



## Review

## Measures of outdoor play and independent mobility in children and youth: A methodological review



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## ABSTRACT

**Objectives:** Declines in children's outdoor play have been documented globally, which are partly due to heightened restrictions around children's independent mobility. Literature on outdoor play and children's independent mobility is increasing, yet no paper has summarized the various methodological approaches used. A methodological review could highlight most commonly used measures and comprehensive research designs that could result in more standardized methodological approaches.

**Design:** Methodological review.

**Methods:** A standardized protocol guided a methodological review of published research on measures of outdoor play and children's independent mobility in children and youth (0–18 years). Online searches of 8 electronic databases were conducted and studies included if they contained a subjective/objective measure of outdoor play or children's independent mobility. References of included articles were scanned to identify additional articles.

**Results:** Twenty-four studies were included on outdoor play, and twenty-three on children's independent mobility. Study designs were diverse. Common objective measures included accelerometry, global positioning systems and direct observation; questionnaires, surveys and interviews were common subjective measures. Focus groups, activity logs, monitoring sheets, travel/activity diaries, behavioral maps and guided tours were also utilized. Questionnaires were used most frequently, yet few studies used the same questionnaire. Five studies employed comprehensive, mixed-methods designs.

**Conclusions:** Outdoor play and children's independent mobility have been measured using a wide variety of techniques, with only a few studies using similar methodologies. A standardized methodological approach does not exist. Future researchers should consider including both objective measures (accelerometry and global positioning systems) and subjective measures (questionnaires, activity logs, interviews), as more comprehensive designs will enhance understanding of each multidimensional construct. Creating a standardized methodological approach would improve study comparisons.

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## 1. Introduction

According to the World Health Organization's Global Recommendations on Physical Activity for Health<sup>1</sup>, children and youth aged 5–17 should accumulate at least 60 min of moderate-to-vigorous physical activity (MVPA) per day to improve cardiorespiratory and muscular fitness, body composition, bone health, and cardiovascular and metabolic health biomarkers. Regular physical activity (PA) provides not only physiological benefits but also psychosocial benefits such as improved self-esteem and self-confidence, lower depression and anxiety, and higher academic achievement and cognitive functioning.<sup>2</sup> Despite these benefits, the

majority of children and youth today are simply not active enough. In Canada, national data from the Canadian Health Measures Survey indicate that just 7% meet the current PA recommendations, with many spending the majority of their day (62%) sedentary.<sup>3</sup> Consequently, increasing emphasis is being placed on exploring opportunities for accumulating PA on a daily basis. For example, the journey to school is considered an opportune time for increasing PA through active transport.<sup>3</sup> Others have recognized the value of integrating PA into the school day.<sup>3</sup>

Recently, more attention has been drawn to the after-school period (3–6 pm), a period increasingly being viewed as a “critical period”<sup>3</sup> for accumulating PA. After school, children have more discretionary time, and there is evidence that children who are active after-school tend to be more active throughout the day.<sup>4</sup> Instead of, for example, playing outdoors during the after-school period, the majority of Canadian children (73%) are pursuing indoor sedentary

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activities.<sup>5</sup> Declines in outdoor play (OP) over the last few decades have been documented globally with adults noting their children play outdoors less than they did as a child.<sup>6</sup> Given that OP is a valuable source of PA<sup>7</sup>, critical for healthy development in childhood<sup>8</sup>, these trends are troubling.

Some believe that this decline in OP may be linked to children's independent mobility<sup>9</sup>, which has also been declining.<sup>10,11</sup> Children's independent mobility (CIM) is typically defined as "the freedom of children to travel around their own neighborhood or city without adult supervision".<sup>12</sup> CIM is also critical for healthy development in childhood, influencing cognitive development, the ability to build relationships, social development and the development of movement skills.<sup>12</sup> There is evidence that children with greater independent mobility spend more time playing outdoors<sup>13</sup> and are more physically active<sup>14</sup> than children whose mobility is restricted. It seems realistic therefore that both OP and CIM are important to children's accumulation of daily PA<sup>15</sup>, and consequently, to the prevention of obesity and chronic disease.

Unfortunately, many barriers prevent children from being permitted independent mobility and playing outside<sup>16</sup>; perceived threats to safety is typically the strongest barrier.<sup>17</sup> Globally, researchers have developed strategies to investigate these predictors of OP and CIM, and explore how they are related to health outcomes, with the intent of informing intervention research. As a consequence, literature on OP and CIM is increasing, yet study designs have been quite diverse. To the authors' knowledge, a standardized methodological approach to measure OP and CIM does not exist. Additionally, no paper has summarized the various methodological approaches used in the literature. A methodological review could highlight most commonly used measures and identify comprehensive research designs that include a range of methodologies. Information on these methodologies could aid countries with little data on OP and CIM to develop a methodological approach for measuring these constructs.

The purpose of this paper is to provide the first known methodological review of outdoor play and independent mobility in children and youth, and provide suggestions for research teams who wish to develop a comprehensive methodological approach to measuring these constructs. If methodological approaches for assessing OP and CIM can be more comprehensive, and perhaps even standardized, international comparisons on these constructs and their correlates will improve, and stronger evidence will emerge.

## 2. Methods

A standardized protocol<sup>18</sup> was used to guide a methodological review of published research on objective and subjective measures of outdoor play and independent mobility in children and youth. Two reviewers (BB and MS) assessed potentially relevant studies for inclusion/exclusion. BB extracted all data, and MS reviewed all extracted material to ensure it was presented correctly. There was no disagreement on the inclusion/exclusion of studies.

An internet search for articles on outdoor play was conducted using the following electronic databases: Academic Search Premier (1936–2013), CINAHL (1936–2013), Psyc Article (1936–2013), PsycINFO (1936–2013), Sport Discus (1936–2013), ProQuest (1971–2013), Google Scholar, and Web of Science. Keywords included in the search for articles on outdoor play were: "child\*", "play", "outdoor", "outside", "activ\*", "unsupervised", "independent\*", and "autonom\*". Ninety-six articles were deemed potentially relevant. Searches were also conducted online for articles on independent mobility using the following electronic databases: Academic Search Premier (1936–2013), CINAHL (1936–2013), Psyc Article (1936–2013), PsycINFO (1936–2013),

Sport Discus (1936–2013), ProQuest (1971–2013), Google Scholar, and Web of Science. Keywords used in the search for independent mobility articles were "child\*", "independ\*", "unsupervised", "autonom\*", "self-reliance", "mobil\*", "active\*", "journey", "excursion", "travel" and "outdoor". Articles were gathered from May to July of 2013. Initially, seventy-three results were identified as potentially relevant. The reference lists of literature retrieved through online search engines were examined to identify any additional articles. The requirement for inclusion of literature was an objective or subjective measure of outdoor play or independent mobility among children and youth (ages 0–18). There were no search limitations regarding research design or year of publication. However, only studies published in the English language were included.

Initially, twenty-eight studies on outdoor play were considered for inclusion. Two studies were omitted, as they did not contain a precise measure of outdoor play.<sup>19,20</sup> Two studies were excluded as results had too great a focus on environment and playground features that impact activity rather than the measure of outdoor play.<sup>21,22</sup> Ultimately, twenty-four studies were selected and data were extracted in terms of sample and location, age of participants, sampling, objective measure and/or subjective measure of outdoor play and details.

Also, twenty-seven studies on independent mobility were originally considered. One study was excluded because results did not specifically focus on independent mobility and the measure of independent mobility was difficult to ascertain.<sup>23</sup> A study by Mammen et al.<sup>24</sup> was initially considered, but later excluded as its focus was on measurement of active school transport, not independent mobility. A study by Mavoia et al.<sup>25</sup> was also initially included, however it contained a subsample of data from another study.<sup>26</sup> Finally, an article by Villaneuva et al.<sup>27</sup> was excluded as it used the same data from a questionnaire described in another article by Villaneuva et al.<sup>28</sup> Overall, twenty-three studies were selected and data were extracted in terms of sample and location, age of participants, sampling, objective and/or subjective measure of independent mobility and details. The review process for the inclusion of studies measuring outdoor play and independent mobility is illustrated through the use of a PRISMA flow diagram<sup>29</sup> in Figs. 1A and 1B.

The methodological quality of the included studies was appraised by two reviewers (BB and MS) using 17-point quality criteria adapted from an existing checklist.<sup>15</sup> This modified checklist captures the quality of reporting of studies as well as characteristics of actual study quality. Each criterion was rated as yes = 1, partial = 0.5 if the criterion was only partially fulfilled, no = 0 or unclear = 0. The highest attainable study quality score was 17. The obtained study quality score was divided by the highest attainable study quality score and multiplied by 100 to give an "overall study quality percentage". Study quality percentages were then grouped into high (>66.7%), fair (50–66.6%) or low (<50%) study quality.<sup>15</sup>

Given the diversity of study designs, a narrative review of the measurements of outdoor play and independent mobility are presented.

## 3. Results

### 3.1. Study quality

In studies measuring outdoor play ( $n=24$ ), the study quality was rated high in 19 studies (79%)<sup>7,9,13,30,32–35,38,40–49</sup> and fair in 5 studies (21%)<sup>5,17,36,37,39</sup> (Table 1). In studies measuring independent mobility ( $n=23$ ), the study quality was rated high in 12 studies (52%)<sup>10,13,28,46,50,53–55,57,58,60,62</sup> and fair in 11 studies (48%)<sup>14,16,17,26,31,45,51,52,56,59,61</sup> (Table 1). There was 100% consensus between the two reviewers (BB and MS) in single study and

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