

**An examination of children's safety associated with children's pedestrian behavior and physical environment while walking across crosswalk to park entrance**



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# Contexte

- Road safety
- Road accident
- Pedestrian safety (Lee and Abdel-Aty, 2005)
- Unsafe traffic environment for children's walking (Safe Kids Canada, 1994-2004)
  
- Healthy lifestyle in the future (Sylvia-Bobiak & Caldwell, 2006; Thompson et al., 2008)
- Active school transportation
- Commuting to parks and playgrounds (Frumkin, 2003)

# Objective

## Main Objective:

- Examine the factors that are influential to the children's safety while crossing streets near the parks.

# Problematic

## ➤ **Developed countries:**

➤ 1 hour

➤ School children in dense urban areas go to park

## ➤ **Active school transportation 1993 to 2003**

➤ In Canada : Children (6-12 years old) 45% to 34%

## ➤ **Walking on routes, less than 2 km 1993 to 2003**

➤ In Montreal: 39% to 35%

(Ville de Montréal, 2006)

## *Socioecological Models of Physical Activity*

Park ↓

➤ Principal behavioral settings for physical activity

➤ Opportunities of physical activity and psychological health benefit

(Andrew, 2008 & Ariane et al, 2005)

# Problematic

## Safe Routes to Park for Children

- **Road safety measurement**
  - Improving individual's safety
  - Reduce rate of childhood accidents (Welander, 2004)
- **In Canada**, injury related to death due to pedestrian injuries (1994 and 2003):
  - 18% (5–9) years old
  - 14% (10–14) years old (Cloutier, Bergeron and Apparicio<sup>1</sup>, 2011)
- **UNICEF**, (2011): the most common health risk children in pedestrian accidents

### WHILE

Many studies focus on :

- **Driver's safety** (WHO, 2004).
- Safety **inside** the playgrounds and the **disparities in accessing** to park (Allen et al (2012)
- Traffic injury risks for children in **deprived area** (Christie et al (2009)

# Problematic

## Road Crossing Behavior

- Correct make decision at the right time based on situation

awareness (Tom, Granié, 2011)

- Risky behavior during childhood  
(gender)



- Crossing inside the marked crosswalk
- Looking right and left before crossing  
(straight or diagonally)
- Crossing speed
- Holding hands while crossing
- Start and ending walking on the zebra  
crossing

- **Girls**

More behavioral compliance with  
pedestrian rules (Granié, 2007).

- Road crossing behaviors  
**individual variables**

affected by  
Street & Intersection  
Characteristics

Crossing width - Crossing time

(Gates et al., 2006, Dumbaugh and Rae, 2009)

# Problematic

## Physical Environment & Crossing Situation

- Children:
  - Recreation
  - Doing physical activity through play
- Physical environment
  - Most in accordance with car travel
- Less attention in relation between
  - Physical environment
  - Child's physical activity behavior (Krizek et al , 2004, Newman et Kenworthy 1991)

Ex: Un controlled pedestrian crossing”

- Pedestrian / Drivers (Hunter-Zaworski, 1997)

# Problematic

## Physical Environment & Crossing Situation

- The number of pedestrian crossing crosswalk at the same time  
Positive and Negative



Red light violation

- Children's pedestrian risks  $\xrightarrow{\text{associated}}$  children crossing situation

- Crossing an intersection without traffic lights
- Crossing red pedestrian signal with no cars coming
- Crossing green pedestrian signal
- Crossing between parked cars

(Cloutier, Bergeron, Apparicio, 2011)

# Concept

- Safety concept
  - Fundamental human right
  - Equal for all individual and communities (WHO,1989)
- Safety Promotion

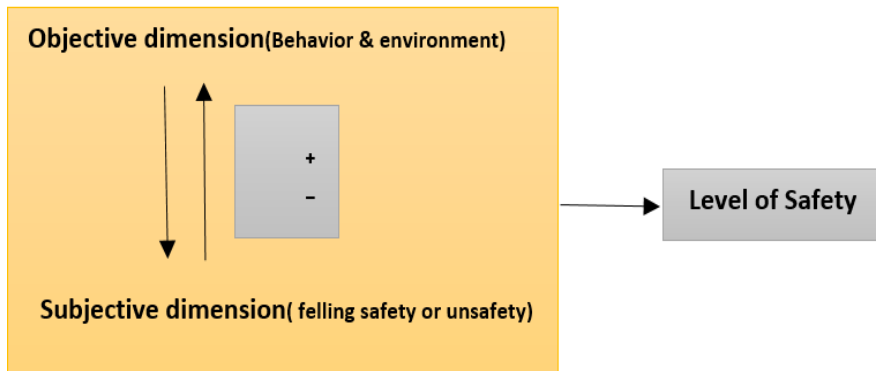


Figure1: Two dimintions of safety source: Maurice et al, 1997

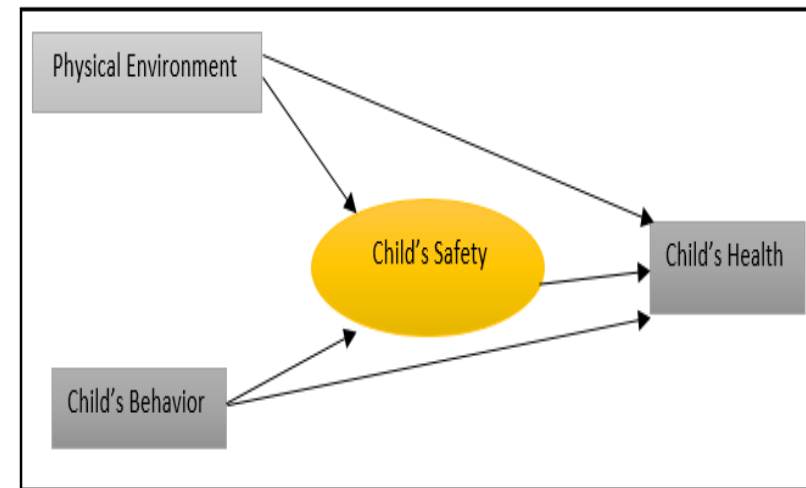


Figure 2: Two Links between safety and health of children inspired by Maslow, 1968

# Ecological Model

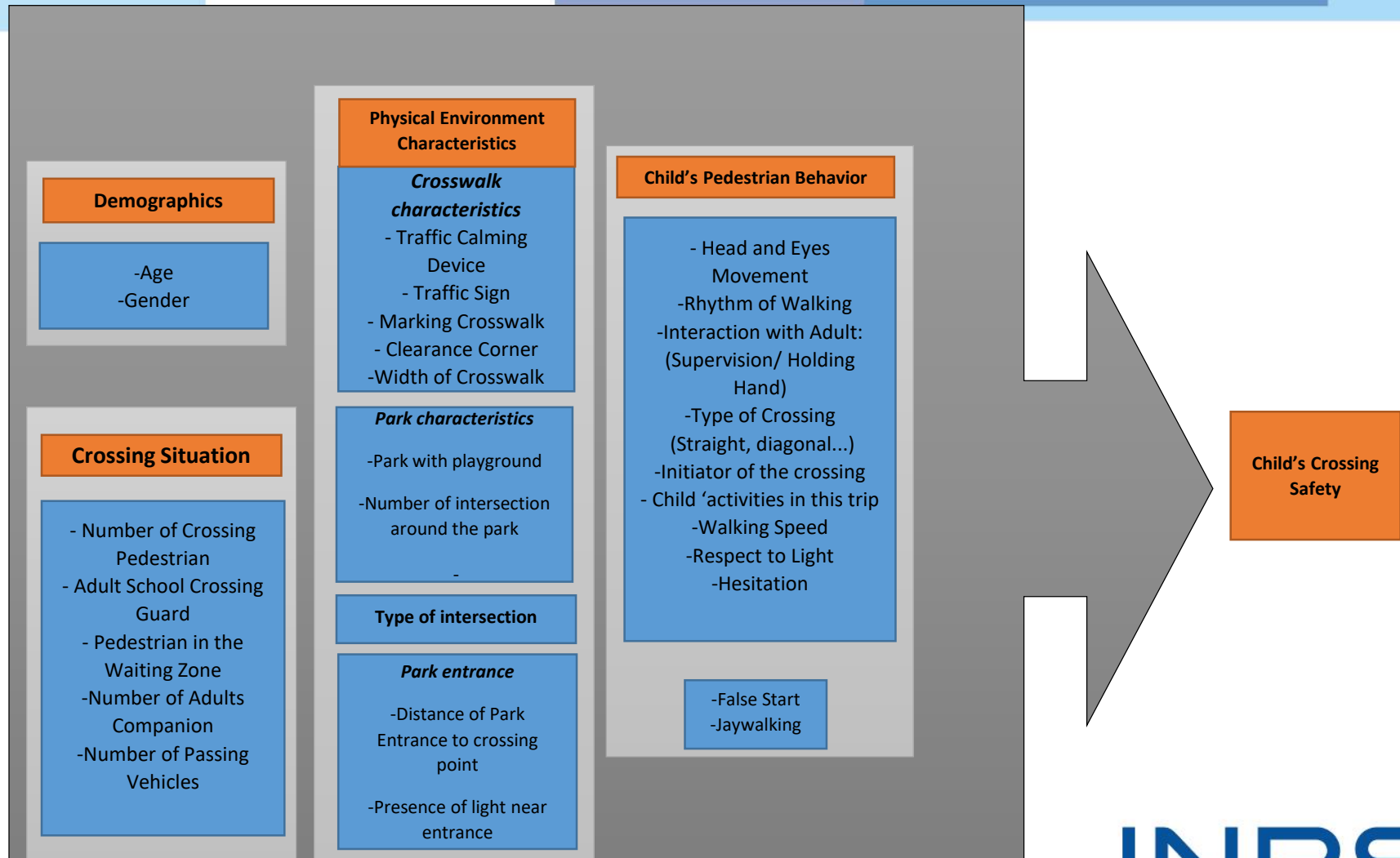


Figure 3: Ecological Model of Child's Pedestrian Behavior and Physical Environment Influence on Child's Crossing Safety

Source : (Inspired by Sallis, et al, 2006 & Saelens et al, 2003 & Lachapelle, Cloutier, 2017)

# Research Questions and Hypothesis

## Main Question

- Which main factors affect the children's safety while walking across crosswalk to park entrance?

## Secondary Questions

- Which physical environment elements of the crosswalk driving children to more safe behavior?
- Do the supervision of children by adults will lead to safe behavior of children while crossing the crosswalk to park entrance?
- Which demographic characteristics (age/gender) of children influence their behavior while crossing?
- Do children's pedestrian as part of group of children perform safer behavior?

## Main Hypothesis

- The children's safety, while walking across to park entrance, is affected by their crossing behavior and physical environment characteristics.

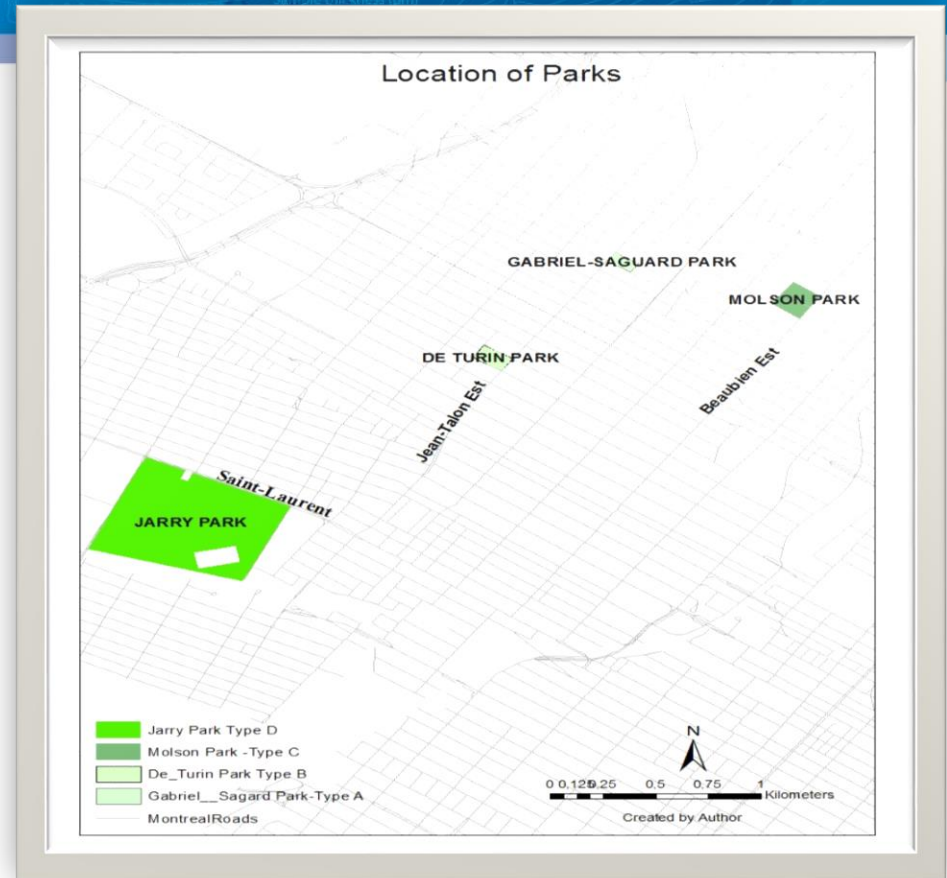
## Secondary Hypotheses

- Presence of traffic calming device, traffic sign and marking crosswalk can drive children to more safe behavior.
- The children whom supervision by adult adopt safe behavior.
- Gender as a demographics factors have influence in their behavior while crossing.
- Children as part of group of children do not perform safer behavior.

# Methodology

## Selection of Study Areas

- **Montreal**
  - Villeray-Saint Michel- Parc Extension (VSP)
  - Rosemont - La petite- Partie arrondissement (RPP)



Arrondissement	VSP	RPP	VSP	VSP
Categories	<b>A</b> Very Small park	<b>B</b> Small park with 1-5 ha & 2 facilities	<b>C</b> Small park with 1-5 ha & average 3 facilities	<b>D</b> Small park with 1-5 ha & Average 6 facilities, an ice rink, a swimming pool
Name of parks	Gabriel-Sagard	Molson	De Turin	Jarry

# Methodology

## Selection of Intersections and Crosswalk

Park	Jarry			De-Turin		Molson	Gabriel-Sagard		
Name of Streets	and Saint- Laurent & Gary-Carter	Saint-Laurent & Villeray	Saint- Laurent & Gounod	Jean-Talon & Lanaudiere	Jean-Talon & Chambord	Elsdale & d'Iberville	Jean-Talon & Sagard	Jean-Talon & Louis-Hemon	In Sagard
Intersection ID	IN-1	IN-2	IN-3	IN-4	IN-5	IN-6	IN-7	IN-8	No intersection
Crosswalk ID	CR-1	CR-3	CR-5	CR-7	CR-8	CR-9	CR-11	CR-12	CR-13
	CR-2	CR-4	CR-6			CR-10			CR-14

### ➤ Choice of Population

➤ Furtive observation

➤ Child pedestrian divided in two group:

**Look like 4-8 & 9-12 years**

➤ 420 children

# Methodology

## ➤ Direct Furtive Observation

- Despite the complexities of observational model in real traffic-environment
- Based on many previous studies

## ➤ Development of the Grids of Observation and Classification of Data

- ESSAIM and PARI, 2013
- Ecological model
- Five observation grid
- Unique ID

## ➤ Description of Data Collection & Processes of Observation

Steps	Support of collection	Tools	Information collected	Time of collection
Characteristic of physical environment	-Tablet electronic with Quick tap application	Crosswalk form	Cross walk elements related to project ESSAIM,	During spring 2017
		Intersection form	Type of Intersection	
		Park form	Number of park entrance/ park surrounding with which elements	
		Park entrance form	Distance of park entrance with crosswalk	
Observation of child behavior	Voice recorder/ Tablet electronic with Quick tap application	Child behavior form	Demographics element/ their behavior during crossing	During spring 2017

# Analysis

$[Cd] = [Cd^{2+}] = 10 \text{ nmol L}^{-1}$

Sample thickness (µm)

Dependents Variables	Independent variables ( Demography- Behavior- Crossing situation)							
	Boy	Age (4-8)	Part of children group	With companion	More than 2 other pedestrian at the same time (while crossing)	Regular waiting in waiting zone	Head and eye's movement to other pedestrian (before crossing)	Initiates crossing at the same time with companion
Straight Crossing	-	+	-	+	-	+	-	+
Compliance to Road Sign and Marking	-	+	-	+	-	+	-	+
Supervision as Physical Contact	-	+	-	+	-	+	-	+

# Analysis

Dependents Variables	Independent variables ( Demography- Behavior- Crossing situation)							
	Presence of school guard	Men as a companion	Doing activity while crossing	Finish crossing out of marking crosswalk	Start with regular walking pace and finish with run	Jay walking	Entry to farther park entrance	Crossing while red pedestrian signal and no cars coming
Straight Crossing	+	-	-	-	+	-	-	-
Compliance to Road Sign and Marking	+	-	-	-	-	-	-	-
Supervision as Physical Contact	-	-	-	-	+	-	-	-

# Analysis



Dependents Variables	Independent variables ( Physical environment characteristics )								
	No sign crosswalk	Pedestrian light duration	Crosswalk less than 10 m	Open park	Non ground marking	Parked car in distance of 5 m	Presence of traffic light	1 way street	Presence of Traffic Calming Device
Straight Crossing	-	+	+	-	-	-	+	+	+
Compliance to Road Sign and Marking	-	+	+	-	-	-	+	+	+
Supervision as Physical Contact	+	+	+	NA	+	+	+	+	+



**Question?**

**Thank you**