episodes, 51% percent of items had an $r \geq 0.70$ and 19% had $r \leq 0.50$. Inter-rater reliability estimates of items shared with the POST were of similar magnitude.

Conclusions: The PARK Tool is generally reliable and can be used to assess park characteristics theoretically associated with PA among youth. Future studies should test associations between intra-park characteristics and youth PA.

3.2. Introduction

The prevalence of obesity among youth in North America has been increasing steadily. Between 1979 and 2004, the prevalence of obesity tripled among 12-17 year olds in Canada from 3% to 9% (Shields, 2006). In 2011, 17% of American children and teens were considered obese, and the prevalence of obesity tripled between the

1960s and 1990s, from nearly 5% to 15% (Centers for Disease Control and Prevention, 2011). Childhood obesity is a major public health concern; it is associated with chronic health risks during childhood that may last into adulthood (Biro & Wien, 2010) as well as adult morbidities such as type-2 diabetes mellitus and cardiovascular disease. Efforts toward curbing obesity among youth have therefore become a public health priority. Because individual-level interventions have not been effective for population-level changes (Bedimo-Rung et al., 2005; Dunn, Andersen, & Jakicic, 1998), policy makers and researchers have turned their attention towards upstream approaches such as those targeting the built environment (BE). Public parks have the potential to facilitate or hinder physical activity (PA) (Centers for Disease Control and Prevention, 2001; Committee on Environmental Health, 2009) and represent potentially modifiable BE factors that may help reduce obesity among youth as they are a popular setting for PA among this population (McCormack et al., 2010; Rehrer et al., 2011).

Parks have been associated with PA among adults and children in the literature, however findings have been mixed as studies are mostly based on perceived accessibility or proximity measures (Kaczynski & Henderson, 2007). Some studies have used qualitative methods to better understand subjective reasons for park use among frequent park users (McCormack et al., 2010), and a small number of direct-observation tools have been created to objectively assess park characteristics or PA in parks (Bedimo-Rung et al., 2006; Broomhall et al., 2004; Cavnar et al., 2004;

Crawford et al., 2008; Kaczynski et al., 2012; McKenzie et al., 2006; Saelens et al., 2006).

Six direct observation tools that specifically assess parks have been developed or adapted (Bedimo-Rung et al., 2006; Broomhall et al., 2004; Crawford et al., 2008; Kaczynski et al., 2012; Lee et al., 2005; Saelens et al., 2006), and one instrument designed to assess park-based physical activity (McKenzie et al., 2006) has been developed. Four of the six tools were developed and tested in the USA, and the two others were developed in Australia. All reported relatively high reliability estimates, particularly for objective items. Four of the tools (Bedimo-Rung et al., 2006; Broomhall et al., 2004; Crawford et al., 2008; Kaczynski et al., 2012) were developed explicitly to assess park characteristics hypothesized to be associated with physical activity, one of which (Bedimo-Rung et al., 2006) was developed based on a conceptual model of park characteristics and physical activity.(Bedimo-Rung et al., 2005) Although two tools have been developed to assess park characteristics that may be associated with youth PA, one was created with a goal to increase awareness of park features among community stakeholders (Kaczynski et al., 2012), whereas the other did not consult with or pilot the tool among youth (Crawford et al., 2008).

In all but two cases (Crawford et al., 2008; Saelens et al., 2006), a limitation of the tools outlined above is the relatively small number of parks audited using each tool ($n < 70$). A lack of response variation due to a limited range of park features examined may impede reliability estimates (Bedimo-Rung et al., 2006; Cavnar et al., 2004; Troped et al., 2006) and external validity. Another limitation for many of the tools is omission of a specified target age group for park evaluation. It is important to identify target population groups for which the parks or park features are being evaluated because there can be areas of parks that are age targeted. Youth are more likely to be attracted to open spaces, skate parks, and organized sports-related features of parks such as soccer fields or basketball courts. Finally, as research on parks and PA continues, it becomes important to develop and assess the reliability and validity of park measurement items in a variety of contexts to facilitate the comparability of research results and to help derive generalizable estimates of association or effect (Saelens & Glanz, 2009). Currently, no items on any of the park evaluation tools have been assessed in more than one geographic context.

In order to address these gaps, the aims of the current study are to (i) describe the development of a youth-oriented park assessment tool, (ii) assess its reliability in the Montreal Census Metropolitan Area (MCMA), and (iii) contribute to the development of standardized park evaluation items through a comparison with an existing tool (Broomhall et al., 2004).

3.3. Methods

3.3.1. Study Context

The park evaluation tool was developed specifically for the Quebec Adipose and Lifestyle Investigation in Youth (QUALITY) Cohort, an ongoing longitudinal investigation of the natural history of obesity and cardiovascular risk among youth with parents with a history of obesity. A detailed description of the study design and methods is available elsewhere (Lambert et al., 2011). Up to three parks in a 1000 m walking buffer zone around the exact addresses of the participants residing in the MCMA (n=576) were audited.

3.3.2.Tool Development

Park evaluation tools published until 2007 were evaluated and items were assessed for their reported reliability and applicability to measuring park characteristics as they pertain to youth (i.e. between 6 and 17 years) and physical activity. Efforts were made to draw items from existing tools that were especially applicable for youth PA (e.g. installations for team sports, swimming pools) and that had reported reliability estimates. The study team endeavoured to balance selecting items that would generate more detail about the intra-park characteristics (e.g. more subjective measures) with efforts to reliably measure the intra-park characteristics between observers (e.g. objective measures). It was agreed that the Bedimo-Rung Assessment Tool-Direct Observation (BRAT-DO) (Bedimo-Rung et al., 2006) and the Public Open Space Tool (POST) (Broomhall et al., 2004) contained items that had demonstrated reliability and were relevant for inclusion for a youth oriented park evaluation tool. The BRAT-DO, and the tool developed for this study, are based on the same conceptual model of parks and physical activity by Bedimo-Rung and colleagues (Bedimo-Rung et al., 2005), facilitating analyses of specific park characteristics that may be associated with PA (Oakes et al., 2009). The Bedimo-Rung conceptual model was selected because it is well established in the parks and physical activity literature and can be adapted to youth PA in parks.

In general, items on presence of park installations and amenities were selected from the POST whereas items associated with the access, condition and restriction of installations were drawn from the BRAT-DO. A number of new items were developed (n=16) to assess features of parks that would likely appeal or be relevant specifically to youth PA in parks but that were not present on the POST or BRAT-DO. These items include the presence of school yards, skate parks, play areas constructed for children 6 years old and older, water sprinklers, and general impression items such as overall safety and level of appeal for youth. The tool underwent expert consensus and was piloted among youth in their late teens and early twenties (n=12). Following this, all items went through numerous revisions by the research team prior to field testing and were further revised during observer training, details of which will be discussed below.

The culmination was a 92-item youth-oriented parks and physical activity tool, the Parks, Activity, and Recreation among Kids or PARK Tool (Figure 3-1, p.68). The PARK Tool was developed to assess 5 conceptual domains of parks that may be important for youth PA: 1) Activities (17 items and 39 sub-items); 2) Environmental Quality (9 items and 3 sub-items); 3) Services (10 items and 2 sub-items); 4) Safety (6 items), and; 5) General Impression (6 items).

3.3.3. Sampling Plan

Park identification was conducted using a two-stage process. First, a geographic information system (GIS) was used with land use information from CanMap (Digital Mapping Technologies, Inc., 2007) where a ‘parks and open space’ category was used to identify the three closest parks within a 500 m walking network buffer of the exact addresses of the youth participants in the QUALITY Cohort. Second, parks were identified on-site using a ‘seek and assess’ procedure where observers walked all the street segments in the 500 m buffer to identify possible missing parks that were not reported in the CanMap. If no parks were found within the 500 m buffer zone, at least one park present within a 1000 m walking network buffer zone was evaluated. For those parks identified using GIS, each was assigned a unique identification number, and indicated on maps provided to observers on the day of observation. When a non-reported park was found by observers they would draw its spatial boundaries on the map provided and highlight the nearest intersection.

3.3.4. Observer Training

Nine observers were recruited for data gathering, which was embedded in a larger neighbourhood assessment study around the homes of the QUALITY participants residing in the MCMA. Observer training occurred over a 9-day period beginning in May 2008. Observers were introduced to the purpose of the study and attended a presentation of the observation tool that contained photo illustrations of answers for each question. Observers were provided with the observation tool manual and requested to read it thoroughly prior to on-site evaluation. On the five subsequent training days, observers and trainers began running independent on-site test observations in various non-study parks in the Montreal area. Following each on-site training session, all observers met with the trainers in the park and later at the research centre to compare answers. In cases of discordant answers, the group would return to the area of the park in question to identify what the “correct” answer should be based on the trainer’s response, considered the gold standard. Following each on-site training day, items on the PARK Tool were revised and adjusted in efforts to improve clarity and inter-observer reliability. The most common change was a reduction in the response options from 4 or 3 to 3 or 2. For some items relating to park amenities, such as, “Condition of toilets” a response option “Impossible to determine”, in addition to “Good” and “Bad”, was added because some installations (e.g. public toilets) were sometimes impossible to qualitatively evaluate but nonetheless visibly present.

During the iterative on-site observer training sessions, a pen-and-paper version of the tool was used to record answers. Following day 6 of training, the revised tool was sent to the co-investigators for finalization. On day 7 of training, the observers began to use a personal digital agenda (PDA) (Pocket PC iPaq 110) containing a programmed Microsoft Excel spreadsheet with a cell drop-down function to record answers. Once again discordant answers were discussed following park audits. This process was repeated with the digital agendas for days 8 and 9 of training. On day 10 (13 June 2008) observers began evaluating parks around the homes of the QUALITY participants. During the week of 16 June 2008, a reliability assessment took place in which all observer pairs assessed the same park and were unaware of the reliability check. Observer responses were compared to those of the trainers’ gold standard responses (82.76% agreement). Observers evaluated the parks as independent observer pairs. All 9 observers evaluated approximately 4.4 parks twice on different occasions for a total of 40 parks evaluated twice by the same observer, or 7% of the sample.

3.3.5. Statistical Analyses

Response frequencies for categorical variables were calculated in order to assess the variance of park characteristics. Inter-rater reliability was estimated using percent agreement per measurement episode as well as Cohen's kappa. Cut-offs for percent agreement categorization were implemented according to criteria established by Saelens and colleagues (Saelens et al., 2006) as "good to excellent" (≥ 75%), "moderate" (60-74%), or "poor" (<60%). In order to additionally account for chance agreement, Cohen's kappa was used to estimate inter-rater reliability. Although the meaning ascribed to the value of a kappa statistic may change according to subject area, Landis and Koch (1977) provide the following guidelines which are used here: <0 = poor agreement; 0 – 0.20 = slight agreement; >0.20 – 0.40 = fair agreement; >0.40 – 0.60 = moderate agreement; >0.60 – 0.80 = substantial agreement, and; >0.80 – 1 = almost perfect agreement. Simple unweighted kappas were calculated for all dichotomous variables and weighted kappas were calculated for all categorical variables where possible (kappa cannot be calculated when there is no response variation). Intra-rater reliability was estimated using a test-retest method. Pearson's product-moment correlations were calculated between observation time one and two of the same park by the same observer on a different measurement occasion. Cohen's Kappa was also calculated between both observations. All analyses were performed using SAS, version 9.2 (Cary, North Carolina).

3.4. Results

3.4.1.Sampling Plan

A total of 576 unique parks were assessed, 345 of which were pre-identified using CanMap (Digital Mapping Technologies, Inc., 2007) and 231 of which were identified on site. Data were directly imported into a database from the PDAs, thereby eliminating data entry errors. The parks were audited during clement weather between the hours of 8:00 and 17:00 in 2008 (76%), 2009 (21%), and 2010 (3%), between the months of June and December. No parks were evaluated when there was snow coverage on the ground.

3.4.2. Inter-Rater Reliability

Eighty-six percent of items across all 576 parks demonstrated ≥ 75% agreement, indicating good to excellent overall agreement (Table I) Among the items for which kappa could be calculated (n = 79), 85% were found to be between >0.40 and 1 (28% moderate agreement, 27% substantial agreement, and 30% almost perfect agreement) (Table I). Kappa coefficients could not be calculated for 11of the 90 items due to a lack of response variation (e.g. for the item “presence of aquatic activities in a pond”). Percent agreement was evaluated for these items and all were ≥ 75% except for one item, pool length, which had 70% agreement.

3.4.3. Intra-Rater Reliability

There were a total of 40 test-retest episodes among all 9 observers (Table II). Because of the relatively small n, the correlation between time one and time two could only be calculated using complete data with response variation (n=45). The median number of days between evaluation time one and two was 61, with a minimum of 3 and a maximum of 448 days. Overall, correlations were high between test time one and two. Fifty-one percent of items demonstrated an $r \geq .70$ and 19% had $r \leq .50$.

3.4.4. Comparison of Kappa Results from Items on the PARK Tool and the POST

Twenty-one items on the PARK Tool were drawn directly from the POST. Inter-rater reliability of the POST, assessed in Perth, Australia, was estimated by calculating Cohen's kappa and percent agreement between raters. Inter-rater reliability estimates for items from the PARK Tool shared with the POST were compared and found to be of a similar magnitude (Table III).

3.5. Discussion

This study successfully developed a direct-observation park evaluation tool for youth PA. The items on the PARK Tool are generally reliable between observers and over time. In addition, the items shared with the POST demonstrated similar reliability estimates despite differences in location (Canada vs Australia), time of observation, observers, and training methods.

As expected, some subjective items (Overall safe, Overall attractive/pretty, and Vandalism present), including a number of the condition items, may be too unreliable to be useful for subsequent analysis. Overall, subjective items demonstrated generally lower reliability estimates than objective items. This trend can be seen in similar studies that undertook similar methods to evaluate parks (Giles-Corti et al., 2005; Saelens et al., 2006; Troped et al., 2006). The trend is also apparent in the comparison of the reliability estimates between the PARK Tool items drawn from the POST. Collectively, results from this and other direct-observation park evaluation tool reliability studies demonstrate that subjective items tend to generate lower reliability estimates from independent observer pairs. Other methods for reliably assessing subjective aspects of park features should be explored further. This may include changes to subjective items' definitions to include more objective benchmarks to help guide subjective responses. Enhanced observer training, such as those outlined by Zenk, Schultz, Mentz et al. (2007) in which observers must demonstrate reliability performance during the training period in order to continue on to data collection may also be a way to improve reliability estimates of subjective items. Finally, a collection of items that attempt to measure different facets of the same construct may improve reliability estimates of subjective items. A factor analysis may help to identify which items adequately measure these subjective concepts.

This study provides the first known comparison between reliability estimates of the same items on tools tested in different countries. Aside from a few items that have considerably different reliability estimates, for example presence of a change room, the kappa results and percent agreement are of a very similar magnitude despite differences in time, location, observers, training and data collection methods, providing further support to the reliability of these items. Drawing items from existing tools and comparison of reliability results with the original tool has been encouraged (Oakes et al., 2009) as it will facilitate comparison between studies from different regions, helping to draw robust conclusions about park characteristics and health behaviours or outcomes.

The exercise of pre-identifying parks using CanMap prior to observers entering the field facilitated the on-site evaluation process. However, it must be noted that only 345 parks in the sample were pre-identified, meaning that observers identified approximately 36% of the parks evaluated. In addition, many of the parks that were pre-identified were found to be different than the map. When this was the case, observers would modify the park on the map to reflect its actual size or shape. This allowed for a more valid sample of the parks of interest in terms of number, location, and size. This is important for all studies using land data from CanMap. Further research should be conducted to work toward improving park identification through satellite images.

3.6. Limitations

The study was not initially designed to assess test-retest reliability, resulting in a low number of test-retest occurrences and an inability to assess intra-rater reliability for all items. The wide range of days between tests was not controlled for and this may have compromised the validity of the test-retest results. The mean number of days between tests was 163, approximately 5 months. This time lag likely resulted in an underestimation of the test-retest reliability, along with an increasing chance of substantive changes to park features between the first and second tests. Finally, the PARK tool underwent expert consensus and pre-teens were not consulted in tool development. The tool therefore may not capture all aspects of parks that are interesting for PA among pre-teens.

3.7. Conclusion

Youth are an important target population for increased physical activity due to increasing concerns of overweight and obesity among this population. The PARK tool can be recommended for use to assess park characteristics that may be appealing for youth PA.

A number of estimates have established the overall reliability of the PARK tool. Future research should estimate the reliability of the items shared between the POST and PARK tool in different geographic regions and compare them with the results found here. In addition, research should explore the relationships between park characteristics and their associations with physical activity, BMI, and other health outcomes, among a youth population.

3.8. Acknowledgements

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3.9. Tables

Table 1. Kappa and percent agreement results for all items on the PARK tool

ACTIVITIES			
ITEM	**Kappa**	**95% CI**	**% Agree**
Park Type	.720[a]	.656; .784	88.25
Tennis Courts Present	.980	.960; 1.00	99.48
Tennis Accessible	.688	.457; .920	92.94
Tennis Condition	.184	-.185; .552	91.77
Tennis Restriction	.481	.294; .667	74.12
Basketball Courts Present	.902	.856; .948	97.04
Basketball Accessible	n/a[b]	n/a[b]	97.94

Basketball Condition	.245	.031; .458	72.17
Basketball Restriction	.490	-.119; 1.00	97.94
Badminton/Volleyball Courts Present	.886	.802; .969	98.78
Badminton/Volleyball Accessible	n/a[b]	n/a[b]	96.55
Badminton/Volleyball Condition	.583	.222; .944	86.20
Badminton/Volleyball Restriction	n/a[b]	n/a[b]	88.89
Soccer/Football/Rugby Field Present	.984	.968; 1.00	99.31
Soccer/Football/Rugby Accessible	.886	.665; 1.00	99.43
Soccer/Football/Rugby Condition	.407	.205; .609	87.50
Soccer/Football/Rugby Restriction	.476	.167; .785	95.40
Baseball/Softball Field Present	.955	.927; .983	98.26
Baseball/Softball Accessible	.758	.495; 1.00	97.91
Baseball/Softball Condition	.557	.352; .762	90.21
Baseball/Softball Restriction	.436	.089; .782	95.07
Hockey/Ringette Rink Present	.980	.942; 1.00	99.83
Hockey/Ringette Accessible	1.00	1.00	100.0
Hockey/Ringette Condition	.595	.183; 1.00	88.00
Hockey/Ringette Restriction	.649	.016; 1.00	96.16
Track (Track & Field) Present	.638	.473; .802	97.21
Track Accessible	n/a[b]	n/a[b]	93.33
Track Condition	.400	-.090; .890	73.33
Trail Present	.6016	.535; .668	80.80
Trail Accessible	n/a[b]	n/a[b]	99.65
Trail Condition	.264	.034; .493	93.31
Bike Path Present	.743	.646; .839	95.65
Bike Path Accessible	n/a[b]	n/a[b]	100.0
Bike Path Condition	n/a[b]	n/a[b]	95.12
Skate Park Present	.976	.944; 1.00	99.65
Skate Park Accessible	n/a[b]	n/a[b]	100.0
Skate Park Condition	.657	.031; 1.00	97.78
Skate Park Restriction	.100	-.260; .460	82.22
6+ Play Area Present	.935	.900; .970	97.74
6+ Play Area Accessible	n/a[b]	n/a[b]	99.31
6+ Play Area Condition	.295	.116; .473	92.68
Multi-Use Area Present	.596	.529;0.664	81.01
Multi-Use Area Accessible	1.00	1.00	100.00
Multi-Use Area Condition	.235	.0605; .410	88.81
School Yard Present	.958	.929; .987	98.60
School Yard Accessible	.654	.288; 1.00	97.43
School Yard Condition	.170	-.072; .411	84.49
Equipment Rental Available	.664	.306; 1.00	99.47
Pool Present	1.00	1.00	100.00
Length of Pool	n/a[b]	n/a[b]	70.21
Pool Condition	.511[a]	.130; .893	80.44
Pool Cleanliness	.598[a]	.324; .871	76.09
Water Sprinklers Present	.882[a]	.816; .948	97.91
Water Sprinklers Condition	.893[a]	.723; 1.00	96.00
Water Sprinklers Cleanliness	.557[a]	.291; .823	76.00

ENVIRONMENTAL QUALTY			
ITEM	**Kappa**	**95% CI**	**% Agree**
Large Body of Water Present	.916	.852; .983	98.95
Sportive Aquatic Activities Present	.683	0431; .935	86.11
Pond or Fountain Present	.704	.544; .863	98.44
Aquatic Activities Present	1.00	1.00	100.00
Decorative or Cultural Features	.549	.466; .632	84.50
Garden Present	.605	.539; .671	80.84
Shady Areas Present	.523[a]	.464; .583	67.49
No Dogs Allowed Sign Present	.767	.714; .819	88.33
Graffiti Present	.514[a]	.451; .576	69.34
Vandalism Present	.224[a]	.141; .308	76.27
Litter Present	.417[a]	.343; .491	67.30
SERVICES			
ITEM	**Kappa**	**95% CI**	**% Agree**
Garbage Bins Present	.811[a]	.702; .920	97.91
Drinking Fountains Present	.918[a]	.889; .948	94.77
Picnic Tables Present	.855[a]	.813; .898	92.68
Sitting Benches Present	.679	.570; .789	94.93
Bleachers Present	.916	.883; 0.949	95.65
Public Toilets Present	.822[a]	.772; .872	92.15
Condition of Toilets	.846[a]	.771; .920	91.09
Chalet/Change Room Present	.673	.588; .758	91.46
Condition of Chalet/ Change Room	n/a[b]	n/a[b]	80.95
Parking Present	.728[a]	.675; .781	86.19
Bike Locks Present	.839	.795; .884	91.97
Public Transportation Present	.759	.704; .813	88.48
SERVICES			
ITEM	**Kappa**	**95% CI**	**% Agree**
Sufficient Lighting for Park	.591	.517; .664	83.28
At Least 1 Street Visible from Centre of Park	.644	.565; 0.722	88.49
At Least 1 House Visible from Centre of Park	.554	.466; .643	86.74
Adjacent Streets Local	.609[a]	.542; .675	82.24
Traffic Calming Measures Present	.448[a]	.382; .513	63.24
Pedestrian Safety Present	.648[a]	.596; .700	73.87
GENERAL IMPRESSION			
ITEM	**Kappa**	**95% CI**	**% Agree**
Overall Appealing for Youth	.480[a]	.424; .536	60.10
Overall Safe	.349[a]	.281; .417	59.97
Overall Attractive/ Pretty	.362[a]	.297; 0.427	58.19
Attractive for Walking	.528[a]	.470; .586	66.55
Attractive for Bicycling	.589[a]	.516; .663	81.53
Attractive for Active Play	.537[a]	.484; .588	61.85

[a] indicates kappa is weighted
[b] indicates kappa could not be calculated due to a lack of response variation between observers

Table II. Test-retest results for intra-observer reliability

Item	*r*	r^2	kappa	95% CI
Tennis Courts Present	.941*	.885	.939	.821; 1.00
Basketball Courts Present	.839*	.704	.827	.641; 1.00
Badminton/Volleyball Courts Present	.854*	.730	.844	.545; 1.00
Soccer/Football/Rugby Field Present	.946*	.894	.944	.836; 1.00
Baseball/Softball Field Present	.898*	.806	.898	.760; 1.00
Hockey/Ringette Rink Present	-.026	.001	-.026	-.0612; .010
Trail Present	.733*	.538	.733	.488; .979
Bike Path Present	.466**	.218	.448	.001; .896
Skate Park Present	.854*	.730	.844	.545; 1.00
6+ Play Area Present	.804*	.646	.804	.541; 1.00
Multi-Use Area Present	.605*	.365	.595	.330; .861
School Yard Present	.943*	.890	.942	.830; 1.00
Pool Present	.806*	.649	.787	.385; 1.00
Water Sprinklers Present	.629*	.395	…	…
Large Body of Water Present	.854*	.730	.844	.5451; 1.00
Decorative or Cultural Features	.577*	.333	.571	.268; .875
Garden Present	.495**	.245	.495	.224; .767
No Dogs Allowed Sign Present	.711*	.505	.696	.477; .916
Bleachers Present	.784*	.615	…	…
Chalet/ Change Room Present	.741*	.549	.731	.514; .948
Bike Locks Present	.632*	.400	.632	.385; .878
Public Transportation Present	.692*	.479	.688	.460; .917
Sufficient Lighting for Park	.504**	.254	.479	.097; .861
At Least 1 Street Visible from Center	.532**	.283	.521	.215; .826
At Least 1 House Visible from Center	.339**	.115	.319	-.035; .673
Park Type	.709*	.503	.793 [a]	.548; 1.00
Shady Areas Present	.477**	.228	.406 [a]	.110; .702
Pond or Fountain Present	1.00*	1.00	1.00 [a]	1.00
Public Toilets	.718*	.516	.725 [a]	.516; .934
Parking Present	.446**	.199	.643 [a]	.382; .904
Graffiti Present	.556**	.309	.470 [a]	.224; .716
Vandalism Present	.499**	.249	.503 [a]	.167; .839
Litter Present	.508**	.258	.377 [a]	.150; .604
Drinking Fountain Present	.709*	.502	.629 [a]	.422; .835

Picnic Tables Present	.549**	.301	.546 [a]	.270; .821
Adjacent Streets Local	.801*	.641	.743 [a]	.566; .920
Traffic Calming Measures Present	.559**	.313	.379 [a]	.132; .626
Pedestrian Safety Present	.475**	.226	.461 [a]	.231; .691
Overall Appealing for Youth	.651*	.424	.492 [a]	.279; .705
Overall Safe	.555**	.308	.479 [a]	.266; .693
Overall Attractive/Pretty	.754*	.568	.658 [a]	.455; .861
Attractive for Walking	.736*	.542	.593 [a]	.398; .787
Attractive for Bicycling	.905*	.819	.844 [a]	.673; 1.00
Attractive for Active Play	.696*	.485	.646 [a]	.446; .846

[a] Indicates kappa is weighted.
* $p < 0.0001$
** $p < 0.05$
r = The Pearson Product Moment correlation between park evaluation time 1 and time 2 by the same observer.
r^2 = The coefficient of determination or the proportion of common variation between park evaluation time 1 and time 2.
CI = Confidence interval.

Table III**.** Comparison of inter-rater reliability of items shared between the PARK tool and the POST

	PARK [d] (n=576)		POST [c] (n=47)	
Item	**Kappa**	**% Agreement**	**Kappa**	**% Agreement**
6+ Play Area Present	.935	97.74	1.00	100.00
Large Body of Water Present	.918	98.95	.876	97.70
Drinking Fountain Present	.918	94.77	.746	87.20
Public Toilets Present	.822	92.15	.849	95.60
Picnic Tables Present	.855	92.68	.956	--
Parking Present	.728	86.19	.744	87.20
Garbage Bins Present	.811	97.91	.691	93.60
No Dogs Allowed Sign Present	.767	88.33	.849	95.70
Public Transportation Present	.759	88.48	.539	76.00
Sitting Benches Present	.679	94.93	.877	97.70
Chalet/ Change Room Present	.673	91.46	1.00	100.00
At Least 1 Street Visible from Center	.644	88.49	.789	97.90
Trail/ Walking Path Present	.602	80.80	.707	85.10
Sufficient Lighting for Park	.591	83.28	.675	85.10
At Least 1 House Visible from Center	.554	86.74	.486	89.30
Graffiti Present	.514	69.34	.565	78.26
Litter Present	.417	67.3	.495	76.00

[c] Data printed with permission from the author, B. Giles-Corti.
[d] All categorical items have been dichotomized.

Table IV. The PARK Tool

Family PIN	
Observer ID.	
ID of co-observer	
Observer code. (A or B)	
Date	
Park ID	
Park address	
Start time	
1. Type of Usage	
Physical activity structured	1
PA non-structured	2
PA struct. and non-struct.	3
Passive activities – gardens	4
Passive only	5 (skip to Q11)
2A1. Tennis: Check if present	
2A2. Check if accessible	
2A3. Check if in good condition	
2A4. Check if restricted	
2B1. Basketball: Check if present	
2B2. Check if accessible	
2B3. Check if in good condition	
2B4. Check if restricted	
2C1. Badminton/Volleyball: Check if present	
2C2. Check if accessible	
2C3. Check if in good condition	
2C4. Check if restricted	

2D1. Soccer/Football/Rugby: Check if present	
2D2. Check if accessible	
2D3. Check if in good condition	
2D4. Check if restricted	
2E1. Baseball/Softball: Check if present	
2E2. Check if accessible	
2E3. Check if in good condition	
2E4. Check if restricted	
2F1. Hockey/Cosom/Ringette: Check if present	
2K2. Check if accessible	
2F3. Check if in good condition	
2F4. Check if restricted	
2G1. Race Track: Check if present	
2G2. Check if accessible	
2G3. Check if in good condition	
2H1. Foot Path: Check if present	
2H2. Check if accessible	
2H3. Check if in good condition	
2I1. Bicycle/Rollerblade Path: Check if present	
2I2. Check if accessible	

2I3. Check if in good condition	
2J1. Skate Park: Check if present	
2J2. Check if accessible	
2J3. Check if in good condition	
2J4. Check if restricted	
2K1. 6+ Play Area: Check if present	
2K2. Check if accessible	
2K3. Check if in good condition	
2L1. Multi-Use Space: Check if present	
2L2. Check if accessible	
2L3. Check if in good condition	
2M1. School Yard: Check if present	
2M2. Check if accessible	
2M3. Check if in good condition	
3.a) Equipment Rental: Check if present	
b) Specify: **TEXT**	
4. Pool Check if present	
5. Pool Length:	
Under 25m	1
Longer or equal to 25m	2
Impossible to evaluate	3

6. Condition Around the Pool:	
No deterioration	1
Presence of deterioration without need for repairs	2
Significant deterioration requiring repairs	3
Under construction	4
Impossible to evaluate	5
7. Cleanliness of Pool:	
Very clean	1
Clean enough	2
Not at all clean	3
Impossible to evaluate	4
8. Water Sprinklers: Check if present	
Water sprinklers under construction	3
9. Water Sprinklers Condition:	
No deterioration	1
Presence of deterioration without need for repairs	2
Significant deterioration requiring repairs	3
Under construction	4
Impossible to evaluate	5
10. Cleanliness of Water Sprinklers:	
Very clean	1
Clean enough	2
Not at all clean	3
Impossible to evaluate	4

11A. Important Body of	

Water: (if no skip to Q12)	

Check if <u>present</u>	
11B. Sportive Aquatic Activities: Check if <u>present</u>	
12A. Pond or Fountain: (if no skip to Q13) Check if <u>present</u>	
12B Sportive Aquatic Activities: Check if <u>present</u>	
13A. Decorative or Cultural Physical Elements: (if no skip to Q14) Check if <u>present</u>	
13B. If present, specify: TEXT	
14. Gardens: Check if <u>present</u>	
15. Shade:	
Many places	1
Some places	2
None	3
16. No Dogs Allowed Sign: Check if <u>present</u>	
17. Graffiti:	
None	1
Some	2
A lot	3
18. Broken Items/ Vandalism:	
None	1
Possibly	2
Definitely	3
19. Litter/Garbage:	
None	1
Some	2

A lot	3
20. Garbage Bins:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
21. Drinking Fountains:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
22. Picnic Tables:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
23. Sitting Benches:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
24. Bleachers:	
Yes, in usable condition	1
Yes, but unusable	2
No	3
25A. Public Toilets:	
Yes	1
No	2 (Skip to Q26)
Impossible to determine	3 (Skip to Q26)
25B. Condition of Toilets:	
Good	1
Bad	2
Impossible to determine	3
26A. Chalet/Change rooms:	

Yes	1
No	2 (Skip to Q27)
26B. Condition of Chalet/Change rooms:	
Good	1
Bad	2
Impossible to determine	3
27. Parking:	
Yes, reserved for the park	1
Yes, on the street only	2
No	3
28. Bicycle Locks:	
Check if present	
29. Public Transportation:	
Check if present	
30. Sufficient Lighting to Light the Majority of the Park:	
Check if present	
31. At least 1 Street Visible from the Centre of the Park:	
Check if yes	
32. At least 1 House Visible from the Centre of the Park:	
Check if yes	
33. Adjacent Streets are Local:	
All	1
Some	2
None	3
34. Adjacent Streets have	

Traffic Calming Measures:	
All	1
Some	2
None	3
35. Adjacent Streets have Pedestrian Facilitation Measures:	
All	1
Some	2
None	3
36. Is the Park Attractive for Youth?	
Very attractive	1
Attractive enough	2
Not attractive	3
37. Is the Park Safe?	
Very safe	1
Safe enough	2
Not safe	3
38. Is the Park Pretty/ Attractive?	
Very pretty/ attractive	1
Pretty/ attractive enough	2
Not pretty/ attractive	3
39. Is the Park Appealing for Walking?	
Very appealing	1
Appealing enough	2
Not appealing	3
40. Is the Park Appealing for Cycling?	
Very appealing	1
Appealing enough	2
Not appealing	3
41. Is the Park Appealing for Active Play?	

Very appealing	1
Appealing enough	2
Not appealing	3
42. Time of	

Completion: