Walk 21, Zurich, September 2005

Investigating the effects of a car culture on a child's spatial skills

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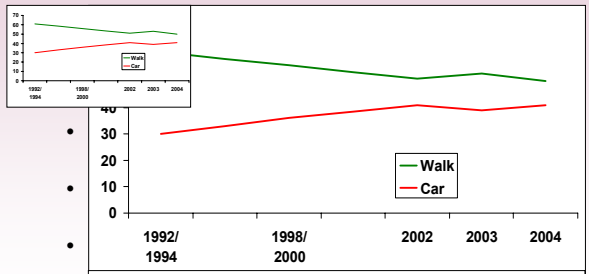
Setting the scene: Changes in children's behaviour



Methods of travel by 5-10 year old children in Great Britain (NTS)

Why Does This Matter?

- Children's day-to-day travel is an important factor in the way that they interact with their local environments
- Reduced opportunity for unsupervised play and exploration
- Increased car use linked with decreased physical activity
- Children may lack the experience necessary to develop the skills they need to travel safely on their own
- May impact on children's cognitive spatial skills

The CAPABLE study

- **C**hildren's **A**ctivities **P**erceptions **A**nd **B**ehaviour in the **L**ocal **E**nvironment
- 2 year EPSRC funded project involving
  - Centre for Transport Studies
  - Centre for Advanced Spatial Analysis
  - Bartlett School of Planning
  - Psychology Department
  - Young Foundation
- The project is using a variety of methods to look at children's behaviour in the local environment

CAPABLE project elements

- Electronic monitoring of children's travel and activity patterns (GPS and accelerometers)
- Questionnaire surveys of parents and children
- Interviews with parents and children
- Tests of children's spatial skills and environmental knowledge
  - Sketch mapping
  - Direction estimation
  - Spatial reasoning tests

Environmental experience and cognitive maps

- Part of the project is an attempt to link children's experience of the environment with their spatial knowledge
- The local environment provides a venue for a wide range of experiences – play and learning
- Cognitive map is a useful concept
- Travel mode may play a role by filtering a child's experience of the environment
  - Walking alone is direct interaction
  - Car passenger is indirect interaction

Sketch Mapping – from pilot study

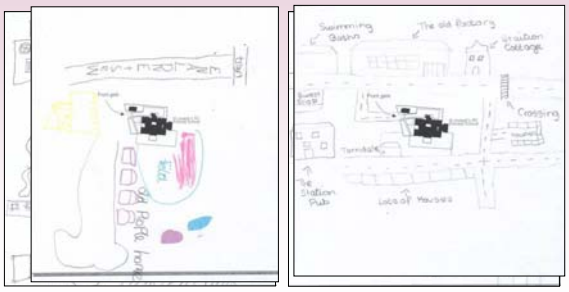
- Unfortunately this is not a cognitive map
- But it does make explicit some of the stored landmarks, route elements and relationships

Sketch Mapping

Children were asked to draw

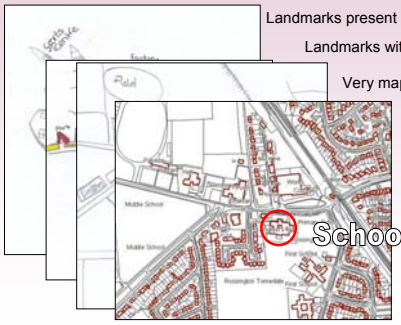
- **Route maps** – "Draw a map that someone could use if they wanted to make the same journey"
- **Area maps** – "Draw a map of the area around the school"
- In both task children were encouraged to include as many landmarks as they could remember, and to label them

Examples of Children's School Area Maps



Year 4

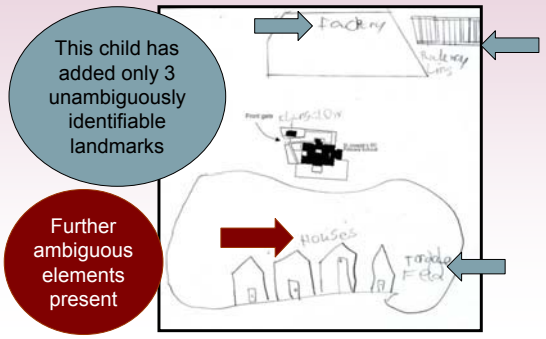
Classifying Maps



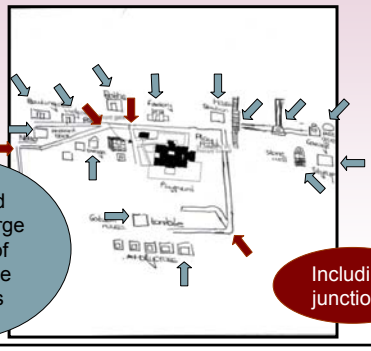
Example of area map analysis

- Some maps contained very few elements
- Some elements could not be matched with their real-world counterparts
- Children needed to add at least 4 unambiguously identifiable landmarks

Low Element Example



High Element Example



This child added a large number of identifiable elements

Including junctions

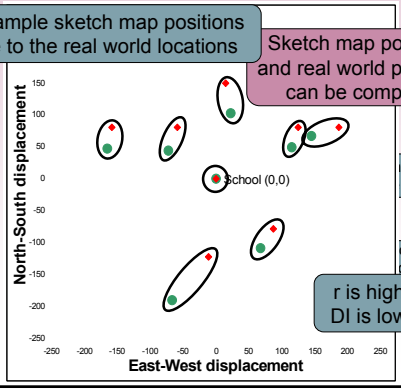
Results for Detail

	N	Mean	SD
Car usually used for the journey to school	31	8.4	2.9
Other mode usually used for the journey to school	28	8.1	2.4
Male	32	8.8	3.0
Female	27	7.6	2.0
Year 4	28	8.4	3.0
Year 6	31	8.1	2.3
Overall	59	8.3	2.7

Example of Accuracy Analysis

In this example sketch map positions are close to the real world locations

Sketch map positions and real world positions can be compared



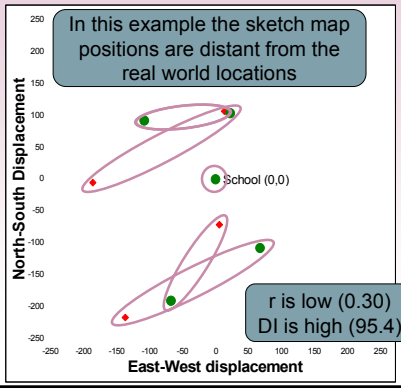
t centres found

oordinates onverted

r is high (0.98)
DI is low (20.2)

Fit and Distortion Index

In this example the sketch map positions are distant from the real world locations



r is low (0.30)
DI is high (95.4)

Results for Accuracy

	N	Mean	SD
Car usually used for the journey to school	31	51.7	22.6
Other mode usually used for the journey to school	28	41.0	18.9
Male	32	44.7	19.6
Female	27	48.9	23.5
Year 4	28	47.4	20.1
Year 6	31	45.9	22.8
Overall	59	46.6	21.4

Preliminary results for detail and accuracy

- Splitting by “usual mode of travel to school” shows significant difference in accuracy
  - Difference is larger for the younger children
  - There is no difference in detail between travel modes
- Boys produce sketch maps that include slightly more detail than girls
  - There is no difference in accuracy

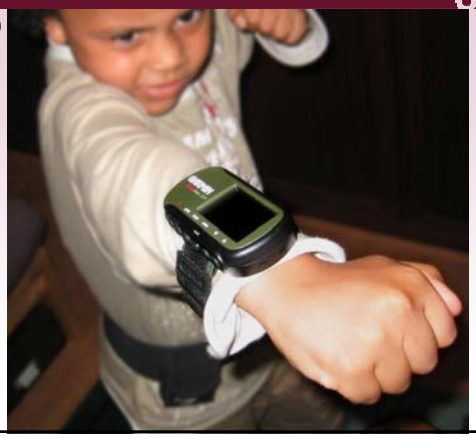
Combining different methods

- Different methods have their own advantages and disadvantages
- The sketch maps provide a rich set of data but are difficult to analyse
- The results from these tests may rely more on a particular skill (drawing) than spatial knowledge
- Direction estimation and landmark recognition remove the need for the child to draw anything
- Spatial reasoning measures basic spatial ability

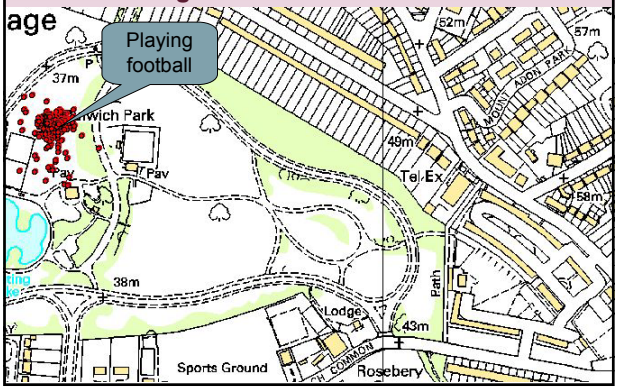
Combining different methods

- An accurate picture of children's environmental experience is needed
- Diary and recall methods produce incomplete records
- Journey to school can be made by a number of routes
- GPS monitoring from another part of the project provides a more objective record

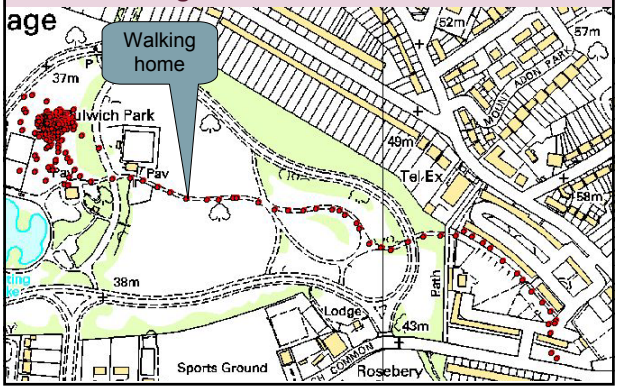
GPS tracking



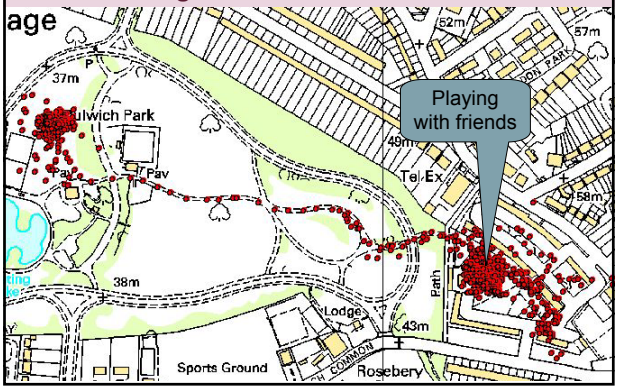
GPS tracking



GPS tracking



GPS tracking



Examining the route to school using GPS

- An accurate measure of a child's route to school can be combined with their recall (sketch map) of the journey
- Without a trace it is difficult to distinguish a mistake from a detour
- Drawing on maps can lead to inaccurate results

Conclusions

- Small initial sample suggests that there may be a link between car use and spatial ability
- Other instruments will provide a more complete picture of children's abilities
- An accurate record of behaviour will allow the effect of environmental interaction, including travel, to be investigated

Further information:

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