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## **Effect of travel modes on children's cognitive development - executive summary**

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### **ES 1 Aims and methods**

The purpose of this project was to establish what research is available on the effect of modes of travel on children's mental health and cognitive and social development (CMHCSD) and potential for further research to give robust, meaningful findings to extend existing knowledge.

The research project was commissioned by the Department of the Environment, Transport and the Regions (DETR) to support policy interests in travel to school including the work of the School Travel Advisory Group (STAG). Although, the primary interest was in travel to school, the Group wished to consider not only research about travel to school but also research about modes of travel suitable for journeys to school. This was to ensure that research on child travel was considered even if it did not directly address school travel issues.

Children travel to school using a variety of methods, such as walking, bicycling, bus, car, and others. On the way to school, they encounter a wide variety of experiences, which may affect their learning, social skills or mental health status, interactions with situations and people. It was beyond the scope of the project to consider all research on all possible components of journeys to school. It was, however, important to consider research addressing the component activities involved in travel and travel to school, where the link to travel was explicit.

The research project had three stages:

- (i) a interview / focus group exercise in which a number of individuals concerned with schools, travel to school, travel policy and children were interviewed where the purpose was to explore the respondents' views of likely effects of travel on CMHCSD and to gather names of key individuals and key pieces of research on this topic;
- (ii) a systematic search and a broad mapping of the literature on the effects of travel on CMHCSD; and
- (iii) a more detailed mapping of one subset of the literature explicitly examining the effects of travel on CMHCSD, but without a very detailed investigation of the findings or quality of this research.

## **ES 2 Interview / focus group study**

The interview / focus group study involved asking a number of people concerned in different ways with travel to school, including a focus group of young people, about the issues they felt were important in relation to the current study and for any suggested further contacts or knowledge of relevant studies. The purpose of this interview / focus group study was to inform a subsequent systematic review, by ensuring that the questions asked by the review were relevant to those involved in these issues and by searching for leads for relevant studies.

The interview / focus group study identified many different issues concerning the potential effects of travel on CMHCSD. Most of the issues raised by respondents related to the components of travel, of physical activity, diet, environment, social experiences, cognitive experience and effects on children of mass travel of different types.

## **ES 3 Broad mapping of research literature**

A two stage process was undertaken. Using relevant terms identified through the interview / focus group study, there was first a search for and mapping of the literature of concern to the systematic review. Second there was a more detailed mapping of one subset of the first stage mapping, based on feedback from the project's steering committee. The two levels of mapping focused on what research had been undertaken rather than what can be reliably learnt from it.

Our searches of electronic databases identified reports relevant to the effects of these sub-components. A total of 3,228 references were located through electronic databases. Of these, 1,464 came from PubMed, 684 were from Eric, 644 were from PsycInfo, 109 from Sociological Abstracts, 312 were from Transport and 15 were from BiblioMap. Once detailed inclusion and exclusion criteria of relevance were applied to the 3,228 references, a total of 353 remained. Approximately one third of these studies were coded as borderline for inclusion leaving 177 studies for inclusion in a broad map of the literature.

In general, the range of reports identified was more limited than the ideas suggested by respondents in the interview / focus group exercise, but there were a few examples where the studies revealed other topics, such as: the effects of noise pollution, the effects of stress and daily hassles on children, the importance of car pools to social networks, risk taking and disruptive behaviour by some children, social responsibility of teenagers allowed/able to drive, the psychological effects of road traffic accidents and assault.

## **ES 4 Detailed mapping on effects on CMHCSD**

The next stage of the review involved producing a more detailed map of a sub-group of identified studies concerned with effect of modes of travel to school, or components of travelling to school, on children's cognitive, social or mental health status. To further focus on the more specific sub-group topic, the 353 studies initially identified plus further studies from websites and interviews and personal contacts were subjected to a 'second round' of inclusion/exclusion screening, that specified research examining the effects of travel to school, travel suitable for travel to school or components of such suitable travel on CMHCSD. Thirty nine of the studies were considered relevant and included in the detailed review. As these studies covered a number of different component aspects of travel there were few studies on each component area.

## **ES 5 Research and travel policy**

Finally, the nature of the research studies was compared with the suggestions for the likely effects of travel on CMHCSD identified by the interview / focus group study. Many of the suggested effects had been studied but only by a few studies using a variety of different research methodologies. These methodologies have been described in this review but they have not been fully quality assessed. This should be a first priority to ensure that the reported results can be a basis for policy and practice decisions. If the results can not be strongly relied upon, then further research will be needed on those topics.

Section 5 of the report provides details on the interview/focus group and identified research studies under the following headings:

### **ES 5.1 Physical activity related to travel**

Five studies were identified. For example, Craft (1983) reported no effect of exercise on cognitive development, whereas Basile et al (1995) reported that exercise reduced disruptive behaviour. Not all of the ideas suggested by the interview/focus group study were covered by the identified research. For example, exhaustion that might be caused by too much physical activity.

### **ES 5.2 Children's environment when travelling**

Five studies were identified. All of the studies were concerned with the effect of travel in causing tension and anxieties or the effect of noise pollution on mental activity. Ideas suggested by the interview/focus group study included the effect on children of being wet and cold from walking or waiting at bus stops in the rain.

### **ES 5.3 Diet when travelling**

Two studies were identified and these reported no effect of school breakfast on academic performance or attendance. The one idea from the interview/focus group study not covered by the research studies was the effect of diet on concentration.

### **ES 5.4 Social experiences when travelling**

Three studies were identified. For example, the positive effects that bus drivers could have on social skills of children (Edwards and Johnson, 1997). Several issues not covered by the research studies were raised by the interview/focus group exercise. For example, quality of parental time with children when traveling together and reduction in personal responsibility in walking buses.

### **ES 5.5 Cognitive experiences when travelling**

Two studies were identified. Both were concerned with the importance of intentional action on cognition. Issues raised by the interview/focus group study included the money and time management and road safety skills involved in independent travel.

### **ES 5.6 Effects of modes of travel suitable for travel to school**

Three studies were identified. Two were concerned with safety skills and one with the effects of car ownership on school students. No other issues were raised in the interview/focus group study.

### **ES 5.7 Effects of mode of travel to school**

Thirteen studies were identified. These included studies on the negative effects of long journeys to school, the social and other effects of car pools and of busing policies, and the social and other skills from use of walking buses.

In terms of research to inform the current policy on increasing use of walking, taking buses and cycling to school (and hence reducing use of cars in travel to school), there are some general suggestions that can be made. Very few of the identified studies were concerned with an evaluation of the impact of new initiatives to directly or indirectly achieve the current policy objective. This is the most clear need for further research. One example, of this approach is the study by Bickerstaff (2000) which evaluated a walking bus scheme. The study did not use independent measures which limits the relevance of the results, but it provides a good example of the research that most clearly and directly addresses policy issues.

### **ES 5.8 Effects of mass use of different modes of travel**

No studies directly assessed the effects of mass modes of travel, though there is highly relevant research on, for example, changing patterns of mobility and independence (Hillman 1993, Hillman et al 1990). Many ideas on this issue were suggested by the interview/focus group study. For example, the effects that mass use of school buses has on the atmosphere of the school and the local sense of community.

### **ES 6 Conclusions and Recommendations**

Children's travel to school is a complex subject, comprising many ways of getting to school, a variety of experiences along the way, and different potential effects on children. Because of the broad nature of the research, the studies included in the review form a disparate and not always cohesive body of research on the effects of different modes of travel on children's mental health and social and cognitive development.

This suggests four different research strategies for the future.

#### **ES 6.1 Research addressing components of the travelling experience**

First, research could address each of the component experiences of modes of travelling such as physical activity, diet and nutrition, and environmental, social, and cognitive experiences.

##### *We recommend*

More detailed critical appraisal of all the studies identified on each component of travel in this review.

Quite separate literatures exist on the effects of such things as physical activity, physical environment, diet, social and cognitive experiences on CMHCSD. Only those parts of those literatures related to travel were included in the current review.

##### *We recommend*

(i) Systematic reviews of the literatures on the effects of physical activity, physical environment, diet, social experiences, cognitive experiences on CMHCSD. (ii) Primary studies to address questions relevant to reducing car use for travel to school that have not been sufficiently answered by current research findings. We understand that such reviews and primary studies are not the primary responsibility of policy makers in transport.

Comparison of research findings with ideas revealed by the interview / focus group study identified gaps in knowledge about the effects of specific components of the travel experience.

##### *We recommend*

Primary studies of the modes of travel to school which address the components of the travel experience (physical activity, nutrition and diet, social, cognitive and environmental experiences) in terms of outcomes identified in the interview / focus group study (readiness to learn, lethargy, exhaustion,

academic performance, social and cognitive skills).

### **ES 6.2 Modes of travel to school or suitable for travel to school**

A second strategy is to undertake research directed at different modes of travel rather than the separate components of the travel experience.

*(1) We recommend*

More detailed critical appraisal of all the studies identified in this review on modes of travel to school and travel suitable for travel to school.

*(2) We recommend*

That the findings of reliable research about modes of travel to school and components of the travel experience be shared with pupils, parents, teachers and school governors and local authorities. Qualitative research should address how this evidence is perceived and whether and how it influences decisions about modes of travel to school.

Relatively few studies have been found to address the different modes of travel to school, and fewer still are likely to be considered reliable once appraised for their rigour and relevance to English school children.

*(3) We recommend*

Small sample surveys (which make up the bulk of research identified in the current review) for examining and developing hypotheses about causal processes and participant views about different services and travel arrangements but not to show causal effect.

*(4) We recommend*

Experimental studies where school students are randomly assigned to either experimental or control groups on an individual or cluster basis. We are not in a position to suggest which of the many current practices or special school travel initiatives is a priority for experimental evaluation, but brief examples of possible studies are given for illustrative purposes. The lack of experimental studies in the literature and the strength of their findings for informing policy about the efficacy of different strategies make this approach a priority for future research.

The size of sample needs for such study would depend upon whether individual or cluster random allocation was used and the outcome measures applied.

### **ES 6.3 Community and travel planning and children**

Thirdly, the interview / focus group study revealed concern about the effects of mass use of modes of transport that was not matched by literature identified by the systematic searching about travel.

*(1) We recommend*

Systematic reviews of literatures addressing community and travel planning and children's mental health and social and cognitive development.

*(2) We recommend*

Primary research about the impact of mass use of different modes of transport on children's independence, social networks, opportunities to participate in after school activities, and sense of wider community.

#### **ES 6.4 Involving children in research**

Historically, children have had little influence over decisions about their travel arrangements. Also, many of the studies identified in this review have been conducted in the USA such that the evidence about children's travel and its impact on their mental health and social and cognitive development has been largely by American academics.

(1) *We recommend*

That children be involved in planning and evaluating changes in their travel arrangements.