



Drivers of Children's Travel Satisfaction

Jessica Westman

Faculty of Arts and Social Sciences

Psychology

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*Better
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ABSTRACT

The purpose of this thesis is twofold: Firstly, it explores the reasons parents state for choosing the car to take their children to school; Secondly, it investigates how the characteristics of the journey relate to children's wellbeing, mood, and cognitive performance. This thesis consists of three papers (Papers I, II, and III). Participating in Paper I were 245 parents of schoolchildren aged between 10 and 15 in Värmland County, Sweden. These parents answered a questionnaire wherein they stated to what degree certain statements correlated with their decision to choose the car. In Paper II, 237 children in grade 4 (aged 10-11), in the City of Staffanstorps, Sweden, recorded all their journeys in a diary over one school week, also reporting on their travel mode, current mood while travelling, activities on arrival, and experiences vis-à-vis those activities. Participating in Paper III was a sample of 345 children aged between 10 and 15 attending five public schools in Värmland County, Sweden. These children rated their current mood, filled out the Satisfaction with Travel Scale (capturing the travel experience), reported details about their journeys, and took a word fluency test.

Parents' wish to accompany their children to school, and the convenience of the car, both impact upon the travel mode decision. In addition, parents also seem to choose the car regardless of the distance between home and school. The findings further reveal that the mood children are in varies with how they travel and where they go, and that there is a difference between boys' and girls' experiences. Children who travel by car experience the lowest degree of quality and activation, something which is maintained throughout the school day (especially for girls). Social activities during travel bring a higher degree of quality and excitement, while solitary activities bring more stress. The findings further show that using a smartphone, or doing a combination of activities during the journey, results in better cognitive performance. Thus, it is concluded that the mode choice that parents make for their children correlates with those children's mood and experience. Specifically, where and how children travel, what they do when they travel, and how long they travel for affect their experiences, mood, and/or cognitive performance.

Keywords: Travel mode choice, experience, current mood, travel mode, activities during travel, cognitive performance

SAMMANFATTNING

Den här avhandlingen har två delsyften. Först undersöks vilka skäl föräldrar anger för varför de väljer att skjutsa sina barn till skolan med bil. Ett andra syfte är att undersöka hur detta val påverkar barns mentala hälsa via självskattad upplevelse av skolresan och hur de känner sig vid ankomst (humör). Ytterligare ett syfte är att undersöka hur upplevelsen av skolresan påverkar hur barnen presterar när de kommer till skolan. Avhandlingen innehåller tre artiklar. I Artikel I deltog 245 föräldrar till barn i årskurs 4, 6 och 8 i värmändska skolor. Föräldrarna angav i vilken utsträckning olika skäl påverkar deras val att skjutsa barnen till skolan med bil. I artikel II deltog 237 barn (varav 101 flickor) från årskurs 4 i Staffanstorps kommun, Skåne. Barnen förde resdagbok över alla resor de gjorde under en vecka. I dagboken beskrev de vart de reste, vilka färdmedel de använt, deras humör under resan (som skattades som ledsen-glad och trött-pigg), vilka aktiviteter de ägnat sig åt vid slutdestinationen samt deras upplevelser av dessa aktiviteter. I Artikel III deltog 345 barn från årskurs 4, 6 och 8 i Värmland. Istället för resdagbok skattade barnen sitt humör, hur nöjda de var med resan genom att fylla i Satisfaction with Travel Scale adapted for Children (STS-C), resedetaljer samt gjorde ett ordflödestest direkt vid ankomst i skolan.

Resultaten visar bland annat att föräldrars önskan att spendera tid med sina barn och praktiska aspekter med bil ligger till grund för valet av bil. Huruvida det är ett långt eller kort avstånd till skolan påverkar inte valet att använda bil. Barns humör varierar beroende på hur de reser (färdmedel) och vart de reser (destination). En skillnad observerades också mellan flickor och pojkar och mellan olika årskurser där t.ex. flickor påverkades mer negativt av att resa med bil än pojkar. Barn som reser med bil till skolan är minst nöjda (upplevde en lägre grad av kvalitet) och på sämre humör (är känslomässigt mindre aktiva) vilket också håller i sig under skoldagen. Att ägna sig åt sociala aktiviteter (konversera med vänner och familj) under resan bidrar till en högre upplevd kvalitet och mer uppmärksamhet medan barn som ägnat sig åt aktiviteter utan sällskap upplever en högre grad av stress. Resultaten visar också att barn som använder sin smartphone eller kombinerar olika aktiviteter under resan presterar bättre på kognitivt test.

Nyckelord: Barns reseupplevelse, humör, färdmedel, aktiviteter under resan, kognitiv prestation

This thesis is based on the following three papers, referred to in the text using Roman numerals:

- I. Westman, J., Friman, M., Olsson, L. E. (2017). What drives them to drive? - Parental reasons for choosing the car for children's travel to school. *Frontiers in Psychology*, 8(1970)
- II. Westman, J., Johansson, M., Olsson, L. E., Mårtensson, F., & Friman, M. (2013). Children's affective experience of everyday travel. *Journal of Transport Geography*, 29, 95–102.
- III. Westman, J., Olsson, L. E., Gärling, T., & Friman, M. (2016). Children's travel to school: Satisfaction, current mood, and cognitive performance. *Transportation*, 1-18.

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Patrik – See you in Barcelona

Jenny & Katrin – Just pure awesomeness.

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“Dogs are our link to paradise. They don't know evil or jealousy or discontent.
To sit with a dog on a hillside on a glorious afternoon is to be back in Eden,
where doing nothing was not boring—it was peace”

Milan Kundera

1. INTRODUCTION.....	3
1.1. Determinants of travel mode choice	5
1.2 Children’s daily travel.....	7
2. PARENTAL MODE CHOICE	11
3. TRAVEL, HEALTH, AND COGNITIVE PERFORMANCE.....	15
3.1 Physical health.....	15
3.2 Mental wellbeing.....	17
3.3 Cognitive performance	19
3.4 Summary	21
4. THEORETICAL PERSPECTIVE.....	23
4.1 The affective dimension of the travel experience.....	23
4.2 The quality dimension of the travel experience	26
5. RESEARCH OBJECTIVE.....	27
6. SUMMARY OF EMPIRICAL STUDIES	31
6.1. Overview.....	31
6.2. Paper I.....	33
6.3. Paper II.....	34
6.4. Paper III.....	35
7. DISCUSSION.....	39
8. LIMITATIONS AND FUTURE RESEARCH.....	45
9. CONTRIBUTIONS AND IMPLICATIONS	47
10. REFERENCES	49

1. INTRODUCTION

The change in children’s travel behavior over recent decades can be described as moving from being predominately active (through cycling and walking) to being motorized and inactive (using private cars) (Ahern, Arnott, Chatterton, de Nazelle, Kellar, & McEachan, 2017; Larsen, Gilliland, Hess, Tucker, Irwin, & He, 2009). Children travel longer distances and more frequently by car to all destinations, with the distance that children are allowed to roam independently being more restricted than it used to be (Bhosale, Schofield, Page, & Cooper, 2015; Kytta, Hirvonen, Rudner, Pirjola, & Laatikainen, 2015). This increase in car use contributes to children’s sedentary lifestyles, with an increased risk of obesity and sequelae. The effects of daily travel on physical health have been well documented in the literature (King, Parkinson, & Adamson, 2011; Landsberg, Plachta-Danielzik, Much, Johannsen, Lange, & Müller, 2008; Larouche, Saunders, Edward, Faulkner, Colley, & Tremblay, 2014; Schoeppe, Duncan, Badland, Oliver, & Curtis, 2013), but research linking travel and psychological health (often referred to as wellbeing in travel research) is largely lacking. A large integrative review (Waygood, Friman, Olsson, & Taniguchi, 2017) reveal that there is evidence that daily travel affects children’s wellbeing in five different domains (i.e. physical, social, economic, cognitive, and psychological wellbeing). It was further established that research into the relationship between travel and the two specific domains of *cognitive* (e.g. related to cognitive ability, concentration, academic achievement), and *psychological* wellbeing (e.g. related to anxiety, depression, anger, stress) need further attention since the findings in the literature are lacking and reveal inconsistent results (Waygood et al., 2017).

The World Health Organization defines general mental health as “a state of well-being in which [an] individual realizes his or her own potential, can cope with the normal stresses of life, can work

productively and fruitfully, and is able to make a contribution to her or his community” (WHO, 2007, p. 1). Although this definition describes adults’ wellbeing, it also applies to children (Tomy & Cummins, 2011) and related to this definition, travel is an activity that contributes to children’s wellbeing in that it enables them to participate and contribute to the community (in itself influencing wellbeing, see Bergstad, Gamble, Hagman, Polk, Gärling, Ettema, & Olson, 2011). It also provides opportunities to move from one place to another in such a way that, for example, protects against stressors (Waygood et al., 2017; Witten, Kearns, Carroll, Asiasiga, & Tava’e, 2013). Daily travel may also have additional effects; for instance, it is known that the characteristics of travel, e.g. travel mode and activities undertaken during travel, affect adults’ levels of stress, alertness, and mood (DeVos, Schwanen, Van Acker, & Witlox, 2013; Ettema, Friman, Gärling, Olsson, & Fujii, 2012), with some research also pointing to spillover effects on performance at work (VanRooy, 2006). Whether or not children and adolescents are similarly affected by daily travel has not been thoroughly established in research, but it is likely that travel impacts upon their wellbeing and performance as well (Waygood et al., 2017). Thus, part of this thesis explores the relationship between the characteristics of travel and children’s wellbeing by means of studying the child’s *experience* of travel. There is an additional focus on whether or not there is a relationship between travel and children’s cognitive performance directly after arrival at school.

Much of the research into children’s travel behavior has sought to establish the reasons for their travel mode use, with the intention of presenting suggestions for changing their travel behavior. In Sweden, a report has revealed that 65 % of parents of school children (aged 7-15) perceive the route to school to be safe and that environmental improvements have been made to increase road safety (e.g. reductions of speed limits, increased sidewalk coverage, and speed bumps). However, travel to school by car has still increased (Anund, Forsberg, Larsson, Liljas, Rusk, Sisell, & Wirsenius, 2013) - a recurring finding right across the developed world (Mah, Nettefold, Macdonald, Winters, Race, Voss, & McKay, 2017; Mehdizadeh, Nordfjaern, & Mamdoohi, 2016; Shaw, Bicket, Elliot, Fagan-Watson, Mocca, & Hillman, 2015). Thus, there must be some additional factors underlying the decision to use the car than merely factors concerning the built environment. To reduce children’s car travel, and increase their active travel, knowledge is required of why parents keep choosing the car even in circumstances when other modes are available. Thus, another aim of this thesis is to contribute toward a deeper understanding of the reasons that parents state for choosing to use the car when taking their children to school.

This thesis is arranged in chronological order, starting with what precedes the child’s journey to school; the determinants of travel mode choice. A review of the earlier literature on travel mode

choice will introduce what research has found to affect travel mode choice, but will also show where the research gap lies. The following section will then highlight the main areas of research into children's every-day travel and present literature about an upcoming research focus that concerns the relationship between travel and children's wellbeing and cognitive performance. The three empirical articles will then provide valuable evidence on the complexity of parental mode choice and how a child is affected by travel.

1.1. Determinants of travel mode choice

Meeting needs, social obligations, and personal desires require people to be able to move from one place to another to perform goal-directed behaviors such as work, leisure activities, shopping, and family visits (Garvill, Gärling, Lindberg, & Montgomery, 1992). Many of these activities are frequently repeated over time and will develop into a *travel pattern*, which can be understood by investigating the different determinants of daily travel (Kurz, Gardner, Verplanken, & Abraham, 2015). Environmental factors, such as the way a society is spatially organized, are essential determinants of the degree and type of travel need. The choice of using motorized or non-motorized transport is primarily based on two fundamental aspects of the way land is used, e.g. (a) proximity (distance) and (b) connectivity (the directness of travel) (Saelens, Sallis, & Frank, 2003). The increase in motorized travel can be explained by urban areas growing in size to accommodate rising populations, thus increasing the need for fast motorized travel (Gärling & Schuitema, 2007). Additionally, changes in lifestyle have increased the complexity of travel needs whereby existing alternative travel modes, such as public transport, lack the versatility of the private car, which seems necessary in order to satisfy a complex travel need (Gärling & Schuitema, 2007). Relating to the journey to school, proximity is often mentioned as an important factor for children's mode of travel to school, while the car is mentioned particularly as a mode fulfilling the connectivity requirement (Ahern et al., 2017). Swedish parents justify their car use on school runs by saying that it is the most convenient way of traveling, but also that they feel the roads are too insecure for alternative travel modes (not seeming to reflect upon the fact that they themselves are contributing to other children's road danger) (Anund et al., 2013).

Figure 1 illustrates the determinants of adults' daily travel. The choice of activity (e.g. running errands, doing the school run) and the spatial organization of the environment both influence the

degree and the type of travel need. The travel need, in combination with environmental and spatial organization and the transportation system, gives rise to a range of choices, e.g. that of destination and travel mode, finally resulting in the actual travel outcome.

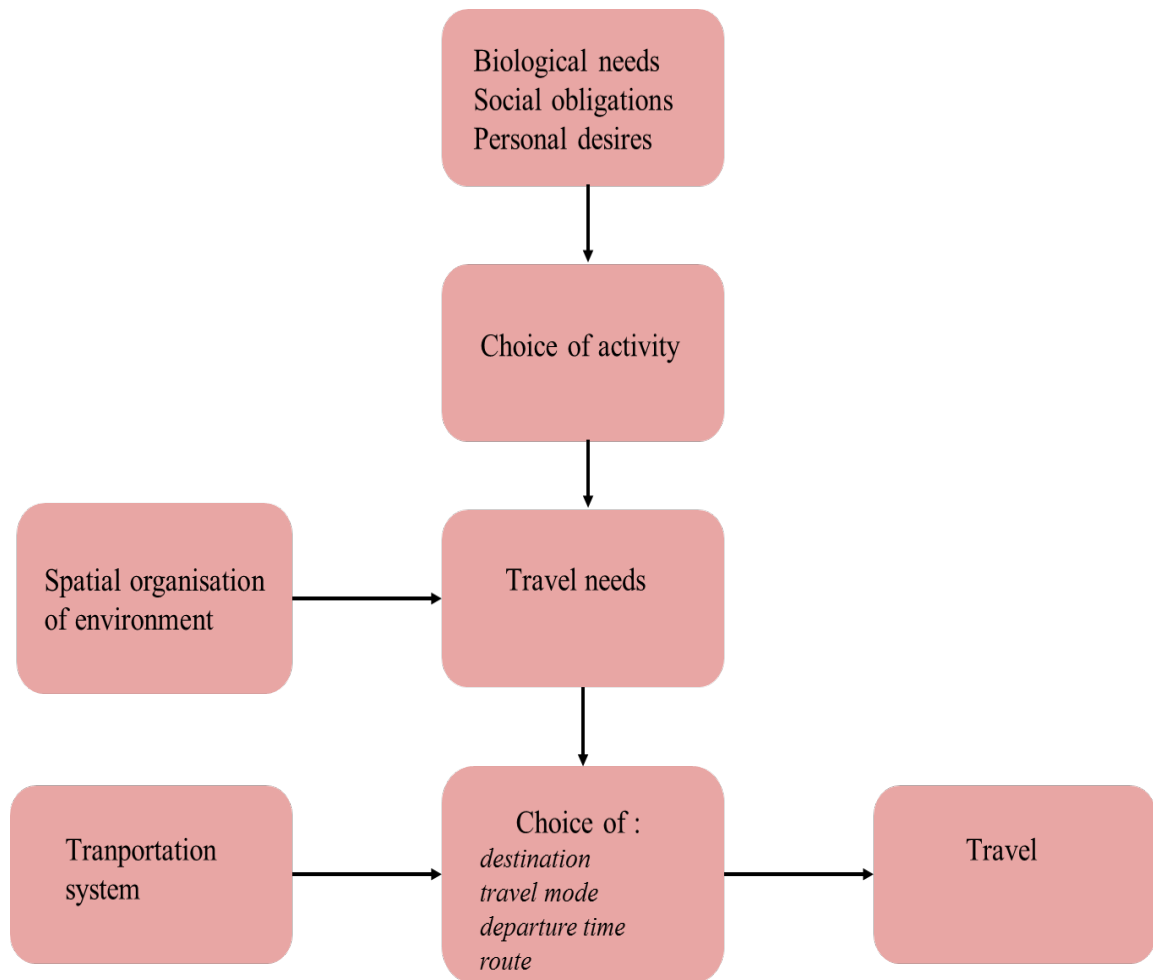


Figure 1. Factors influencing adults' own journeys (based on Gärling, 2005).

Travel time and financial cost are other important determinants of daily travel, with the aversion to waiting times, uncertain delays, and changes being other frequent research findings concerning travel mode determinants (Gärling, 2005). Frequently, these determinants work in favor of the car,

making any attempt at pushing for a sustainable modal shift challenging (Cass & Faulconbridge, 2016). It could be argued that travel mode choices are based on relatively fixed and foreseeable factors, but it has been suggested that a certain degree of freedom exists in deciding on a mode (Arentze & Timmermans, 2005). This thesis places an emphasis on the reasons parents state as preceding the travel outcome for their children, something which will add knowledge to existing research on children's travel behavior. Relating to Figure 1, the focus lies on the choice of travel mode (i.e. choice of car) and to personal needs and desires captured via parents' stated reasons for their travel mode choice.

1.2 Children's daily travel

Children's independent travel, which can be described as the freedom to travel to places without adult supervision (Hillman, Adams, & Whitelegg, 1990), has dramatically decreased over recent decades. This change can be seen in terms of an increase in car use, but also in terms of longer travel distances and more frequent journeys (Carver, Timperio, & Crawford, 2013; McDonald, 2014). This change is particularly noticeable in schoolchildren; in Sweden, in 2013, 24 % of all schoolchildren between the ages of 6 and 16 were driven to school in cars, whereas only three years earlier, the corresponding number was 21 % (see Figure 2). Even during spring and summer, when the active mode may feel more appealing due to longer daylight hours and higher temperatures, there is a similar decline in active travel in favor of the car (Anund et al., 2013).

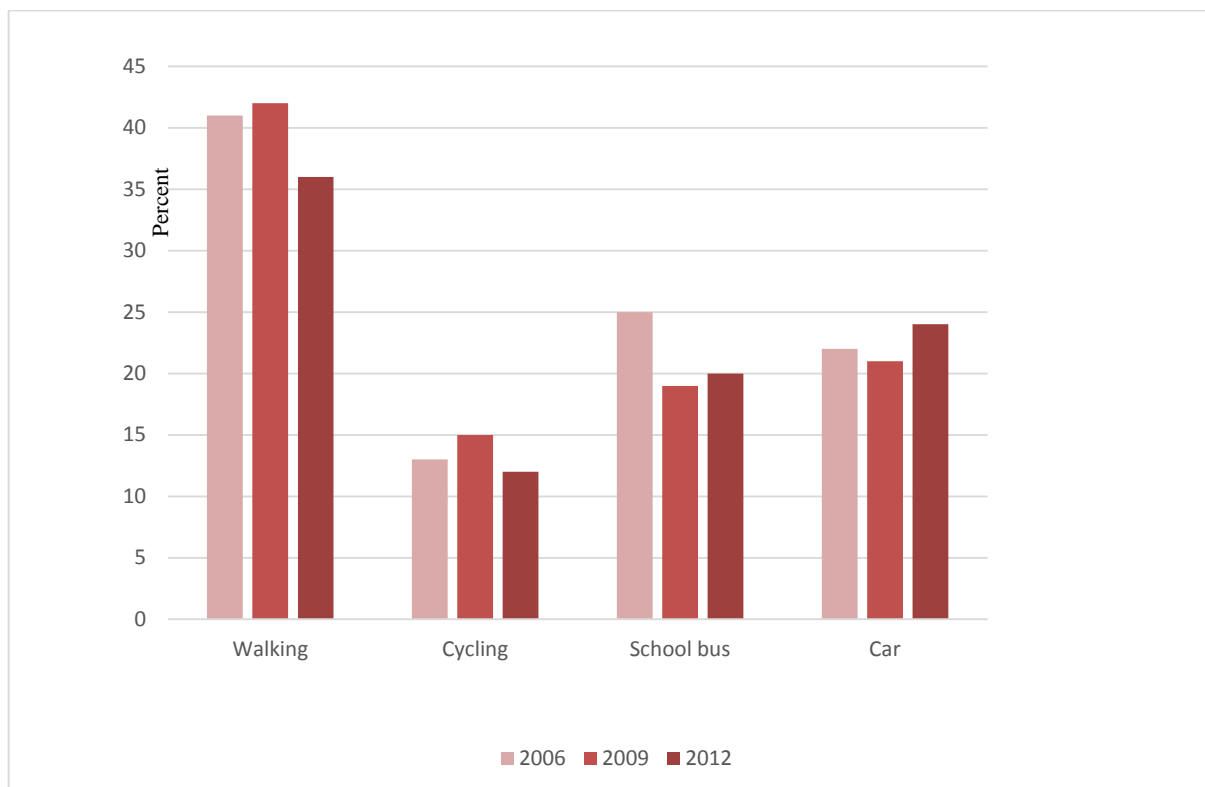


Figure 2. *Children's travel modes to school, between November and March (Swedish Transport Administration, 2013).*

Children between the ages of 7-15 (grades 1-9) in the Nordic countries still have a relatively high level of travel independency since parental fears and mobility restrictions are less significant than in many other countries (Chillon, Ortega, Ruiz, Veidebaum, Oja, Mäestu, & Sjöström, 2010; Fyhri & Hjortol, 2009; Fyhri, Hjorthol, Mackett, Nordgaard Fotel, & Kyttä., 2011; Horelli, 2001; Johansson, 2006; Kyttä, 2004). Finnish children in rural areas have more travel freedom than their peers in cities and small towns (Kyttä, 1997) - a pattern similar to the other Nordic countries (Fyhri, Bjørnskau, & Ulleberg, 2004). Icelandic children are expected to be travel-autonomous at an earlier age than children in other Nordic countries, but they also face higher rates of traffic-related injuries (Fyhri et al., 2004). Parents of primary school children report that their children often face traffic obstacles while parents of older children do not list this as a barrier as frequently (Dellinger, 2002). Children's vulnerability in traffic is linked to their level of cognitive maturity, where younger children have less developed cognitive resources for risk calculation and problem-solving

(Bjorklund,1990; Siegler & Jenkins, 1989; Whitebread, 1998). Younger children (< 9 years) have not fully acquired the skills necessary to assess whether a traffic situation, or place, is dangerous or not. Children over 9 show a greater sense of awareness regarding what makes a place safe or unsafe, and are also more prone to avert risk by relocating to a safer place when necessary (Ampofo Boateng, Thomson, Grieve, Pitcairn, Lee, & Demetre, 1993). However, regardless of children's age and maturity, the decline in the use of active and independent travel still seems to be a general issue in countries in the developed world, where the preference for the car outstrips other alternatives (Mackett, 2013; McDonald, 2007).

Longer distances between home and school are one factor explaining increasing car use to school (Ding,Wang, Liu, Zhang, & Yang, 2017). Ever since the early 1990s, Sweden and many other countries have policies in place for the establishment of independent, tax-funded education systems that give students the right to select the school they want to attend, regardless of location (Andersson, Malmberg, & Östh, 2012). This free choice of school has created major environmental barriers to active and independent travel since the chosen schools are often located farther away from students' homes. In addition, when schools are selected, not in that child's school district, free school bus services cease, making many children dependent on their parents' escort service (Sirard, McDonald, Mustain, Hogan, & Helm, 2015).

From the limited evidence available on children's travel, research suggests that additional elements of the environment affect children's mode use to school. Such elements are safe paths and routes to school, speed bumps, high sidewalk coverage, and monitored road crossings, all of which have the potential to increase independent travel (Carver et al., 2013; Yarlagadda & Srinivasan, 2008). However, to what extent the form and design of the built environment affect children's travel has not been established in research (Van Goeverden & DeBoer, 2013). What has been established, though, is the fact that the increasing levels of car use to school go beyond the increase in distance and road-safety improvements; a large number of parents drive their children to school regardless of distance and even though the route is perceived to be safe and within walking distance (Ewing, Schroeder, & Greene 2007; Lee, Zhu, Yoon, & Warni, 2013). Among the children in the Nordic countries, the increasing levels of car journeys are partly explained, on the societal level, by changes in parents' (especially mothers') employment rates, which have increased household time constraints, making car use the most practical way of transporting children to school (Fyhri et al., 2011). Parents' perceptions of the risk to their children when outdoors, children's participation in

organized activities, and the availability of cellphones all give increased access to parents' transport services, thus influencing car use (Simpkins, Delgado, Price, Quach, & Starbuck, 2013).

Sociodemographic and socioeconomic factors affect children's travel mode to school whereby children over 11 years of age are more likely to use an active mode and the school bus, and less likely to be escorted by their parents (McDonald, 2005), which is a notable trend in many countries, e.g. Sweden, Finland, Norway, the Netherlands, and the UK (Fyhri & Hjortol, 2009; Schoeppe et al., 2013). Boys are more likely to travel actively than girls, but the school bus is used equally by both sexes (McMillan, 2006). Also, boys from the ages of six to eleven are more frequently allowed to travel to school alone, or with a friend, while girls are more often escorted by their parents (Hillman et al., 1990; McDonald, 2005). These gender differences in travel behavior may be the result of the social construction of girls' identities as more endangered or in need of protection, which inhibits girls' travel independence (Day, 2001; McMillan, 2006). The children of high income, car-owning, and well-educated parents are driven to school more frequently than children from families with more moderate income levels (DiGuseppi, Roberts, & Li, 1998; McMillan 2003; Vovsha & Petersen, 2005). Children living in high-density areas use non-motorized modes more, and are generally less likely to travel on the school bus (McDonald 2005).

To summarize, the change towards inactive and motorized travel behavior in children has been explained by distance, sociodemographic factors, socioeconomic factors, and traffic concerns. Empirical research, much of which emanates from North America, associates the built environment with travel behavior outcomes (Curtis, Babb, & Olaru, 2015). However, these factors alone cannot account for the increased car use to school since they have not changed as swiftly, or at the same pace, as the increase in car travel. Thus, parental reasons for choosing the car may be an additional and important part of understanding the full range of factors that influence children's travel behavior.

2. PARENTAL MODE CHOICE

Parents are the gatekeepers of children's independence and autonomy throughout childhood, and the primary decision-makers regarding children's travel mode to school (Wolfe & McDonald, 2016). Thus, parents are largely responsible for changes in their children's travel behavior and the quest to understand children's travel behavior requires an understanding of the reasons that parents state for deciding travel mode. The failure of various policies in attempting to achieve a modal shift has been ascribed to an incomplete understanding of the process underlying individual choice (Anable & Gatersleben, 2005; Bamberg, Rölle, & Weber, 2003; Steg, 2005). Research has primarily investigated how sociodemographic and environmental factors influence mode use to school. Common praxis has been to investigate built environmental factors and the demographic characteristics of families and children and to compare them to escorted (usually by car) and unescorted (usually by active mode) journeys to school. This renders the broader literature on children's daily travel limited since it rarely deems the travel mode decision to be underpinned by different parental decision-making processes, e.g. their subjective reasons and preferences, which can also be related to personal needs and desires (Gärling, 2005) (see Figure 1). Strengthening this hypothesis is the fact that daily journeys to school are not a free choice of activity per se but an obligation, which limits or restricts destination choices, routes, and departure times, potentially rendering other factors more determinative of the school mode choice.

Recurring research findings regarding the motives for adults' own car choice are described as instrumental, affective, and symbolic (Steg, 2006). Instrumental motives relate to the speed,

flexibility, and convenience of the car whereby convenience, at least, has been suggested to impact upon car use to school (Steg, Dreijerink, & Abrahamse, 2006). Affective motives relate to feelings of, for example, arousal and pleasure, and sensations (and their opposites), whereas symbolic motives tap into social status, power, and self-esteem (Gatersleben & Uzzell, 2007). People who value the affective benefits of driving seem less inclined to reduce their car use (Stradling, Anable, & Carreno, 2007), with authors arguing that travel is not only derived demand but could also be desired for its own sake, which may result in undirected (car) travel (Mokhtarian & Salomon, 2001). In the light of these issues, parents who state that security (or the lack of it) is a contributory factor in the choice of children's travel mode to school, may be influenced by stress or worry and thus less inclined to allow their children to travel independently. Parents' concerns regarding safety, their wish to spend time with their child(ren) during travel, and the ease of car travel could all be influential during the decision-making process (Mehdizadeh, Nordfjaern, Mamdoohi, 2016; Stewart, Vernez-Moudon, & Claybrooke, 2012), but this needs further research (McMillan, 2007).

As illustrated in Figure 1, the spatial organization of the environment impacts upon mode choice and additional research suggests that individual *perceptions* of the spatial organization of the environment influence mode choice (Lee et al., 2013). Indeed, parents who regularly choose the car seem to have a different perception of what constitutes a close enough distance for walking or cycling to school, in comparison with parents who choose active travel for their children – even though they share the same distance from home to school (Lee et al., 2013). In addition, parents who use the car frequently to drive their children to school perceive the environment to be more hazardous than those who frequently allow their children to travel independently (Trapp, Giles-Corti, Christian, Bulsara, Timperio, McCormack, & Villanueva, 2011). This adds to the conception that the physical environment alone does not account for the increase in car travel; instead, supplementary factors such as perceptions influence decisions. Parents' concerns about traffic prevent up to 40% of children from walking or cycling, with as many as 45 % of car-driving parents claiming that they do so due to traffic concerns (Carlson, Sallis, Kerr, Conway, Cain, Frank, & Saelens, 2014; Dellinger & Staunton, 2002). Ironically, in doing so, they themselves are contributing to the insecure environment by adding to congestion and the traffic dangers faced by active and independent travelers (Carver et al., 2013). As a consequence, parents who repeatedly choose the car are more likely to develop a habitual travel behavior whereby other travel modes are not under consideration during the morning rush (Loukopoulos, Jakobsson, Gärling, Schneider, & Fujii, 2005). All in all, although there are objective measures of the physical environment and safety issues, parents seem to partly be basing their travel mode decisions on their subjective perceptions.

Unfortunately, parents regard the car to be the safest way of traveling and frequently exclude the option of sustainable travel modes to school due to these concerns (Woldeamanuel, 2016).

In summary, there are a multitude of factors influencing the actual travel mode outcome whereby a person's needs launch a range of considerations and processes that finally result in a journey (Gärling, 2005). These considerations and processes are of an instrumental, symbolic, and affective nature, in addition to being dependent on built environmental factors, transportation systems and so on. While research has investigated how sociodemographic and environmental factors impact upon mode use, there is only scant knowledge of how parents' personal reasons impact upon the same decision, thus causing a shortfall in research. This thesis aims to explore the reasons stated for car choice and investigates whether or not these stated reasons then impact upon the actual travel mode decision. Furthermore, the mode decision will have implications for children's physical health (as will be presented in the coming section), with some research indicating that travel impacts upon children's mental health/wellbeing (the concepts are often used interchangeably) as regards their degree of happiness, alertness, feelings of independence, and social engagement (Hillman et al., 1990; Ramanathan, O'Brien, Faulkner, & Stone, 2014; Romero, 2015). Some studies also suggest that daily travel has implications for children's academic performance (Martinez-Gomez et al., 2011; Stea & Torstveit, 2014). The coming sections will highlight research that focuses on how travel mode choice affects children's physical health, and wellbeing, and on the ensuing effects on academic performance.

3. TRAVEL, HEALTH AND COGNITIVE PERFORMANCE

3.1 Physical health

Children commuting to school is a worldwide everyday phenomenon that takes up a lot of time and is filled with meanings and consequences (Andersson et al., 2012). Research on children's commuting and daily travel has been growing over recent years due to an increasing interest in the consequences for children's physical health. Researchers are referring to children's increasing car use as a "physical inactivity crisis," since low levels of physical activity are linked to a higher prevalence of obesity, and to the emergence of cardiovascular disease during both childhood and adolescence (Janssen & Rosu 2015; Larouche et al., 2014; Schranz et al., 2014).

As with much research into children's travel, there is both a shortage of the same and some inconsistency in the evidence that does exist. The research focus is often on the relationship between active travel and weight status, physical activity, and sedentary behavior, presenting somewhat inconclusive evidence (Shoeppe et al., 2013). There are studies that show a positive relationship between active travel to school and children's overall physical activity levels (see, for example, Buliung, Mitra, & Faulkner, 2009; Davison, Werder, & Lawson 2008; Lubans et al., 2011), while findings in relation to a healthy weight status are less robust (Davison et al., 2008; Lee et al., 2013; Sirard et al., 2015). Two literature reviews (i.e. King, Parkinson, & Adamson, 2011; Landsberg et al., 2008) have reported that active travelers to school spent significantly less time being sedentary

than non-active travelers, while three studies found no significant results at all (Larouche, Lloyd, & Knight, 2011; Nilsson, Andersen, & Ommundsen, 2009; Owen, Nightingale, & Rudnicka, 2012). A large systematic literature review (Schoeppe et al., 2013) has concluded that there is a significant relationship between active travel and overall physical activity; the studies upon which this conclusion is based were of high quality, thus providing strong evidence (Davison et al., 2008; Larouche, 2014; Lubans, Boreham, Kelly, & Foster, 2011; Sirad et al., 2008). Other studies supporting the relationship between active travel and physical health suggest that children who use active mode to school are more physically active and have better cardiovascular fitness than those who travel by car (Cooper, Page, Foster, & Qahwaji, 2003; Davison et al., 2008; Lubans et al., 2011). If there are any positive effects of using the school bus on physical health, these have not been established; nonetheless, the school bus provides opportunities for physical activity which may contribute toward children's health. The use of public transportation by adults provides health benefits due to engaging in physical activity walking to and from bus/train stations (Besser & Dannerberg, 2005; Weinstein & Schimek, 2005). On an average day, public transport commuters walk as much as 30 % more than car commuters (Wener & Evans, 2007), which may very well also apply to children who travel using these modes (Merom, Tudor-Locke, Bauman, & Rissel, 2006).

Despite the positive effects of active and independent travel on children's health, there is still an increasing traffic volume around schools due to private car use, putting independent and active commuters at a hazardous disadvantage. The increased car traffic around schools also reduces air quality, which is linked to adverse cardiorespiratory effects, including increased prevalence of asthma (McConnell et al., 2010). Needless to say, children who are frequently driven to school by car are left with fewer opportunities for physical activity, something which continually adds to the negative effects on their health (McMillan, 2007). While the exact intensity and frequency of the activity required to improve physical fitness is not clear, it is plausible to suggest that habitual active travel to (and from) school has the potential to improve health-related fitness and is an important source of physical activity for young people (Lubans et al., 2011, Merom et al., 2006). Schoeppe and colleagues (2013) suggest that the inconsistent correlations between active school travel and physical health found in research may be the result of using different thresholds to classify children as, for example, overweight or sedentary. Different findings may also be ascribed the lack of data on the duration of school journeys, or the lack of disaggregation of walking and cycling data. Since cycling has been associated with greater physical fitness in children, compared to walking, cycling instead of walking may have a greater potential effect on children's physical health.

The decrease in active and independent travel to school, and the subsequent decrease in physical activity, has implications for children's physical health. In contrast, the implication for children's mental wellbeing is far from established, but has been established in adults whose every-day travel is linked to their wellbeing (DeVos et al., 2013; Smith, 2016). Thus, the following section will highlight research studying this relationship.

3.2 Mental wellbeing

Research focusing on the possible effects of travel on children's mental health identifies everyday travel as a contributor toward wellbeing, by increasing or decreasing happiness, and stress, developing confidence and social skills, and social inclusion (Hillman, 1990; Mackett, Lucas, Paskins, & Turbin, 2005). Thus, in this context, wellbeing is an umbrella term which encompasses a range of psychological factors. When travel enables individuals to engage in society, to fulfill their needs and wishes by moving from one place to another, but also allows them to enjoy the freedom of cycling with friends, this will most likely impact on wellbeing in one way or another.

Although there is both limited and concordant knowledge of the relationship between children's everyday travel and wellbeing, research suggests that the decrease in active and independent travel results in children losing the freedom to explore their local environment and to achieve mastery of their physical and social environment (Curtis et al., 2015). Children who are not allowed to move around independently are exposed to fewer opportunities of spontaneously socializing with others, which negatively affects their independence and wellbeing. It additionally deprives them of opportunities to acquire a sense of community and familiarity, something which builds confidence and self-esteem through increased independence and responsibility (Hillman et al., 1990).

A study from Australia, conducted on nearly 200 children aged 9 and 10, using both interviews and questionnaires, revealed that the most valued factor of walking to school or taking the school bus is that children get to meet, talk, and interact with their friends (Romero, 2015). An additional factor that children value when taking the school bus is that it provides them with a greater sense of independence, while the car deprives them of these cherished social opportunities. Both independence and social support are factors related to wellbeing (Siedlecki et al., 2014). The importance of friendships cannot be overestimated during childhood and adolescence as these are a source of social inclusion and belonging. Traveling to school together with friends provides an

opportunity for children to engage with one another and to feel socially included (Wentzel, McNamara-Barry, Caldwell, 2004). Additionally, social interaction with friends seems important in order for children to experience travel positively; when interviewed, 9-year-old children said that, if a friend joined them in the car, they would enjoy the journey. In contrast, children who travelled by car with their parents and siblings said that they would rather travel independently. These children also expressed the positive aspects of the car in that it can provide the space and opportunity for both play and conversation – but preferably with friends (Barker, 2009). Romero (2015) argues that children who are able to walk to different destinations throughout the day display independence, happiness, and the positive social aspects of wellbeing, which are not attained through car travel, as indicated by children’s self-reports. Another study on a sample of 5,400 children aged between 5 and 15 has revealed, via both interviews and questionnaires, that there are emotional benefits associated with active travel to school. Children who actively traveled to school reported emotions of happiness, excitement, and relaxation, while passive motorized travelers experienced emotions such as feeling rushed or tired (Ramanathan et al., 2014).

Children’s independent and active journeys contribute toward exploring their local environment, with positive effects on wellbeing and behavioral development (i.e. spatial abilities, curiosity, independence, confidence) (Fusco, Moola, Faulkner, Buliung, & Richichi, 2011; Mackett et al., 2005; Rissotto & Tonucci, 2002; Tranter & Pawson, 2001). Many of these positive effects are not only associated with active commuting but also with public transport and the school bus, which both encourage children to move from one place to another without adult interference and provide opportunities for valuable socialization (Jones, Steinback, Roberts, Goodman, & Green, 2012). The effects of the school bus on children’s wellbeing are still quite unknown since research has focused on the relationship between active travel and increased wellbeing, and also to some extent on the car. This shortage of research and distinct findings may be due to the lack of concordant definitions of wellbeing, and/or not knowing how to measure wellbeing in a travel setting.

In this thesis, aspects of wellbeing are measured through the *experience* of travel. An experience is a specific moment when a person encounters, observes, and/or undergoes something which causes different affective and cognitive reactions (Nambisan & Watt, 2011). An experience is related to a person’s emotional state, described using degrees of arousal and pleasure, but also using cognitive judgments of, for example, how good or bad something is (Friman, Satoshi, Ettema, Gärling, & Olsson, 2013). A positive experience (e.g. of a journey) entails feelings of pleasure, happiness, and excitement, which are all related to a person’s wellbeing. Investigating a child’s experience of every-

day travel may unfold relationships between travel and the degree of pleasure, activation, cognitive judgements, and mood (Rothman, Buliung, To, Macarthur, Macpherson, & Howard, 2015), but this will be further elaborated upon in the theory section.

3.3 Cognitive performance

As discussed in the previous section, a journey influences children in various ways. Given the notion that a child's physical and mental health is affected, it is not far-fetched to assume that other aspects are influenced as well, viz. cognitive performance (e.g., academic achievement), which may be sensitive regarding the effects of a journey (Waygood et al., 2017). For instance, the link between physical activity and cognitive functioning has been established in research (Kramer, Hahn, Cohen, Banich, McAuley, & Harrison, 1999), showing that exercise is beneficial to executive functioning (e.g. working memory, attention, volitional inhibition) and that it increases synaptic plasticity and flexibility in certain brain areas (Davis et al., 2011; Guiney & Machado, 2013; Romero, 2006). The notion that a journey can influence children's academic achievement has only just recently been recognized, with researchers investigating how school journeys (i.e. car versus active mode) correlate with student achievement (Martinez-Gomez et al., 2011).

Every three years, the Programme for International Student Assessment (PISA) evaluates education systems worldwide by testing the skills and knowledge of 15-year-old students. These assessments have revealed that there is a noticeable academic decline in mathematics, reading skills, and science subjects in many countries; this may, on some level, be related to children's school journeys. This rather daring statement is argued by Martinez-Gomez et al. (2011) who found that girls, aged 13-18 and actively commuting to school, have grades approximately 4 % better than girls who travel by motorized transport. This indicates that, during adolescence, physical activity (by actively traveling to school) has a beneficial influence on cognitive performance (Martinez-Gomez et al., 2011; Trudeau & Shepard, 2008). In agreement with this, students who travel actively to school appear to experience less perceived stress when confronted with cognitive challenges during their school day, which may be the result of the enhanced positive emotions and the reduction of stress among active travelers (Hillman, Pontifex, Raine, Castelli, Hall, & Kramer, 2009; Lambaise, Barry, & Roemmich, 2010). Indeed, physical activity helps to reduce stress (Nabkasorn, Miyai, Sootmongkol, Junprasert, Yamamoto, Arita, & Kazuhisa, 2005), which may provide an

explanation for the link between active commuting and cognitive performance. For adults, commute-induced stress due to car travel negatively affects work-related decisions such as evaluative judgments (Van Rooy, 2008). Thus, active travel modes and positive travel experiences help in achieving higher performance levels, while passive travel modes and negative travel experiences lead to lower performance levels, thus making the school journey a contributory factor toward academic decline. Active commuting additionally facilitates environmental engagement that improves, at least, adults' levels of attention, memory, and energy, but also reduces levels of stress, anxiety, and fatigue (Bowler, Buyung, Knight, & Pullin, 2010; Eysenck, 1992), and may have a similar effect on children. This however, needs to be studied further (Singh, Uijtdewilligen, Twisk, van Mechelen, & Chinapaw, 2012).

There are some contradictory findings as regards active commuting and cognitive performance, whereby one study found no relationship between active commuting and student achievement (Van Dijk, De Groot, Van Acker, Savelberg, & Kirschner, 2014). It did, however, find a gender difference whereby girls in grade nine (aged 15-16) traveling actively scored better in an attention test, indicating that the result might be moderated by gender (Van Dijk et al., 2014). Irrespective of the contradictory findings regarding travel and performance, literature reviews conclude that physical activity is positively related to cognitive functioning (Bielak, Cherbuin, & Anstey, 2014; Burkhalter & Hillman, 2011; Stea & Torstveit, 2014). On the whole, we know little of the relationship between daily travel and academic performance; once again, as with much research into the effects of travel, the research that does exist provides inconclusive results. This may partly be explained by the fact that some studies investigate children's cognitive performance after treadmill walks or similar setups in laboratory settings (i.e. Schoeppe et al., 2013), while other studies compare different travel modes (i.e. car and active mode) with academic results (Martinez-Gomez et al., 2011). This variance in research methods may provide differences in results, whereby academic results depend on many factors over a full school year while experiments may fail to mirror all the different elements of a journey.

3.4 Summary

While there are some discrepancies in research findings regarding degree to which children's physical health is affected by daily journeys, it is concluded that there is a significantly positive relationship between a child's travel and his/her physical health (Davison et al., 2008; McDonald, 2008; Merom et al., 2006). A growing body of literature is additionally addressing the relationship between travel modes and children's wellbeing, as well as the relationship with cognitive performance or academic results (Hillman, 1990; Mackett et al., 2005; Rissotto & Tonucci, 2002; Tranter & Pawson, 2001; Waygood et al., 2017). Previous research into children's travel often treats travel mode as a single contributory factor to their health, while overlooking other factors that may be equally important. Thus, this thesis aims to explore how the characteristics of a journey affect children's wellbeing. More specifically, how do the different travel modes, travel times, and activities that children engage in during travel impact upon their experience (i.e. wellbeing), mood, and cognitive performance. It also investigates whether or not there are variances between children as regards age and gender.

When studying the experiencing of a journey, that experience will unfold and we will be able to reflect upon which factors affect that experience and what the consequences will be. To capture the experience of travel, this thesis includes the scientific theories about the *affective* and *cognitive* dimensions underpinning the experience. These two dimensions have shown themselves to be important for our understanding of adults' experiences of day-to-day travel (Ettema et al., 2012; Friman, Edvardsson, & Gärling, 2001; Olsson, Gärling, Ettema, Friman, & Satoshi 2013).

4. THEORETICAL PERSPECTIVE

A journey is not only a way of moving from one place to another, it is also important as a space in its own right, with the possibility of doing activities which will elicit experiences (Jones et al., 2012; Westman, Johansson, Olsson, Mårtensson, & Friman, 2013). Two dimensions underpin an experience: (a) the affective dimension and (b) the cognitive dimension. The affective dimension relates to feelings of pleasure and arousal while the cognitive dimension relates to quality judgments (e.g. how good or bad the journey is perceived to be). When these two dimensions are measured, they jointly describe the experience of travel (Ettema et al., 2012), thus revealing one aspect of wellbeing. Theories on affective and cognitive dimensions are summarized in the following section.

4.1 The affective dimension of the travel experience

There is an array of different theories and models proposing to explain affect by using definitions such as emotions, mood, current mood, and core affect (Diener & Suh, 1997; Russell, 2003; Watson, Clark, & Tellegen, 1988). Consequently, classifying a complete assessment of the affective qualities is challenging due to the plethora of definitions (Russell, 2003). In this thesis, affect is described as an umbrella term that includes emotions, mood, core affect, and all other emotionally charged events. Despite all the different definitions, models, and theories, what many of them have in common is the fact that they identify two key concepts which jointly capture affects: *activation*

and *pleasure* (i.e. valence). At the center of emotion, mood, or any other emotionally charged event lie affects that are experienced in terms of good or bad (valence), or energized or enervated (activation). These affects are called *core affects* and are defined as a single feeling present at any given point in time, with a variance in duration and intensity. There is a relationship between core affects and a person's motivation, thoughts, and behavior (Yik, Russell, & Steiger, 2011). Core affects are colored by both internal and external stimuli; however, a person has no conscious access to these connections and they simply appear unconsciously. Thus, it is argued, core affects are the simplest, raw, and non-reflective feelings evident in our moods and emotions (Russell, 2003).

Mood, on the other hand, is a prolonged core affect and is not necessarily directed at a particular object. For example, an anxious mood entails core affects of unpleasant arousal that persist for a long(er) period, resulting in worried thoughts, cautious behavior etc. It is argued that one distinct difference between core affect and mood is the fact that sometimes a person is in a particular mood and sometimes not, while that person always has core affect (Yik et al., 2011). Emotions, in contrast to mood, are only salient when an object is presented. For example, if we travel by cycle, we may immediately feel energized, happy, and carefree. Emotions are (just like mood and core affects) related to the dimensions of valence and arousal (Russell & Feldman Barrett, 1999).

To visualize affect and how it represents core affects, mood, and different emotional episodes, Russell & Feldman Barrett (1999) developed a circumplex model in which various emotional episodes could be logically plotted according to their levels of activation and valence. Valence and activation together form one horizontal and one vertical dimension (see Figure 3), capturing the momentary affective state and referred to as current mood. Valence and activation are sufficient as well as necessary when it comes to measuring current mood (Russell & Feldman Barrett, 1999).

To capture additional emotional aspects, other mood descriptions can be plotted using the circumplex model, depending on their levels of activation and valence (Russell & Feldman Barrett 1999). Eight affect categories have been identified and arranged around the model: *excitement, pleasure, contentment, sleepiness, depression, misery, distress, and arousal*. These categories form secondary axes at 45 degrees, corresponding to excitement-depression and contentment-distress (Russell, 1980) (see Figure 3). Using this rotation, intermediate dimensions of pleasant activated affect—unpleasant deactivated affect, referred to as positive activation - negative deactivation (PAND) and unpleasant activated affect—pleasant deactivated affect, referred to as positive deactivation-negative activation (PDNA) are identified (see Figure 3).

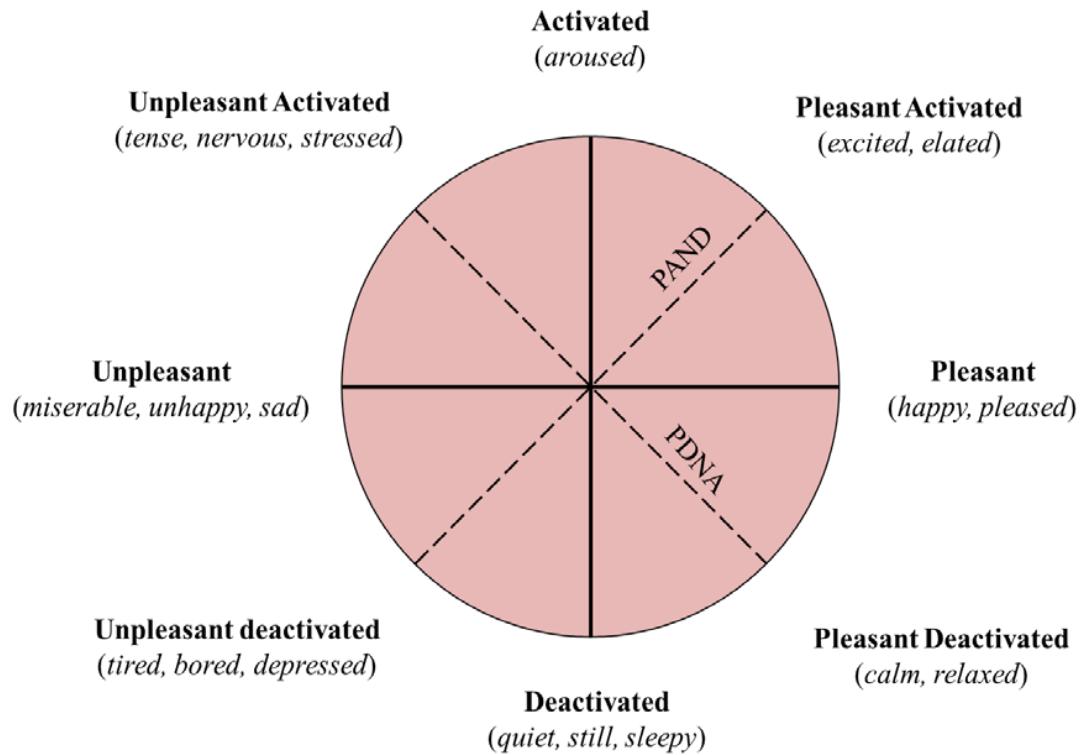


Figure 3. The circumplex model of affect (adapted from Yik et al., 1999).

When this model is applied to travel research, it is found that driving a car is experienced as relatively arousing, that public commuting is unpleasant and not arousing, and that cycling and walking are the most pleasant and arousing travel modes. Stress and boredom seem to be elements that particularly contribute toward affective reactions in travel settings (Gatersleben & Uzzell, 2007). Activities which are sources of pleasure and which are conducted while traveling by public transport include reading, listening to music, interacting with other people, and looking out of the window. Pedestrians evaluate their walks using factors such as crowdedness, air quality, the presence of trees and flowers, and the type of sidewalk. Other factors influencing the experience include cleanliness, privacy, safety, convenience, and scenery (Stradling et al., 2007). As noted, some of these assessments entail cognitive judgements (referred to as quality judgements), rendering the

circumplex model insufficient as regards capturing the full experience of a journey. It has been established in research that measurements of both cognitive and affective experiences should be considered when capturing the travel experience (Ettema et al., 2012; Friman et al., 2013).

4.2 The quality dimension of the travel experience

Quality can be defined in terms of how good or bad something is by estimating the characteristics or features of that something. More specifically, the cognitive evaluative responses are the thoughts concerning an object, which are often conceptualized as associations between the object and its various attributes (Oliver, 1993, 1997). For instance, a person will ascribe an object (e.g. a car) with positive or negative attributes, in part depending on previous experiences (Fishbein & Ajzen, 1975). When a child travels by school bus, it is likely that he or she will make varyingly conscious assessments of the bus as an object, of the journey itself, and of the delivery of that journey. Thus, quality evaluations are commonly explained in terms of being based on the outcome of an encounter and include evaluations of the object and the process of the encounter (Parasuraman, Zeithaml, & Berry, 1985). Research into travel quality often examines factors linked to reliability whereby delays, the behavior of other drivers, and congestion greatly affect perceptions of reliability and subsequent quality judgements (Gatersleben & Uzzell, 2007). Established factors relating to the quality of public transportation include (again) reliability, frequency, travel time, cost, and punctuality (Felleson & Friman, 2008; Hensher, Stopher, & Bullock, 2003; Tyrinopoulos & Aifadopoulou, 2008), comfort, cleanliness (Eboli & Mazzulla 2007; Swanson, Ampt, & Jones, 1997), and safety issues (Smith & Clarke 2000; Felleson & Friman 2008). Quality judgments elicit affects whereby, for instance, crowdedness and congestion cause residual stress at the workplace (Novaco & Gonzales, 2009) and reduce a person's wellbeing. However, very little research has included children's perceptions of quality, making research into people's travel experiences insufficient. It is likely that children make other cognitive evaluations of their travel than adults since they are exempt from, or have different perceptions of, certain responsibilities, time limits, financial costs and so on. Thus, investigating the child's experience of a journey will put a missing piece in place as regards understanding the effects of that journey

5. RESEARCH OBJECTIVE

The aim of this thesis is twofold. Firstly, it explores parents' stated reasons for car choice to school and how these stated reasons then impact upon frequency of car choice. Secondly, it further investigates the relationship between the characteristics of a journey and children's travel experience, their current mood, and cognitive performance, and whether or not these vary with age and gender.

The research objective of study I is to investigate how the stated reasons, relating to a sense of security and the desire for accompanying the child, impact upon the mode decision. There is also a focus on how environmental and sociodemographic factors impact upon these stated reasons for the specific car choice. How parents decide that their children are going to travel will have certain implications for these children's experiences, moods, and possibly also for their cognitive performance upon arrival at school, which is the research focus of Studies II and III. Figure 4 illustrates the established and potential relationships between a journey and travel experiences, current mood, and cognitive performance through the lens of the child. The figure specifically illustrates the relationships that will be tested in this thesis, where dashed lines illustrate the potential relationships. However, established relationships (marked with solid lines) also receive attention since previous studies provide somewhat inconclusive evidence. The specific research objective of Paper II is to evaluate whether or not a child's current mood, while traveling, varies with travel mode and destination, marked with dashed lines in the figure below. In Study III, which is an extension of study II, the research objective is to investigate whether or not children's travel experiences and current mood vary with travel mode, travel time, and activities while they are

traveling. There is an established relationship between active mode and cognitive performance; however, whether or not the characteristics of the journey (i.e. the activities and travel time) affect cognitive performance remains to be investigated. Neither is it known, similarly, whether or not there is a relationship between travel characteristics and the child's experiences and current mood.

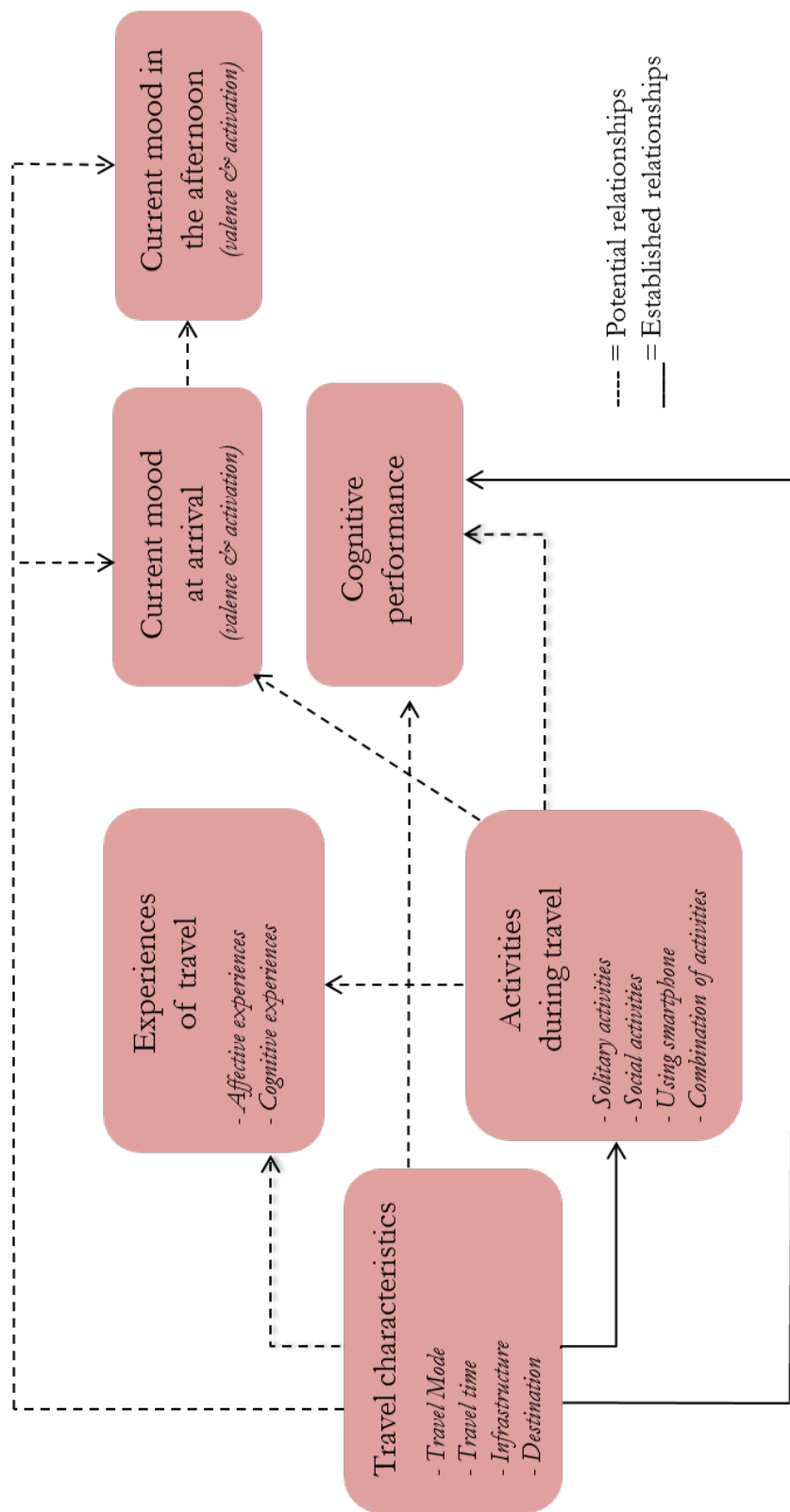


Figure 4. Potential and established relationships between travel and children

6. SUMMARY OF EMPIRICAL STUDIES

6.1. Overview

In Paper I, the parental perspective is in focus. Parents (of the children participating in Paper III) reported their personal reasons for car choice, which then formed the foundations of Paper I. Paper II includes children in grade 4 (aged 10-11) from the town of Staffanstorp, Sweden, with a 7-day travel diary noting day-to-day travel details and current mood forming the basis of this paper. In Paper III, a larger sample covering different geographical areas was included, and the focus was on particular school journeys. Children in grades 4 (aged 10-11), 6 (aged 12-13), and 8 (aged 14-15) were included, as well as an additional travel mode (the school bus). The children answered questionnaires in the morning and afternoon and completed a cognitive test upon arrival at school. The aim was to capture the entire travel experience using the Satisfaction with Travel Scale, adapted for children (STS-C).

Paper No.	Sample characteristics	Research method	Main measurement variables	Main Findings
Paper I (published): <i>Frontiers in Psychology</i>	245 parents	Survey using questionnaire	a) Social convenience b) Safety/security c) Car choice	Social convenience impact upon car choice. Education impact upon Safety/security Distance do not affect car choice
Paper II (published): <i>Journal of Transport Geography</i>	237 children in grade four	7-day travel diary/log	a) Destination b) Current mood (<i>valence and activation</i>) c) Travel mode	The destination 'school' elicit the lowest degree of valence and activation The car elicit the lowest degree of activation Gender impact upon degree of activation while traveling and during the school day.
Paper III (published): <i>Transportation</i>	345 children between the ages of 10 and 14	Repeated survey Cognitive test	a) STS-C (<i>travel experience</i>) b) Current mood (<i>valence and activation</i>) c) Cognitive performance	Car travel and > 15 minutes' travel negative relationship with quality Social activities – positive relationship with quality and excitement. Being passive – higher degree of stress > 15 minutes' travel - less activated but positive relationship with performance Using smartphone or doing a combination of activities - positive relationship with performance

Table 1. Paper Overview

6.2. Paper I:

Westman, J., Olsson, L. E., & Friman, M. (2017). What Drives Them to Drive? – Parents' reasons for choosing the car to take their children to school. *Frontiers in Psychology*, 8(1970).

Paper I aims to explore parents' stated reasons for car choice and how these reasons affect the frequency of car use for their children's journeys to school. How environmental and sociodemographic factors impact upon the stated reasons, and on the mode decision, was investigated. By isolating the particular reasons for using the car, it focuses on a potentially important missing piece of research in finding out what motivates the increasing level of car use for children's school journeys.

A sample of 245 parents (194 women) of schoolchildren aged 10-15 from the County of Värmland, Sweden, was included in the study. These parents responded to a questionnaire wherein they answered background questions about their age, gender, income, car ownership, residential area, and level of education. They then stated to what degree (ranging from *disagree completely* (1) to *agree completely* (5) certain statements correlated with their decision to choose the car. Here, the alternatives on offer were: the opportunity to spend time with the child, concerns regarding traffic dangers, 'stranger danger', concerns about their child being bullied by other children, conveniently going that way, and the accompaniment of an adult. The parents then indicated how many days during the school week (ranging from 0 days a week to 5 days a week) they used the car to take their child to school (0 days [n=116], 1 day [n=43], 2 days [n=18], 3 days [n=10], 4 days [n=5], and 5 days [n=40]). Finally, to report on independent travel, the parents indicated whether or not their child was allowed to travel to school independently via a *yes/no* question (1 = yes [n=169], 2 = no [n=72]).

Through factor analyses, correlation analysis, and succeeding Partial Least Square Structural Equation Modeling (PLS-SEM) analyses, two latent variables were identified; *Social convenience*, measuring 'conveniently going that way' and 'accompanied by adult/parent', and *Safety/Security*, measuring 'stranger danger' and 'traffic danger'. Further PLS-analysis of the relationship between the latent variables and car choice reveals that the variable Social convenience had a direct

relationship with frequency of car use; parents valuing social convenience highly were more likely to choose the car. Further results show that if the child was not allowed to travel independently, then parents would choose the car more frequently to take their child to school. Sociodemographic factors were directly related to Safety/security, whereby parents with a higher level of education valued safety/security less. Distance (i.e. an environmental factor) did not impact upon mode choice. In summary, social convenience was directly related to car choice, as was independent travel. Sociodemographic factors was directly related to Safety/security, but distance did not affect the sense of security, social interaction, or mode choice. The mode choice that parents make, regardless of the underlying reasons, will have implications for their children's health in various ways. The following papers will investigate some of these implications.

6.3. Paper II:

Westman, J., Johansson, M., Olsson, L. E., Mårtensson, F., & Friman, M. (2013). Children's affective experience of every-day travel. *Transport Geography*, 29, 95–102.

The aim of Paper II is to evaluate the relationship between children's current mood and their every-day travel and whether mood varies with travel mode and destination. Children's reported valence (unpleasantness–pleasantness) and activation (deactivation–activation) while traveling to different destinations will be investigated and whether or not this has any spillover effects on how they perceive activities at their destinations. All the children in grade four (aged 10-11) (N=258) in the Municipality of Staffanstorps were approached in the autumn of 2009. Two hundred and thirty-seven children (49 % girls) returned their weekly travel diaries, which formed the basis for the analyses.

Every morning for one full week in September, the children received an activity diary sheet and colored pencils. The children reported all their trips and travel modes, drew their travel routes on an aerial photo, and reported their current mood while traveling, and at their destination. Each destination they traveled to was reported via an opened-ended question, followed by a description of which travel mode had been used. Their mood during the trip was reported via the written statement: "While I was traveling, I felt", whereby he/she indicated his/her experienced valence and activation using two five-graded scales of mood icons. They also reported their mood at their

destination. The children reported more journeys to school than any other destination. Cycling was the most frequently used mode (approximately 45 % of journeys), with girls and boys using different modes and traveling to their various destinations at approximately the same extent.

The results showed that the average valence and activation was significantly lower while traveling to school than to other destinations. The level of activation during a school day was significantly lower for those who had traveled by car than for those who had cycled to school. Girls experienced less activation than boys, both on their way to school and during the school day, and even more so when they had traveled to school by car. No gender difference was detected with regard to valence.

It is concluded that children's current mood varies with how they travel and where they go and that travel affects boys and girls differently. Traveling to school is a routine and highly-scheduled journey which seems to impact upon children's mood. It is further concluded that the specific school destination needs further attention, together with more extensive investigations of the travel experience by means of including sophisticated measures designed to capture both the cognitive and affective experiences of travel.

6.4. Paper III:

Westman, J., Olsson, L. E., Gärling, T., & Friman, M. (2016). Children's travel to school: Satisfaction, current mood, and cognitive performance. *Transportation*, 1-18.

Research on the adult population shows that activities, travel time, and travel mode all affect the travel experience (Ettema et al., 2012; Mokhtarian & Salomon, 2001; Olsson et al., 2013; Wachs, Taylor, Levine, & Ong, 1993; Young & Morris, 1981). The focus of this paper is on *whether* and *how* this applies to children. Children's experiences of their school journeys are evaluated using the Satisfaction with Travel Scale (STS), adapted for children (STS-C) (Friman, Olsson, & Westman, 2017), and by using measurements of their current mood. The aim is to investigate whether or not children's travel experiences (i.e. wellbeing) and their current mood vary with travel mode, travel time, and activities during travel. Earlier research shows that travel mode affects children's school grades (Martinez-Gomez et al., 2011), and that commute-induced stress negatively impacts upon work-related decisions (Van Rooy, 2006). Thus, this study further investigates whether or not travel

and the travel experience affect cognitive performance. Also investigated is whether or not the variables vary with age and gender.

Children in school years four, six, and eight (aged 10-15) at five schools in Värmland County were included in the study. Data was collected between December 2012 and March 2013, with 345 children (165 girls) forming the basis of the analyses. The questionnaires consisted of questions regarding background information (i.e., age, gender, grade, and school), the characteristics of the journey (i.e., travel mode, travel time, and what activities they had been engaged in during the journey). Measurements of current mood were made and children's affective and cognitive experiences of their journeys were captured using the STS-C. The STS-C is the child-adapted version of the STS, which has been developed in order to measure experiences gained during any type of travel, without focusing on a particular travel mode (Friman et al., 2013).

Directly after filling out the questionnaire, a word-fluency test was administered to the children in order to measure their cognitive performance. The Thurstone Word Fluency Test (TWFT) is a widely-used neuropsychological instrument which captures a person's psychomotor speed, executive functioning, attention/concentration, and memory (Cohen & Stanczak, 2000; Ruff, Light, Parker, & Levin, 1997; Sergeant, Geurts, & Oosterlaan, 2002; Tallberg, Ivachova, Jones, Tinghag, & Östberg, 2008). The phonological word fluency test (used in Paper III) measures a person's ability to produce as many words as he/she possibly can within a particular category (fruits, animals etc.), or any noun that starts with a certain letter. These abilities are tested within a specific time period (usually one minute) (Borkowski, Benton, & Spreen, 1967; Spreen & Strauss, 1998). In order to successfully conduct a word fluency test, the participant needs to concentrate fully and to diligently focus on the task in front of him/her (Pekkala, 2004).

The results revealed that traveling by school bus or using the active mode was experienced as being of greater quality than traveling by car. Children who engaged in social activities during the journey experienced greater quality than those who had used their mobile phones or engaged in solitary activities. Social activities elicited greater excitement than any other activity, while remaining solitary resulted in higher levels of stress than doing any other type of activity. A shorter journey was experienced as being of greater quality than a longer one. Thus, the experience (referred to as satisfaction in this paper) varied with the travel mode, travel activities, and travel time. Current mood was related to travel time in the sense that a longer journey resulted in lower levels of activation. Age was related to both valence and activation during the mornings and afternoons.

The results further show that activities and travel time were related to cognitive performance. Cognitive performance increased with longer travel times, as with mobile phone usage, and when engaging in a combination of activities. It is concluded that there is a relationship between travel and children's travel experience, mood, and cognitive performance.

7. DISCUSSION

Paper I explores parents' travel mode choice for their children based on the assumption that factors additional to environmental and sociodemographic ones underlie the mode decision. Papers II and III explore whether or not children's mood varies with where they go and how they travel: How do the characteristics of a journey influence children's wellbeing and cognitive performance? The relationship between travel and children's experience (i.e. wellbeing) was investigated using theories concerning affect and quality. These two dimensions of the experience and the immediate affective experience (as measured using current mood) were thus explored across Papers II and III.

The empirical findings of Paper I show that parents' stated reasons can be described as Social convenience (relating to the parents' own wish to accompany their children and to convenience) and Safety/security (relating to parents' concerns that their children will encounter dangers on their way to school). However, on investigating how the stated reasons actually affect the travel mode outcome (i.e. frequency of car choice), only Social convenience influences the travel mode outcome. It is rather surprising that Safety/security did not impact upon car choice, since a vast amount of earlier research shows that parents' fear of traffic, stranger danger, and other risk factors all make parents choose the car (Carlson et al., 2014; Curtis et al., 2015; Ramanathan et al., 2014; Yarlagadda et al., 2008). Here, questions arise as regards whether or not parents are merely *claiming* that they drive their children to school due to security concerns in order to justify their unnecessary car use. If a parent states that he or she is worried about his/her child's safety, the decision to take the car will be hard to question. In line with this reflection, Steg (2005) argues that car drivers are inclined to justify and rationalize their behavior (see also Steg & Vlek, 1997; Tertoolen, Van Kreveld & Verstraten, 1998). In an earlier study, Steg (2001) revealed that, when car drivers are asked to

explicitly state the reasons for their car use, they particularly mention instrumental motives, e.g. convenience and speed, but do not admit that symbolic and affective motives (i.e. feelings of sensation, thrill, and self-esteem) underpin these same decisions. These motives only surface when questions about motives for car choice are camouflaged. There seems to be some degree of reluctance to admit why the car is used, and perhaps even more so when other modes are available. During hectic mornings, when time is scarce, parents justify their unnecessary car use by claiming that they partly do this for safety reasons. Another explanation as to why Safety/security did not impact upon car choice could be the fact that Sweden, and smaller municipalities in general, is perceived to be relatively safe, leaving other factors more relevant to mode choice.

Social convenience did have an impact on car use. Parents seem to base their decisions to use the car on convenience, and getting a chance to be with their children while traveling. This may additionally be one of the few times during the day when they get the chance to be alone with their children and to make plans for the day (Barker, 2009). It may also indicate a joint work commute, which entails the practicalities of car travel. In earlier research on adult travel behavior, convenience is a strong motive for car choice, both as an instrumental factor (i.e. merely practical) (Tertoolen et al., 2015) and as affective factor (by reducing stress), thus making the preference for using the car difficult to change (Anable et al., 2005). In the light of these issues, the results of this thesis may actually reveal some degree of hope in the otherwise rather negative trend for car travel; if security does not account for the increase in children's car travel (in Sweden), this may leave some scope for travel change. The desire to accompany one's child can be fulfilled by means of actively traveling together, while alleviating parents' concerns for their children's safety would most likely require long-term multilevel interventions and changes (e.g., safer roads and crossings, pavement shoulders - but also their perceptions of security) (Lee et al., 2013).

Parents' educational levels had a correlation with Safety/security whereby parents with higher educational levels valued Safety/security less. It can only be speculated as to why this result emerges, but the literature has shown that education lessens perceptions of risk in certain areas (Knight, Weir, & Woldehanna, 2003) or, perhaps, this may be due to a higher level of education providing the skills for calculating potential danger, or education changing our attitudes toward security and safety. Education may also affect how we assess news and media reports – i.e. that they do not always mirror reality but address our fears instead. One possible contradictory factor in these explanations is the fact that education, in earlier studies, has been shown to increase car use instead, with those who drive regularly perceiving the environment to be more hazardous

(Stewart et al., 2012). All in all, there seems to be distinct perceptions of safety for different groups and programs aimed to increase security aspects for children's travel to school may fail without a solid understanding of how these groups differ in this aspect.

A noteworthy but non-significant finding is that distance did not affect car choice; parents seem to drive their children regardless of the distance between home and school. This suggests that there may be some habitual reasons for car choice whereby other available travel modes are not considered during the morning rush, which is also in line with earlier research showing that habitual patterns influence mode choice (Gärling & Axhausen, 2003). Instead, it could also be distance *in combination* with other environmental factors that impact upon the decision. In any case, this result challenges common beliefs that the number one reason for taking the car is distance, which again shows the complexity of the mode decision. Research into both children's and adults' travel behavior shows that distance is a major reason for taking (or not taking) the car (Ding et al., 2017), as is also indicated in Figure 1, but this does not seem to apply to our sample where the adult chooses the travel mode for his/her child.

After the travel mode choice comes the child's travel and together, Papers II and III reveal that there are relationships between travel and children's experiences, their moods, and cognitive performance. The results diverge somewhat between Papers II and III due to a variance in the research questions, but both show that car travel has a negative impact on children. In Paper II, children who traveled to school by car experienced the lowest level of alertness during the school day, while active travelers had the highest. The positive cognitive evaluations of the school bus and active mode could be the result of the physical activity associated with the journey (Cooper et al., 2003), while car travel has the opposite effect. When children travel independently, they appear to ascribe that mode with a greater quality and the journey seems to be experienced as simply "better", strengthening the notion that children truly appreciate traveling with their friends.

Travel mode did not have a correlation with the level of activation and alertness in Paper III, which was rather surprising since it was expected that active journeys would make the children feel more alert and awake. One plausible explanation for this could be the fact that the season affected the degree of activation in the sense that the morning darkness in Paper III made the children feel less alert despite traveling actively. In Paper II, data collection took place in September, when the weather was still nice, bright, and warm, while data collection for Paper III took place in the middle of winter, when the sun does not rise until after school starts. Darkness negatively affects children's

level of alertness (Swedo et al., 1995), something which may help explain these distinct findings. Previous research has additionally suggested that cycling to school provides stronger health benefits than walking (Bere & Andersen, 2009); the aggregating of cyclists and walkers into the active mode category in Study III could have caused the distinct findings regarding the degree of activation. In Paper II, almost all the active commuters were cyclists, while in study III, there were more walkers (due to it being winter with snow on the ground).

What children do while they are traveling correlates with their wellbeing. Social activities during travel add to higher levels of both quality and excitement, while solitary activities (i.e. activities done alone, e.g. looking out of the window, listening to music, and resting) bring more stress. These results show the complexity of the relationship between activities and wellbeing; it could be expected that solitary activities lead to more relaxation and calmness, but the opposite applies instead. For children, traveling on the school bus and using active mode offer a natural space in which to engage in social activities that increase excitement and reduce stress. Social support is unquestionably a strong mediator of wellbeing, with interactions between people protecting against stress (Cobb, 1976). Children who socially interact with friends practice interpersonal problem-solving, information processing, and communicative competence, which all add to their overall social skills, mental development, and academic achievement (Goldstein, Boxer, & Rudolph, 2015; Wentzel et al., 2004). The school bus and actively traveling with friends facilitate this type of social interaction and bring the possibility of increasing children's sense of social inclusion. Car journeys often occur with the accompaniment of parents and siblings, which is usually appreciated less than traveling with friends (Barker, 2009; Siedlecki et al., 2014). Furthermore, there is also a relationship between using cellphones and doing a combination of activities and improved cognitive performance in children. Could it be the case that, by doing certain activities, children awaken and feel more mentally alert, something that consequently affects their performance? Social activities may also offer a positive spillover effect against stressful academic situations, thus contributing toward better cognitive performance (Ramanathan et al., 2014). It has been established in research that the use of ICTs (e.g. playing interactive games) is strongly related to visual-spatial skills (Green & Bavelier 2006, 2007), and to the multiple dimensions of creativity (Jackson, Witt, Games, Fitzgerald, von Eye, & Zhao, 2012). Shifting one's attention, through combinations of activities, could possibly be an indicator of cognitive flexibility, which is linked to certain measurements of intelligence (Colzato, van Wouwe, Lavender, & Hommel, 2006; Les & Les, 2008). Then of course, relating to this explanation, our finding would be the result of the already more intelligent children using cellphones or shifting their attention, indicating that the result is moderated by intelligence.

However, although the effects are relatively small, and not entirely easy to explain, more than anything they raise questions and provoke thoughts regarding new ways of appreciating travel, whereby activities may be of more importance than was previously assumed.

Travel time can, in some ways, be viewed as an opportunity for social participation, whereby the traveler gains something from the experience of travel – influencing his/her wellbeing (Jain & Lyons (2008)). This statement applies to the children in this sample; a longer travel time provides opportunities to engage in activities and to social interact with friends, something which seem to impact upon both the experience and cognitive performance. Although a longer journey resulted in less quality and excitement, the children still produced significantly more words in the word-fluency test conducted upon arrival at school. Again, the result is not easy to disentangle; however, in trying to do so, I argue that there is a relationship between the activities *per se* and the experience and cognitive performance, rather than the actual travel time. With longer travel times, the children have more opportunities to engage in activities that may positively affect their experience and performance. The notion that travel time can be a gift surely offers some interesting possibilities in respect of travel behavior and how to travel.

The findings furthermore suggest that children understand, and are capable of making, affective and cognitive judgments about their travel, as captured using the STS-C. They express feelings of worry, relaxation, tiredness, boredom, and alertness while traveling, but also that travel elicits cognitive judgments relating to degrees of uselessness, excellence, being the best imaginable, or that travel works poorly. These results reveal that children, when asked, reflect upon their travel situation, how it impacts upon their degrees of arousal and valence, and they can relate to their emotions regarding their travel experiences and then transfer them to the questionnaire. The STS-C appears to work well on children; they understand, and are both able and willing to answer the questions. The STS-C is a multi-dimensional, context-sensitive measure of the travel experience and is applicable to all travel modes for children. During the process of writing this thesis, the STS-C was empirically validated on a sample of 345 children, which showed that this scale is a reliable measurement tool for assessing children's own travel experiences (Friman, et al., 2017).

To conclude Papers I, II and III, parents value the car for its convenience and for the possibility of accompanying their children. Even though the reasons underpinning car choice seem well intended, they are nonetheless depriving children from the positive aspects of independent and active travel. Children enjoy active travel, which makes them feel more activated during their

journeys, but also during their school days. Similarly, the school bus offers a space and opportunities for socializing with friends, and engaging in the types of activities that seem beneficial to cognitive performance. Social activities and interaction seem to be important factors for both parents' travel mode choice and for children's experience of travel. Since children want to fulfill these wishes by traveling with friends, parents who have no choice but to drive their children could try to organize carpools to deliver their children to school. Of course, small children may not be street-smart enough and may need to be escorted to school but nonetheless, younger children still need to be given increased travel independence to develop the strategies, skills, and understandings relevant to road safety (Whitebread & Neilson, 2000), which is another incentive for making parents travel actively with their children to school. However, in Sweden, there is a recommendation that children should be 12 or older before cycling alone to school, which may incentivize parents to uphold the belief that the car is the safest and best way of taking their children to school. This recommendation may deprive many children, who have either safe bike lanes to school or the maturity to use the roads safely, from traveling independently to school (Björklid, 1994).

All in all, this thesis shows the diversity of parental mode choice and sheds light on the nascent research focus on children's experiences of their every-day travel; it also shows that there is a relationship between travel mode, travel time, and activities and children's wellbeing and cognitive performance.

8. LIMITATIONS AND FUTURE RESEARCH

Study I is rather exploratory in nature and thus generates preliminary findings. Consequently, additional research is necessary to make certain of the findings and whether or not they gain empirical support, preferably in a Nordic setting since there are some distinct differences with regard to children's autonomy, safety concerns, traffic, the weather and so on from country to country. Whether or not parents are aware of the fact that their children do not appreciate being driven to school as much as they do traveling independently and actively has not been established in research; neither has it been established whether or not this awareness would make them reevaluate their preference for the car. Our novel findings on the relationship between the reasons stated for choosing the car will hopefully inspire and assist further research to develop models for testing other potentially influential reasons for mode choice.

In our quest to fully understand children's travel experiences, it would be valuable to randomize the participants into travel mode groups, and perhaps even as regards their engagement in certain activities. In doing so, internal validity would be better established. Thus, it would be beneficial if future research capitalized on natural experiments or tries to set up randomized ones. It would, for instance, be possible to conduct an experimental study when a new school bus service starts up, for instance when children attend a new school when, for example, moving from primary to secondary school. One limitation of the studies in this thesis is that current mood (Paper II) and satisfaction with travel (Paper III) were measured retrospectively. It would be possible to make observations and measurements during the actual journeys, at least on public school buses. Also,

baseline measurements of current mood would rule out the possibility of already happy, excited, alert, and awake children scoring significantly higher upon arrival at school. Baseline measurements of performance tests would also be valuable for the same reasons mentioned earlier. Additionally, there are also other theoretical perspectives that could be used to investigate the potential effects of a journey on the child, depending on the research aim (i.e. environmental factors, physical health, parental influence, travel mode choice etc.), and these would be valuable to investigate at a later stage.

9. CONTRIBUTIONS AND IMPLICATIONS

One theoretical contribution made by this thesis lies in its demonstration of the multi-dimensional nature of the parental travel mode decision and the child's travel experience. The STS-C has shown itself to be an adequate tool for capturing the child's experience and helping to reveal how aspects of wellbeing are affected by travel. These results add diversity to the common practice used in travel research by presenting evidence that the characteristics of the journey impact upon the child's experience and wellbeing, while earlier research primarily investigates the effects of mode use.

The journey as a space of its own, rather than just moving from A to B, with the opportunity to do activities that can help to boost performance and increase wellbeing, is an important piece of knowledge for parents, scholars in different fields, and for various policymakers who have the power to improve the availability of sustainable travel modes. Children should be encouraged to travel actively to school, and parents need to be made aware of how children value car travel and of the relationship between health and travel mode. Not only would this have a beneficial effect on the environment, and create healthy travel patterns for our children, it would also enhance the travel experience and current mood, and would possibly boost cognitive performance.

The way in which researchers perceive the status of children influences how children are understood (Punch, 2002); I believe that children have the right to be heard and taken seriously in procedures that involves and affects them. Children have the right to be consulted, and also to be allowed to challenge and question decisions made on their behalf (Morrow & Richards, 1996). Today, policies (logistics, environmental planning, school choice etc.) are made without any solid

understanding of the key factors influencing children's travel. This thesis shows that children are affected by their day-to-day travel, which should be taken into account when planning infrastructure. Also, parents should be made aware of the relationships between day-to-day travel and children's wellbeing; without this understanding, there may be a lack of motivation to bring about changes in travel behavior. In cases where independent travel is unrealizable, parents could take the opportunity to spend time with their children by actively traveling to school together, thus fulfilling the wish for social convenience and the beneficial effects of children's active travel. Similarly, for children who need to travel by car and who do not have the opportunity to engage in social activities with friends; it would be valuable if parents can encourage their children to engage in in-car activities, which can highlight the fun aspects of their journeys to school. Car travel is an environmentally-unsustainable travel mode, which impairs children's physical activity, their social interaction, and their possibilities of exploring their local environment (Cooper et al., 2003; O'Brien et al., 2000; Roth, Millett, & Mindell, 2012); active travel and the school bus should be regarded as the first choice for children's school journeys.

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Drivers of Children's Travel Satisfaction

The aim of this thesis is twofold. Firstly, it explores parents' stated reasons for choosing the car for their children's school journeys. Secondly, it investigates the relationship between the characteristics of a journey (i.e. travel mode, travel time, and activities conducted while travelling) and children's wellbeing (through domain-specific satisfaction), current mood, and cognitive performance. The overall findings show that parents value the car both for its convenience and for the possibility of accompanying their children. Parents also use the car regardless of the distance between home and school. Travel affects children in various ways; for instance, doing certain activities while traveling can help boost cognitive performance and make children feel happy and excited. Notably, being passive during the journey makes children feel stressed and those who travel to school by car are the most tired during the school day. This implies that parents' travel mode choice affects children's wellbeing and cognitive performance. These insights are important when it comes to addressing current challenges relating to children's day-to-day travel: How they experience their day-to-day travel may contribute toward how children travel in the future.

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