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How actively do children travel to their pre-school setting?

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ABSTRACT

Background: Physical activity in early childhood can impact favourably on later child and adult health and walking or cycling for transport, otherwise known as 'active travel', is recommended as a way of increasing activity levels in children and adults. This preliminary study focussed on active travel amongst pre-school aged children, an age group that has received little attention in this respect. It aimed to determine the prevalence of active travel in four pre-school settings and assess factors influencing travel patterns.

Methods: A cross sectional travel survey in four pre-schools: two in each of two contrasting socio-economic neighbourhoods was completed in April 2013.

Results: 289 questionnaires were completed i.e. a response rate of 83.5%. Analysis focussed on the four pre-schools since sample heterogeneity precluded neighbourhood comparisons. Active travel prevalence for children usually arriving and/or collected for each pre-school was 40.8% (A), 56.9% (B), 34.1% (C) and 60.0% (D). Regression analysis showed that distance to pre-school, weather and other travel commitments independently predicted active travel.

Conclusion: This preliminary study identified factors associated with active travel amongst pre-school aged children and issues warranting further research. Addressing these could assist in developing effective strategies to promote active travel in the early years of life.

1. Introduction

Regular physical activity in the early years of life is considered to be essential for promoting physical and psychological development and contributing towards establishing behaviour patterns that persist into later childhood and adulthood (Department of Health (DH), 2011). Guidelines state children of pre-school age capable of walking unaided should be physically active for at least 180 min, spread throughout the day. However most UK pre-school children spend 120–150 min a day in physical activity (Department of Health (DH), 2011) and sedentary behaviour may become established at an early age (Reilly et al., 2004). Active travel (walking or cycling for transport) is recommended as a means of contributing to overall physical activity levels amongst children going to a 'pre-school or early years facility' (National Institute for Health and Clinical Excellence (NICE), 2009). There is however, no agreed criterion for a child's reasonable walking distance although in England, 800 m has been commonly applied to primary aged children, based on the 85th percentile for 'Pupil Home-School Distance' (School Travel Health Check (STHC), 2013).

There is a dearth of literature regarding active travel to pre-school settings. The only research available relates to school aged children. These studies indicate active travel to school can contribute to physical activity targets (McCormack et al., 2011; Murtagh and Murphy, 2011; van Sluijs et al., 2009).) Furthermore, children who walk to school may be active over and above the time spent on active travel (Alexander et al., 2005; Cooper et al., 2003). They may also have a healthier body composition and better cardiorespiratory fitness compared to children who travel inactively (Lubans et al., 2011; Sandercock and Ogunleye, 2012).

The literature regarding school-aged children indicate that active travel has been found to be consistently positively associated with neighbourhood density and connectivity (Larsen et al., 2009; Martin et al., 2007; Panter et al., 2008), with concerns about road safety and personal safety being barriers (Panter et al., 2008; Timperio et al., 2006; Zhu and Lee, 2009). Distance is also consistently negatively associated with active travel amongst school aged children (D'Haese et al., 2011; Larsen et al., 2009; Stewart et al., 2012; Yeung et al., 2008). Additional barriers include

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inflexible parental work schedules, other commitments or lack of time (Ahlport et al., 2008; Faulkner et al., 2010). However whilst some studies have suggested active travel prevalence is greater in lower socio-economic groups (Brophy et al., 2011; Martin et al., 2007; Larsen et al., 2009; Zhu and Lee, 2009) others have found less active travel (Panter et al., 2010) or no association in either direction (D'Haese et al., 2011). Walking to school may be more likely if there is no access to a car (Brophy et al., 2011; Steinbach et al., 2012; Zhu and Lee, 2009) although D'Haese et al. (2011) found no such association. Similarly, some studies have suggested boys are more likely to travel actively to school (Larsen et al., 2009; Yeung et al., 2008) but Martin et al. (2007) found no such difference. Faulkner et al. (2010) suggested 'nice' weather may influence parents usually travelling inactively to walk with their children but Mitra and Faulkner (2012) found weather related variables were not associated with choice of travel mode.

Some authors have proposed predictive frameworks 'capturing' the complexities of decision making about active travel but these have not been validated and currently have limited application (Panter et al., 2008; Pont et al., 2011).

There is no published validation for measurement of travel mode and the criteria such as frequency, duration and type of activity considered to be "active" travel, are inconsistently reported, making study comparisons difficult (Lubans et al., 2011). Methods used to measure travel distance itself have also varied (Wong et al., 2011).

Parental decision making about travel mode and the need to escort pre-school aged children are likely to be important. Assessing the factors applicable to pre-school children could assist in developing effective travel strategies for this group. The preliminary cross sectional study reported here aimed to compare prevalence of active travel and other variables amongst pre-school children in a small sample of urban pre-school settings.

2. Material and methods

2.1. Sample

Four pre-schools in urban locations in South Gloucestershire were chosen for this study, with two pre-schools from each of two areas categorised as a "Priority Neighbourhood" (PN) and a "non-Priority Neighbourhood" (non-PN). Public health activity in South Gloucestershire is focused on PN areas as a matter of local government policy but we wished to include both PN and non-PN areas in our preliminary study to assess variation. To qualify as a PN at least one of the domains (unemployment, housing, crime, education, health, housing, and environment) must be in the lowest 20% nationally and/or in the lowest 20% overall within South Gloucestershire and part of a cluster.

The PN area in this study was a cluster of four 'lower super output areas' (LSOA) on a pre-war Bristol 'fringe' housing estate. The two pre-schools were situated in a LSOA with an IMD score of 15.30 and in the third decile nationally (1 being most deprived). The non-PN area was a group of six LSOAs in an urban area on the eastern border with Bristol, the two pre-schools situated in a LSOA with an IMD score of 13.03 (fourth decile). The pre-schools selected were in the LSOA in which the town/parish council offices were situated.

The target respondents were all parents/carers bringing to and/or collecting children aged 2–4 years old from the pre-schools on the survey days. The intention was to obtain a high response rate in a few pre-schools enabling generalisation of results to those settings only. As a preliminary study focussing on descriptive statistics we estimated an overall sample of 200 cases would provide acceptable levels of precision for assessing factors associated with active travel. Ethical approval for this study was obtained from the University of the West of England.

2.2. Data collection

The manager of each selected pre-school (A, B, C, D), was invited to participate by letter in March 2013. In a follow up phone call they each agreed for their pre-school to participate and a meeting was arranged between the researcher and each individual manager in which they were given study details and copies of ethical approval; an introduction letter and; information sheet which specified the voluntary nature of participation to give to parents in advance of the survey. They were also given a copy of the travel questionnaire, (double sided A4 sheet), that had been previously piloted in a single comparable preschool. Questions related to factors potentially affecting travel and were based on those commonly identified in the literature review and pilot. The final version of the questionnaire included questions about child and parent travel to and from the pre-school 'today' and 'usually' at this time of year', factors affecting the pattern of travel (with space provided for respondents comments on this), journey length, access to a car and home postcode (Appendix A). The questionnaire was designed for fast completion by parents/carers 'on the go' in order to maximise completion rates in each pre-school setting.

The survey was undertaken over four weeks commencing 8th April 2013 during which there was no rain. Each pre-school was visited on four different weekdays, and at both child delivery and collection times, over two weeks, to 'capture' as many parents/carers as possible with different pre-school attendance patterns. The questionnaires were completed voluntarily and this constituted 'informed consent'. Questionnaires were personally distributed to the parent or person usually dropping off and collecting the child, and completed before or after their child went into the pre-school room. Another information sheet was available for parents who wished to be reminded of the study details. Each family completed a questionnaire once only.

2.3. Data analysis

Completed questionnaires were logged, checked for gross inconsistencies and entered onto SPSS Version 19 (IBM Corporation, 2010). The following decisions were made: families with twins and siblings at the same pre-school were entered as one case but an additional variable created to capture this information; in 11 cases two modes of travel were indicated and both variables were entered: postcode data were used to determine the 'walking' distance using Google Maps (2013); ten grandparents and four childminders completing the survey were not included in the analysis involving distance travelled as it was known they had used their own home postcode rather than the child's.

Active travel frequencies for the child were determined from amalgamating 'active travel' modes (walking, cycling, scooter/cycle, bus) and 'inactive travel' modes (car, taxi, pushchair, cycle seat/trailer) for the arrival and collection journeys of children 'today' and 'usually'. As we recognised that travel that included a bus trip involved some walking this mode was categorised as 'active'. In fact, only one child in the sample arrived by bus. The measurement of 'today' provided a 'snapshot' of active travel behaviour but did not take account of varying weather conditions, family sickness, appointments or unexpected events although one potential weakness of using 'usually' is that respondent's personal definition of the term may vary. The preliminary analysis, showed, that the results for 'today' and 'usually' were similar in each of the four pre-schools. To avoid duplicating results 'usually' was used in further analysis since this was more likely to reflect normal patterns of behaviour. A judgement was made that a child 'usually' travelling actively either to and/or from the pre-school had positively engaged in active travel and a derived variable was created to represent this. Pearson's chi-squared tests, and a logistic regression were also undertaken where indicated.

In addition, ten short interviews were conducted with parents that lived within 800 m of the pre-school but drove. These did not provide any additional information about their reasons for driving; all related to dropping off other children, travelling on to other commitments or to or back from work. These findings did not conflict with the questionnaire results and are, therefore, not reported here.

Table 1
Active travel: children's arrival and collection 'usually'.

	Priority neighbourhood		non-Priority Neighbourhood	
	Setting A	Setting B	Setting C	Setting D
To pre-school	40.8% (20/49)	56.9% (37/65)	29.3% (12/41)	51.0% (53/104)
From pre-school	32.7% (16/49)	54.7% (35/64)	26.8% (11/41)	39.8% (41/103)
To/and or from pre-school	40.8% (20/49)	60.0% (39/65)	34.1% (14/41)	53.8% (56/104)

3. Results

3.1. Response rate

The overall questionnaire response rate was 83.5% (total sample of 289) with 76.8% (53), 81.1% (77), 90% (45) and 87.4% (114) for pre-schools A, B, C, and D respectively. The response rates were based on the total number of families registered to attend the pre-schools during the period of data collection and accounting for twins, siblings, illness and holidays. Initial analysis of the survey data showed notable differences in travel behaviour in pre-schools A and B within the PN area and in pre-schools C and D within the non-PN area. These differences precluded formal statistical comparison of neighbourhood types since differences within each neighbourhood type exceeded those between them and a decision was made to focus on descriptive analyses of the four pre-schools, reporting differences, but not attributing these to neighbourhood status.

3.2. Children's travel to and from pre-school

Initial analysis showed the main travel modes reported (walking or car) to and from pre-school amongst children 'today' broadly reflected that of 'usually' although in all cases the '*usually walk*' responses were slightly more prevalent that the '*today walk*' responses. All further analyses are based on the "usually travel" responses only to avoid unhelpful duplication.

Applying the criterion that a child 'usually' travelling actively either to and/or from the pre-school had positively engaged in active travel, prevalence was 40.8% (A), 60.0% (B), 34.1% (C) and 53.8% (D) with an overall 'active travel' rate of 49.8% (Table 1). There was no relationship between gender and children *usually* travelling actively to *and/or* from the pre-school $\chi^2=0.27$ (df1) $p=0.6$.

The distance travelled to each pre-school had skewed distributions. The range was largest in pre-school setting A with the greatest distance travelled to this setting by an individual (11.4 km) (Table 2). Travel distances were generally larger, however, in Pre-school C. The proportion of families living within 800 m of the pre-school, the distance regarded as a "reasonable walking distance" for children of primary school age (STHC, 2013) was 40.5% overall (Table 2). Unsurprisingly, children who lived 800 m or less from the pre-school were more likely to *usually* travel actively to *and/or* from the pre-school $\chi^2=43.4$ (df1) $p<0.001$ compared to their peers living further away.

The duration of the total journey to pre-school 'usually' was reported in 'minutes' and showed some similarities across the four pre-schools with a wide range, particularly in pre-schools B and D (Table 3). 86.9% of parents reported that they had access to a car on one or more weekdays ranging from 75.3% for pre-school B to 95.5% for pre-school C (Table 3).

3.3. Factors affecting the pattern of travel to pre-school

Overall 81.2% of respondents indicated that one or more factors affected their pattern of travel to the pre-school; pre-school C (90.7%) and D (87.5%) followed by pre-school B (77%) and A (64.6%). The weather (33%), distance (26%), dropping off other children (26%), time available (25%) and travelling to or back from work (23%) were the most frequently reported factors overall (Fig. 1). Within each pre-school these factors followed a similar pattern (data not shown).

66 (22.8%) of respondents volunteered free text comments (Question 3, Appendix A) on factors affecting their pattern of travel but these did not include any new factors to the categories already listed in the question. The comments most frequently concerned distance ($n=12$), dropping off other children ($n=8$), travelling to or back from work ($n=8$) and travelling on to other commitments ($n=8$). Examples reflecting the range and frequency of responses for the four most popular categories selected include:

Distance:
'Would love to walk if we lived close. (D93 car/1600 m)
'I live a fifteen-minute car journey away. I travel to work straight from pre-school. (A51 car/3600 m)
'Live seven miles from pre-school'. (A31 car/7900 m)
'We chose this particular pre-school as it is very close to home and easy to walk to'. (D4 walk/400 m)

Dropping off children:
My choice of travelling by car is because of time available after dropping off one child at school'. (C29 car/1000 m)
'Always walk to pre-school after dropping off older sibling at infant school. If running late at collection time I'll drive. (D100 car/walk/pushchair/750 m)

Other commitments:
By the time I get back from drop off it doesn't give much time to get what I want done. (D63 car/1300 m)
'Need to start walking more, just due to other commitments'. (D57 car/walk/750 m)

Only five free text comments related to weather despite this being the most frequently reported factor affecting the pattern of travel (Fig. 1). These comments related to rain ($n=2$), good/bad weather ($n=2$) and snow ($n=1$):

'*If it rains, I drive*.' (B42 walk/scooter/600 m)
'*If my partner is not at work and the weather is particularly awful he will drive them to pre-school.*' (B69 walk/950 m)

A one stage logistic regression was used to predict the adjusted odds of a child travelling actively to *and/or* from the pre-school (the dependent variable). Independent variables that the research literature or previous analyses had shown were possible predicting factors were included and a derived categorical variable created for 'commitments' i.e. dropping off other children and/or travelling to/from work and/or travelling onto other commitments. Access to a car to use to travel to pre-school was not included because relatively few families in the sample overall had no access (13.1%). Longer distance to travel to the pre-school, weather affecting the pattern of travel, and 'other carer commitments' each independently and strongly predicted a child being less likely to travel actively, with the impact of weather almost as strongly associated with not actively travelling as 'other commitments'. The results also showed that 3 year old children were almost statistically significantly less likely to travel actively than either 2 year olds or 4 year olds. The gender of the index child and the number of children in the household under 16 years were not significantly associated with active travel (Table 4).

4. Discussion

This study is the first of its kind to measure active travel prevalence to and from pre-school settings and factors affecting travel patterns. It contributes to our understanding of active travel issues specific to this age group, which should be considered when planning strategies to promote physical activity.

The questionnaire generated 289 responses out of 346 eligible respondents (a return rate of 83.5%) The high response rate was likely to be a consequence of conducting the survey on different days of the week, visiting before both the morning and afternoon session and the researcher being present at the time of questionnaire completion. However, it was not possible to identify characteristics of non-respondents and it may be that respondents were biased towards parents that walked. The questionnaire strengths were that it was piloted, easy to complete and could accommodate responses using different travel modes to and from pre-school 'today' and 'usually'. This was important because the nature of a return journey may differ to the arrival journey (Larsen et al., 2009). The study focus was on child travel behaviour and there had been no previous contact with parents completing questionnaires. Travel behaviour is likely to be habitual and given the narrow time frame for data collection it is unlikely managers influenced parental behaviour before the survey or that parents changed their behaviour in response to the introductory letter and information sheet. Parents were given general notice of the survey period but not the exact days, also reducing the possibility of measurement bias.

Two limitations, however, emerged during data collection and initial analysis of the survey data. Firstly, while the large majority of respondents were parents the questionnaire was not well designed for the cases where grandparents (3.4%, $n=10$) or a childminder (1.4%, $n=4$) accompanied the child to and/or from pre-school. Talking to each grandparent, it emerged they collected their grandchild from their daughter's/son's home to take to/from pre-school whereas children were dropped off at the childminder's home to then take to/from pre-school. These questionnaires were excluded from analysis involving distance. It is possible in other localities the role of the extended family may be greater. Secondly, in this study the difference in travel behaviour within neighbourhood types was no less than those between them, precluding comparison of neighbourhood types. The population in South Gloucestershire is not as socio-economically diverse as some other local authorities and it is possible that while the two neighbourhood types selected contrasted locally, the

Table 4
Results of a logistic regression of factors independently predictive of reported active travel to and/or from a pre-school setting ($n=220$).

Factor	Category	Adjusted odds ratio (AOR)	95% CI range	*p* Value
Gender	Girl (Reference)	1		
	Boy	0.92	0.48–1.7	0.79
Distance to travel to pre-school	< 800 m (Reference)	1		
	800–1300 m	0.29	0.13–0.66	0.003
	> 1300 m	0.11	0.05–0.25	< 0.001
No. of children in household	1 (Reference)	1		
	2	0.9	0.39–2.1	0.79
	≥ 3	1.1	0.42–2.8	0.87
Weather affects travel	No (Reference)	1		
	Yes	3.4	1.7–7.0	0.001
Commitments[a]	No (Reference)	1		
	Yes	0.29	0.15–0.58	< 0.001
Age of index child	2 yrs (Reference)	1		
	3 yrs	0.38	0.14–1.01	0.052
	4 yrs	1.04	0.38–2.84	0.94

[a] Any of dropping other children off; travel to work; other commitments.

differences may not actually have been that marked. The results within the Priority Neighbourhood suggested that while a similar proportion of families lived less than 800 m away, pre-school A had more families travelling greater distances to reach the pre-school than pre-school B. In the non-Priority Neighbourhood a greater proportion of families lived over 800 m away from pre-school C compared to pre-school D. A larger scale study, using a representative sampling method and involving a greater number of settings within neighbourhood deprivation types, or by directly recording individual family levels of deprivation, is needed to properly address associations between travel behaviour and deprivation. Furthermore, a more detailed examination of the role that pattern of employment, family size and spacing have in relation to travel choices, than was possible in this initial study, is required to properly investigate active travel and promote it effectively.

This study estimated the home-pre-school distance objectively using home and preschool postcodes and determining the 'walking' distance using Google Maps (2013) and its "walking route" option. It is recognised however, that error could have been introduced as full postcodes map to an average of fifteen homes in close proximity in urban areas of high population density (Map Marketing, 2013). Also, Google Maps do not always include lanes for non-motorised traffic and personal route choices may differ from shortest on foot ones, these options being likely to increase with distance. A Global Positioning System or subjects mapping their route and then digitising to a GIS may be the most accurate way of measuring distance (Wong et al., 2011) and could be considered for future more accurate research on travel distance.

In this study 800 m was used in the analysis as a 'walkable distance'. This distance has been commonly applied in primary schools (STHC, 2013). It is recognised this was a blunt tool but it aimed to indicate children travelling actively within a defined distance. Less than half of the children lived within 800 m of each pre-school but these children were more likely to travel actively. The regression model unsurprisingly, showed that longer travel distance independently predicted a child being less likely to travel actively, as has been consistently found in travel research on older children. However, questions remain: what is an appropriate maximum criterion distance for walking to pre-school at different ages and in what circumstances could this be applied. Answering this would assist policy makers in developing appropriate strategies for early years active travel.

Some parents travelled considerable distances to the pre-schools in this study and it is known from the home postcodes volunteered and location of other pre-schools in the geographic areas of study that families did not always travel to their nearest pre-school. Questionnaire responses and anecdotal conversations with parents during the fieldwork suggested pre-school choice was influenced by factors such as continued preference despite moving away from the area. Repeat use by the 'next generation' of family and perceptions of pre-school quality obtained word-of-mouth or from online Ofsted reports were also mentioned, with the sample notably including one 'good' and three 'outstanding' pre-schools. This raises the question about how far parents are prepared to travel for their child's pre-school experience against the priority parents put on active travel. The median duration of the total journey to pre-school was ten minutes across the four pre-schools, although the range was wide.

The overall prevalence of active travel at this time of year was 49.8% with the proportion of children walking and travelling actively to/and or from pre-school highest in pre-school B and lowest in pre-school C. Access to a car was lowest in pre-school B and highest in pre-school C but overall access to a car was too high in the sample to allow detailed exploration; there are many reasons influencing decisions about car travel e.g. parking, route, traffic. A more focussed study could assess the impact of car ownership or access on travel. Choice of travel mode may also be affected by 'life events', for example birth of a child and unpredictable 'everyday changes', for example, work schedules, with travel decisions constantly revised (Guell et al., 2012). Weather conditions in the present study were generally favourable and it is possible that the recorded prevalence was greater than average. Data collection over a longer period of time would provide better information about seasonal variation particularly since 'weather' was a significant predictor variable. The questionnaire did not ask if the child attended the morning and/or afternoon session although informal observation indicated the majority attended both. Future research could assess the impact of session attendance further and other factors that may impact on this age group, for example, pregnancy and the birth of siblings.

Factors affecting travel patterns that were reported very infrequently included parental fitness and health, concerns about personal safety and road safety and the travel mode of other parents. These results contrast markedly with studies on the travel behaviour of school aged children and may have emerged because children in this age group are always accompanied on their pre-school journey and also the stage of their social development. Lastly, no respondents indicated neighbourhood features affected their travel patterns but it may be that respondents were unclear what this referred to.

This preliminary study, the first of its kind, focussed on active travel prevalence of pre-school aged children in just four settings, and larger scale, more focussed research is needed. It is not known, for example, if there is a relationship between this and physical activity at other times of the day or between pre-school and primary school travel patterns. Relationships between pre-school age travel and parental activity and health also require investigation. It is possible that development of active travel behaviour in the early years may positively influence these outcomes. These issues should be fully considered by policy makers with responsibility for developing effective strategies for optimising activity levels in the early years.

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