



Research Paper

Park characteristics preferred for adolescent park visitation and physical activity: A choice-based conjoint analysis using manipulated photographs

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ABSTRACT

Adolescents should engage in 60 min of physical activity daily in order to obtain health benefits. Creating environments supportive for physical activity, could be a valuable strategy to increase physical activity at the population level. The purpose of this study was to understand the relative importance of park characteristics for park visitation and park-based physical activity among adolescents, using manipulated photographs of parks. Participants ($n = 1197$) were asked to perform two sets of ten choice tasks. For each choice task, a choice had to be made between two photographs of a park where ten characteristics were manipulated: naturalness, upkeep, walking paths, outdoor fitness equipment/playground, sport field, benches, drinking fountain, peers, mother with children and homeless person. In the first set of choice tasks participants had to select the park most inviting for visitation, in the second, they had to select the park most inviting for physical activity. Hierarchical Bayes Estimations were used to calculate (1) average utilities that represent the desirability of each level within a characteristic and (2) importance scores which reflect the effect each park characteristic had on the choice. The results indicate that park upkeep was the most important characteristic for park visitation and physical activity followed by the presence of playground/outdoor fitness equipment and sport fields. Policymakers could ensure that parks are well maintained, have sport fields and outdoor fitness equipment in order to meet adolescents' needs. Evaluation of such initiatives can confirm whether these park characteristics will influence actual adolescent park visitation and park-based physical activity.

1. Introduction

Worldwide, but mostly in Westernized countries, the prevalence of overweight and obesity among adolescents rises continuously and overweight or obese adolescents are more likely to develop non communicable diseases such as type 2 diabetes and cardiovascular diseases (Alwan, 2010; WHO, 2012). Sufficient physical activity can prevent overweight and obesity (Janssen et al., 2005) and has been shown to enhance adolescent health (Bauman, 2004; Hallal, Victora, Azevedo, & Wells, 2006; Janssen & Leblanc, 2010). It is recommended that

adolescents engage in 60 min of moderate-to-vigorous intensity physical activity daily in order to obtain these health benefits (WHO, 2010). However, worldwide almost half of all adolescents do not meet these guidelines (Cooper et al., 2015; Telama, 2009; Van Hecke, Loyen, et al., 2016b). Moreover, there seems to be a steep decline in physical activity levels during the transition from childhood to adolescence (Dumith, Gigante, Domingues, & Kohl, 2011) and these physical activity habits tend to track into adulthood i.e. lower physical activity levels during adolescence can predict lower adult physical activity levels (Telama et al., 2005). Therefore it is important to promote

Abbreviations: CBC, Conjoint based choice; CI, Confidence interval; EU, European union; FPAQ, Flemish Physical Activity Questionnaire

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adolescents' physical activity at the population level.

Socio-ecological models of health behaviour have emphasized the importance of the environment for physical activity (Sallis et al., 2006). Creating an environment that is supportive and inviting for physical activity could be a valuable strategy to increase physical activity levels at the population level. It has been shown that parks are settings within the urban environment that are suitable for physical activity (Cohen et al., 2007). Parks have been defined by the International Federation of Parks and Recreation Administration as: "open space areas, mostly dominated by vegetation and water, and generally reserved for public use. Parks are mostly larger, but can also have the shape of smaller pocket parks" (Konijnendijk, Annerstedt, Nielsen, & Maruthaveeran, 2013). Previous research has demonstrated that adolescents from Westernized countries living closer to parks perform more total leisure time- and park-based physical activity (Babey, Brown, & Hastert, 2005; Babey, Hastert, Yu, & Brown, 2008). Moreover, parks are valuable and accessible places where people can socialize, experience nature and relax (Lee & Maheswaran, 2011). Especially for adolescents, neighbourhood parks can be important, as from the age of twelve, adolescents gain more independent mobility, compared to younger children, allowing them to travel to local destinations without adult supervision (Carver, Timperio, Hesketh, & Crawford, 2010; Veitch et al., 2014). Furthermore, parks can be a destination to visit by foot or bike (Grow et al., 2008; Veitch et al., 2014) and therefore have the potential to increase physical activity through active travel even if park users engage in sedentary behaviours after arriving at the park. Therefore research to better understand how to promote park visitation and park-based physical activity is needed.

Worldwide, 54% of people currently live in urban areas and this number is expected to reach 70% in the future, which will result in the expansion and densification of cities (United Nations Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352)). The most urbanized areas are Northern America (85% living in urban areas in 2014), Latin America and the Caribbean (80%), and Europe (73%). Within densely populated cities, the amount of public and private green spaces is expected to decrease (Haaland & van den Bosch, 2015). Haaland and van den Bosch (2015) proposed several strategies to ensure green space provision in densifying cities, such as providing green space on redeveloped sites and increasing the quality of existing green spaces (Haaland & van den Bosch, 2015). In order to increase the quality of green spaces and parks, it is important to understand the most important park characteristics related to park visitation and park-based physical activity. Urban planners and policy makers should be informed which characteristics to prioritize, as often there is a lack of funding for total park renovations, and attention should be paid to ensuring parks are suitable to meet the most important needs of all user-groups.

Previous research using qualitative methods has revealed several aspects of parks to be associated with adolescent park visitation and park-based physical activity, such as the presence of nature (Lloyd, Burden, & Kiewa, 2008), well maintained facilities (Ries et al., 2008), sport and play facilities (Van Hecke, Deforche, et al., 2016a), large open spaces (Van Hecke, Deforche, et al., 2016a) and attractive scenery (Van Hecke, Deforche, et al., 2016a). Additionally, quantitative studies have confirmed associations between park-based physical activity and activity settings (e.g., playgrounds, basketball courts, pool and water features) (Baran et al., 2014; Reis, Ferreira Hino, Florindo, Rodriguez Anez, & Domingues, 2009), greenness (Dunton, Almanza, Jerrett, Wolch, & Pentz, 2014) and other features such as a skate parks, walking paths, picnic tables and toilets (Edwards, Hooper, Knuiman, Foster, & Giles-Corti, 2015). A natural experiment examining park renovations in two US parks revealed that the park renovations (renovation of playfields for basketball and soccer, new fencing, landscaping, lighting, picnic benches, new soccer goals, a walkway around the field) significantly increased park visitation and physical activity levels at the

playfields (Tester & Baker, 2009) and a natural experiment conducted in Australia indicated that the improvement of park features: installation of a walking path, fenced dog off-leash area, landscaping and a modest playground, led to increases in the number of park users of all ages and physical activity levels (Veitch, Ball, Crawford, Abbott, & Salmon, 2012). Other experimental studies have been conducted to examine older adults' preferences for environmental park characteristics in the UK (Alves, Aspinall, Ward Thompson, & Sugiyama, 2008; Aspinall, Thompson, Sugiyama, Brice, & Vickers, 2010) and to identify the relative importance of park features for adolescent park visitation in Australia (Veitch, Salmon, Deforche, et al., 2017a). These studies revealed that for older adults, lack of nuisance (absence of youngsters hanging around, dog fouling, signs of vandalism), facilities (the presence of café's, toilets) and the presence of trees and plants were the most preferred park characteristics (Alves et al., 2008; Aspinall et al., 2010), whereas for adolescent park visitation, slides were the most preferred park characteristic followed by absence of rubbish and the presence of swings (Veitch, Salmon, Deforche, et al., 2017a).

In this research article, two main research question are addressed: (1) What are the most important park characteristics for adolescents' park visitation and park-based physical activity? (2) Which level (e.g. paved vs unpaved walking paths) within each park characteristic is preferred by adolescents for park visitation and park-based physical activity? The results of this study will inform policy makers and urban planners on which characteristics to prioritize for adolescents in park renovation projects, ensuring the right characteristics are present in parks as often there is a lack of funding for total park renovations.

2. Methods

2.1. Method selection

Experimental studies are needed in order to inform policies about which park characteristics are causally related to adolescent physical activity (Koohsari et al., 2015). Some natural experiments have been conducted in parks. A natural experiment is characterised by researchers not having complete control over the decision about what changes will be made to the environment. Public open space-renovations pose good opportunities for a natural experiment as researchers often do not have the budget nor the jurisdiction to realise environmental changes. A natural experiment evaluates the effect of environmental changes on the behaviour of the users of this environment (Craig et al., 2012). However, natural experiments are relatively scarce (Hunter et al., 2015) and difficult to conduct because of organisational and financial challenges (Veitch, Salmon, Deforche, et al., 2017a; Veitch, Salmon, Giles-Corti, et al., 2017b). An alternative and cost-effective method to examine which park characteristics are most important to attract adolescents to visit and be physically active in parks is the use of virtual experiments i.e. where virtual environmental changes are examined without actual changing the real park environment. Choice based conjoint (CBC) analysis is often used in virtual experiments (Alves et al., 2008; Aspinall et al., 2010; Nordh, Alalouch, & Hartig, 2011). CBC makes it possible to examine how people value different characteristics (e.g. park upkeep) of a product (e.g. a park) and to understand which characteristics are the most influential on participants' preferences. Hence, CBC analysis provides information that can help decision making about which park characteristics to prioritize during park development/renovations with limited financial resources. Furthermore, within CBC analysis it is possible to systematically vary specific park characteristics (which is often not possible in park renewal projects), control other environmental characteristics (such as the weather) and present the studied product (parks in our case), in different formats such as written descriptions, photographs, or videos (Orme, 2014). Most studies have used a written description of the park characteristics, which implies that the participants had to imagine these park characteristics. This may lead to different

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