

BEHAVIOUR CHANGE DYNAMICS IN RESPONSE TO REWARDING RUSH-HOUR AVOIDANCE: A QUALITATIVE RESEARCH APPROACH

Eran Ben-Elia^{*♣}, Hennie Boeije^{}, Dick Ettema^{***}**

* Centre for Transport and Society, Faculty of Environment and Technology, University of the West of England
Frenchay Campus, Bristol, BS16 1QY, United Kingdom.

** Faculty of Social Sciences, Department of Methods and Statistics, Utrecht University –
h.boeije@uu.nl
P.O Box 80140, 3508 TC, Utrecht, The Netherlands.

*** Faculty of Geosciences, Urban and Regional research centre Utrecht, Utrecht University
d.ettema@geo.uu.nl
P.O Box 80115, 3508 TC, Utrecht, The Netherlands.

♣ Corresponding author

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ABSTRACT

Spitsmijden (peak avoidance is Dutch) is a new travel demand measure introduced in the Netherlands. It is based on rewarding frequent car commuters for avoiding the rush-hour, using monetary incentives. Although previous quantitative analyses had revealed many of the factors influencing car users' responses to rewards, their decision to participate and the order of magnitude of rush hour travel reduction, several questions remained regarding participants motivations to participate and avoid the rush hour, and how their behaviour and motives develop throughout the reward period. Qualitative research methods (semi-structured interviews) were applied to tackle these questions. The analysis, involving 12 participants, suggests their motivations and behaviour are not stable and that a process takes place in which the rewarding gradually leads to behavioural change. Although the reward is the initial motivation to enrol and avoid the peak, many participants find travel options that are in themselves rewarding, leading to intrinsic motivation to sustain their behaviour. Some eventually choose a single new travel option (stabilisers), while others optimise their choice using dynamic traffic information (flexibles). Those who do not find attractive alternatives do not develop intrinsic motivation and fall back to their old behaviour when the reward ceases (relapsers). From a methodological point of view, the qualitative method used has significant added value to quantitative methods applied earlier in the sense that processes can be identified in which motivational, behavioural and contextual factors interact, leading to richer descriptions and improved insights into the behavioural adaptation process in response to congestion management measures.

KEY WORDS

Behaviour-change, congestion, motivation, qualitative research, rewards, semi-structured interviews.

1. INTRODUCTION

Road pricing has been suggested over the past two decades as a first-best solution to efficiently alleviate congestion externalities (1-3). In practice, imposing road pricing is controversial as it raises questions regarding social equity (4) and public acceptability in addition to economic efficiency (5-7). Psychological theory (8) suggests, that an incentive can achieve a similar behavioural response to that of pricing (9, 10). The ‘Spitsmijden’ (translated freely from Dutch as peak avoidance) concept has been applied in various settings in The Netherlands with the objective of investigating the potential impacts of rewards over commuters’ behaviour during the rush-hour. Its rationale is to reward commute travellers if they avoid driving during the morning rush-hours. They can achieve this by driving during off-peak times (before or after the morning rush-hour), travelling by other modes (public transport, cycling or carpool) or working from home. Travellers' behaviour is compared to a reference situation without rewards which determines to what extent peak-hour driving was avoided. To date, Spitsmijden has been tested in several projects (motorway trajectories) and locations across the country (11). In operational terms, the behaviour of participants in Spitsmijden is monitored using electronic license plate recognition on the main trajectory and other routes. In addition, participants fill out a logbook providing data on their trips, times and locations especially if they were not using their car. Data on socio-demographic characteristics, work and household flexibility, habitual travel behaviour (usual departure and travel times) and traffic information usage are also collected through surveys.

Although Spitsmijden is quite unique in its large scope as a nationwide policy measure, the use of incentives to encourage changes in travel behaviour is evident in the literature. (12, 13), used a temporary free bus ticket as an incentive to reduce car driving. (14) studied the effect of providing passengers with free train tickets for travelling before the rush-hour. Other examples include the ‘in motion’ and the ‘one car less’ programmes in Washington State to encourage less use of travel by car.

To date, research into Spitsmijden has been conducted using quantitative methods i.e. econometric techniques and discrete choice models (and see 15). These methods have been applied to find statistical associations between the degree of rush-hour avoidance (RHA), on one hand, and the different reward regimes (i.e. treatments), socio-demographics and work/household related constraints, on the other hand. In general, these analyses have revealed that RHA is affected mainly by type (monetary or in-kind) and height of the reward. However, other factors have also been found to influence behaviour and especially the choice how to avoid the rush hour (driving before/after or not driving). As stated by (15) who studied Spitsmijden I consisting of 340 participants during a 13 week pilot study, the main conclusions were that sensitivity to the reward was decreasing relative to its size thus a reward of 4 € was deemed satisfactory. Furthermore, rush-hour driving was associated more with women, frequent commuters and higher education and lack of work time flexibility. RHA was positively linked to exploration and practicing with travel alternatives. Driving before the peak was associated with participants’ usual departure times (i.e. habitual behaviour) whereas driving after the peak was positively associated with flexible work times, teleworking and frequent use of traffic information. Participants choosing not to drive were associated with positive attitudes towards car alternatives and with previous experience with them. Wind speeds were also found to be negatively associated with not driving (probably affecting cycling)

Two main issues have been insufficiently studied in the context of Spitsmijden. First, the underlying reasons and motivations to participate in the program and to exercise RHA.

Although certain motivations (e.g. the reward, contributing to mitigating congestion, finding solutions to tackle congestion) explain the willingness to participate (16), these were measured using predefined closed scales, leaving. It makes sense to explore the motivations of participants further, as well as the stimuli and constraints that influence their daily trip-making decisions while being rewarded. A second issue concerns the dynamics of behaviour over an extended period of time. In a program that lasts over a year, motivations as well as influential factors may vary. Behaviour itself may change due to fatigue, or motivations and attitudes may change based on experiences. Although some dynamic effects can be accommodated using econometric models such as panel based models, there is a considerable lack of knowledge about how behaviour and its underlying motivations change over a longer period, and how this affects the outcome of incentive programs such as Spitsmijden.

Research into behavioural change has led to relevant psychological theories such as Theory of Planned Behaviour -TPB (17), Norm Activation Theory - NAT (18, 19) and Theory of Interpersonal Behaviour -TIB (20, 21), which suggest that behavioural change may occur if beliefs about the outcome of choices change (leading to changes in attitudes), if social or personal norms change and if perceived control about the outcomes of alternative behaviour is sufficient. Another important condition for change is that behaviour should be conscious, rather than habitual. Although these factors have been demonstrated to influence behavioural change in various circumstances (21-23), they have to date been studied in static settings. As a result, the process of behavioural change has not received sufficient attention. Moreover, an extensive literature (24-28) discusses whether rewards (being extrinsic) are more or less instrumental than activating intrinsic motivations (e.g. by providing information) when attempting to change behaviour. Also for Spitsmijden, one can question the relative role of the reward and intrinsic motivations in various stages of the program.

In short, to understand the emergence of behavioural responses to rewards in a long term program, it is important to study the development of intrinsic and external motivations to enrol in the program and avoid the peak, as well as the development of beliefs, norms and perceived control. Therefore, the main objective of this paper is to elucidate the behavioural process that develops over a longer period of time. The following research questions are addressed:

1. What motivates participation in Spitsmijden?
2. How do participants' intrinsic motivations develop over time during the course of the program?
3. What stimuli and constraints do they experience and what impacts do these have on their decision to avoid the rush-hour?
4. What role do support measures play, e.g. accessing traffic information or employers or household arrangements?
5. Does RHA behaviour change during the course of the project and if so how?

To address these questions, we will use qualitative research techniques (semi-structured interviews and discussed briefly in section 2. The rest of the paper is organized in the following way. Section 2 provides a brief description of qualitative research methods and their application to our research problem; Section 3 explains the methodology applied in this study; Section 4 presents the results; Section 5 presents a discussion, sets conclusions and future research directions.

2. QUALITATIVE RESEARCH METHODS

Since the use of qualitative techniques is not common practice in transportation research, this section discusses the principles of the approach. The purpose is to sketch an image of qualitative research and focus on four elements: purpose, methods, research procedure and findings. Next, we demonstrate how these relate to our research agenda.

Purpose

In general, the purpose of qualitative research is to find out how people give meaning to their social world. Participants are asked to reflect on their experiences within the focus of the research questions. It is assumed that people actively construct their social lives and shape their social environment in a meaningful way. A fundamental source of guidance is the problem statement of the research project. Answering the research questions requires a large degree of exploration. The quantitative models that resulted from the research of Spitsmijden 1 (the aforementioned pilot study), showed a definite connection between behaviour-change and factors such as household constraints, flexibility of work, and appreciation of alternative ways of travelling in addition to the reward itself. However, the mechanisms behind some of these factors still need elaboration and other factors might be further explored. Consequently, the research objectives are geared to better understand the perspective and behaviour of commuting drivers. Qualitative research methods are beneficial when exploration is needed in an area of scientific interest. Qualitative researchers do not imply their theoretical framework on the participants. Instead, by asking open questions the participants are enabled to bring to the front what they think is important for answering the question.

Methodology

In order to provide knowledge about people's social worlds, standard qualitative methods tend to emphasize flexibility of procedure (29). Flexible methods are adaptive to what the field of research has to offer. Consequently, methods are modified during the course of the research process, as only when the researcher is 'in the field' does it become clear which research questions have been successfully posed, which new questions or approaches need to be included, what types of additional observations could be made using variants of the developed methods, and so on. Therefore, the measurement instruments are mainly semi-structured. Before going into the field, researchers generate a well-prepared instrument, such as an interview protocol, an observation scheme, or a focus group agenda, but only in 'the real world' does this instrument reveal its value.

The issues concerning the Spitsmijden project are quite complex in nature. A decision to participate in the project could be based on different personal considerations, as well as the decision to choose alternative modes of travel to avoid the morning rush-hour. Qualitative methods are employed to unravel complex issues such as decision making. These methods can provide insights into all the different aspects that participants weigh and into the decisive aspects that play a part in daily decision making. Interviews realize this by asking participants for a complete overview of their considerations as well as for a reflection on the interplay of these factors. Interviewees can do so from their own frame of reference for instance, in terms of environmental interest, costs, productivity or a combination of these.

Research procedure

In qualitative research, a cyclical process is often advocated (30). As such, it is preferred to sample a subset of cases, collect data, and then to analyze these data, before repeating this cycle with a new set of cases. Ideally this cyclical process is continued till no new insights originate, and the findings show no obvious gaps anymore (i.e., saturation is achieved).

Otherwise stated, the investigated social phenomenon is well understood, and the research questions can be answered. The flexibility of qualitative methods makes them appropriate to study change. Change is sometimes difficult to study with fixed instruments as the adequacy of measuring instruments might decrease over a longer period. Data collection in qualitative research can be adjusted to the issues that are at stake at a specific measuring moment. Additionally, participants can reflect on previous periods and recall any decisive moments. It is an important question whether participants become more aware of travelling decisions and whether any change in their behaviour becomes routine. This information is very relevant with regard to the future success of (reward-based) congestion management programs

Findings

Qualitative research can provide descriptions of daily life. Descriptions must be understood as detailed accounts of what a specific setting looks like, what keeps people engaged and what they take for granted. Often, qualitative researchers do not only aim to describe what is happening, but also want to explain how it works and why it is that things work that way (31). Microscopic insights can be placed against theoretical and societal backgrounds or macroscopic conditions to further understand the research topic. During the analysis researchers reduce, select and interpret the data. However, the claims they make need to be grounded in the data i.e. stories and examples, and therefore data needs to be included as research evidence. In the Spitsmijden project findings can help to develop further theorizing in the realm of mobility, for instance by providing different stages in behaviour or in discovering different types of commuters.

3. METHODOLOGY

3.1 Recruitment and sample selection

In this study we focused on participants recruited for Spitsmijden 2D conducted on the westbound stretch of the A12 motorway connecting Gouda to The Hague. Initially, 20 participants were targeted for semi-structured interviews. More than 4,000 participants could be approached with ample data available via the detection equipment regarding RHA. First the data was aggregated to monthly summaries for each participant regarding: number of days of driving before the peak, during the peak (6:30-9:30) period and after the peak period. Data was further explored with Parallel Coordinates methods implemented in the Parallax software (32) which applies geometric principles of multidimensional visualization to find regularities in the data without any a priori assumption on the distributions. We then looked at the number of RHA days in each month (March 2008 – July 2009) and detected representative periods of high activity in the program: one in the early stages of the program (4th month) and another towards the end (17th month). A cluster analysis (in SPSS v.15) demonstrated that for each RHA strategy (before or after the peak) there were four distinct group-clusters: Participants showing a high RHA rate throughout the program (HH); Participants showing a low RHA rate throughout the program (LL); Participants starting with a high RHA rate but falling back to a low one (HL); and participants starting with a low RHA but later climbing up to a high rate (LH); and providing the basis for a random sample of participants (accounting for both gender and age). This sample of 95 participants was delivered to the project's back office which sent invitations to participate in the study by email. Although 95 participants were approached by email, unfortunately only 12 interviews were ultimately held mainly due to lack of interest, as well as practical difficulties to make an appointment. Eventually, three interviews were conducted in each of the selected clusters, mentioned above, except for the LL-participants (considered as drop-outs of the project).

3.2 Data collection

Master students of Utrecht University, were recruited to conduct the interviews. They had taken a course in qualitative research methods and additionally received a training workshop. The topic list that they would be using during the interviews was addressed and discussed for any unclear parts. Based on their comments some adjustments were made to the topic list (see Appendix). Interviews were eventually held (for safety in pairs of two students) from November 2009 until January 2010. The interviews took place at the homes of the participants and lasted approximately one hour. All interviews were digitally recorded and fully transcribed.

3.3 Data analysis and quality control

Data were analyzed with the use of Maxqda2007 software for qualitative data-analysis. The first step of the analysis consisted of disassembling the interview texts into relevant themes. In this so-called stage of open coding each theme is assigned a label, a code. Some codes were deductively derived from the literature, such as 'flexible work arrangements', 'public transportation' and 'supporting measures'. Others were inductively derived from the interviews, for example, 'optional reward', 'decrease travel time', 'rhythm', and 'decisive factor'. Coding was also regularly discussed in the project team in order to reach agreement on the interpretation of the data. In the second stage of the analysis themes were distinguished between main themes considered by the in the interviewees and more peripheral issues. The research questions were influential in deciding what were considered the main themes. This resulted in a hierarchical code tree that was regularly refreshed on the basis of new information stemming from the data. The fragments that could be retrieved with the codes were examined thoroughly while looking for regularities and patterns. This resulted in different stages that participants seemed to go through from entering the project till finishing the program and to a typology of different participants. It should be noted that all the text fragments were in Dutch and they were eventually translated to English only for publication purposes.

4. RESULTS

4.1 Motivations to participate

The reward was the primary reason to enrol in the program for ten participants. Two participants were only registered for a day in a fortnight and as hence the amount of money to be earned was low and not influential. At the same time they all state that they do not need the reward financially and they consider it to be extra money added to the big heap and hardly noticeable when paid. Still, it was the reward that made them enrol in the program.

I: Why did you participate?

P: Mainly the idea that it could never harm. (...) A bit out of curiosity? No not really, because at that time you don't have a clear picture of what you will gain. The decisive moment for me was that I was offered money. That is what pulls you in.' (P-01)

The amount of money is considered appropriate and less would not be considered as a sufficient reason to request a change of behaviour. Most participants could earn quite a substantial amount of money, if they stick to RHA. Some participants stated they find a reward so much more encouraging than a sanction and others stress that with the reward there is nothing to lose only to win.

Other reasons for participating included both individual-related reasoning such as decrease of travelling time and unpleasantness of the rush hour, as well as socially related reasoning such as the scientific value of the project itself, the contribution to concerted action to deal with congestion, expediting road construction works. The environment was never a reason and it was often stated that it should have played a part, but that in fact it had not. Some felt challenged and wanted to see if they could make it before the rush hour. Some were more generally interested in traffic and were curious if the project would be effective.

It is interesting to note that all participants take the decision to participate individually without discussing it with family members or others. Some find out later on that colleagues are invited to the program as well, but that is not influential in any way. This suggests that the option to earn extra money, the potential behavioural change needed and the consequences are considered to be of individual relevance mostly.

4.2 Exploration stage

Once enrolled, the participants contemplated about transport alternatives and departure times from home. The reward raises their awareness about the flexibility of their work, the necessity to be at a specific location at a fixed time and about travelling times. They also reflect on their experiential knowledge with rush-hour traffic. For some a short period of exploration starts in which they investigate the options that are available to them to avoid the morning rush-hour. They find out how late they have to depart and they learn what the advantages and disadvantages of particular options are.

I: Was the reward important for you?

P: Well no, but it was a pleasant consequence. I mainly wanted to gain some experience: what would I gain in terms of time? I got to the office in 45 minutes and sometimes in 35 minutes and I did not drive exceptionally fast. That is when you leave at 5:50 (...) If you leave later it easily takes you about an hour and a half.' (P-06)

'Now I will try to leave on Fridays not just before five thirty but just before seven. To check how that turns out. Not any later, I once did that and I shouldn't, because you get stuck in traffic'. (P-09)

In considering the options the costs and benefits, including the reward, are weighed:

'Yes, I consciously thought about how to do this? Can I go by public transport? And then I thought that not an option for me. Things would be so much worse; I am not doing that for four Euros. If I work nine hours a day and am away from home for twelve hours, it is not worth four Euros.' (P-10)

Eight participants did not have to fundamentally change their regular behaviour to gain the reward. For instance, they already were starting their day quite early and only had to get up ten minutes earlier than before. For four participants it meant a moderate to large change. For instance, one participant who started to work at home for two days and one participant who started travelling by train.

In some cases the program is congruent with what the participants had already noticed, but it helped them to act more explicitly on these experiences. Like P-02 who had already noticed that traffic became heavier causing her delays and now started to drive before the rush-hour. She called the program an eye-opener. The employers of two participants

allowed working from home which matched the intention to avoid the rush-hour. One participant noticed that other drivers were probably participating in Spitsmijden because congestion levels decreased. This helped her be less sceptical and adjust her behaviour. So it seems that the nature of traffic congestion itself and developments in it are participants' triggers to reflect on behaviour, but that they need the reward to act upon it.

4.3 Choosing an alternative

After the exploration period, the majority of participants choose one option. The most used alternatives are: driving before the rush hour (6x), using different routes (2x), working at home (1x), driving after the rush hour (1x) and alternative transportation (1x) i.e. going by train. One participant did not develop a preference. The choice of travel options can become quite complex. As the following quote shows, different elements have to be balanced:

'My consideration to participate was that it might lead to something that could be useful in the future. To make a small contribution to making things run smoother. The environment did not cross my mind. I realised that afterwards. Money did not play a role for me. Obviously, my work hours were important: how to deal with those. But I have already done that for years myself' (P-05)

There is one group that although developing one preferred option, likes to combine different alternatives. Sometimes they drive before the rush-hour, sometimes after and some days they work from home. There are also less conventional alternatives, like staying overnight with family or friends, using alternative routes via secondary roads, going by motorcycle or doing site visits instead of going to the office. Public transportation, i.e. the train, is not considered a feasible alternative in this group. Individuals in this group extensively use support measures to discover daily what the best option to get to work is:

'When I get up, first I look at Teletext. On page seven-hundred-something, the queues are listed and I check what is going on with my route. Have there been accidents? You more or less know the usual queues, but you check if there has been an accident, glazed frost or snow or something like that. Then you know: OK there will be a queue and travel times will go up. Then I get alarmed: I have to watch things carefully. Then when I got dressed, I go to the laptop that is always switched on in my room. The ANWB (Dutch Car Drivers Association) has a great site where they indicate with red bars where congestion develops. You can also see if it is increasing or resolving. Based on that I determine the best time to leave home.' (P05)

All participants except one develop regularities. This means that they change their behaviour in a fixed way. This includes the option they choose, the days of the week that they use this option, the information sources they consult and support they receive (e.g. partners who get up to make coffee at 5:30 to get them started before the traffic jams). It is like a timetable as one of them says. There is one interviewee who decides the evening before or the day itself what she will do. There is neither one criterion that is decisive nor a fixed transport option. She has no regular way of choosing how to travel.

The choice for an alternative is influenced by different factors. In Table 1 advantages and disadvantages are shown for driving before the morning peak, after the peak, going by train, working at home and the combination of options. Participants' experiences with advantages and disadvantages are very much related to their work conditions and private lives. For instance, if openings hours do not permit one to enter the office when arriving at 6.30 then dismissing the option to drive before the rush-hour is related to the nature of the

job. In our small sample family obligations, like chauffeuring children to school or day care, were mentioned twice but were not decisive as partners usually took care of the children.

Use of public transportation is described in contrast with the car. Some need to commute by car for visiting different work locations. The longer travelling times relative to the car stand out. The car is seen as satisfying way of travelling while listening to music, making phone calls, and being comfortable and warm. Some cannot work in the train because they need information that is only available at the office hence travelling time is neither considered working time nor personal time and it is experienced less comfortable and private.

In sum, alternative options for RHA are inspired by factors related to work conditions and to personal conditions. Work conditions are among others, flexibility, working hours, quality of work, necessity of information, presence at location and colleague dependability. Personal factors are among others family circumstances, personal agenda, experience of comfort, and being an early bird or a night person. Some of the advantages and disadvantages are valid for driving before as well as for driving after the rush-hour, like time benefits and more relaxed driving. In those cases other factors are decisive, for example the guarantee to be at work in time or ability to sleep in.

TABLE 1: Advantages and disadvantages of different peak-hour travel alternatives

<i>Advantages</i>	<i>Disadvantages</i>	<i>Influential factors</i>
Before rush- hour		
On time at work		Dependent colleagues
Long working days		More working time
	Long working days	Working too much
More time for transfer		transfer shift
	Shortage sleep	Tiredness at work Difficulty to maintain option
	Too early at work/appointment	Opening hours office
Quiet driving		Relaxed arrival
After rush-hour		
Take children to school/day care		family obligations
Driving calmly		Fitness at work
Less travelling time		More working time
Personal rhythm		Being a night person Having young children
	Too late at work/appointment	Inflexibility work
	Starting late	Working late to make hours
Public transportation (train)		
	Not being able to work during trip	Less working time
	Long travelling time	Long days from home
	Less relaxed and private	Less personal time
	Unreliable	Missing appointments
	Not gratifying	Need car during work
Working at home		
No travel at all		Ability to do work at home
	Not at location	Presence needed at work
Combinations of options		
Matches current personal state		Flexibility
Matches current traffic situation		Traffic information available

4.4 Sinking in

With the exception of three participants, all of them developed new reasons for sustaining their behavioural change. One participant drastically changed her behaviour by choosing to travel by train and was primarily motivated by the reward. When the project ended she immediately returned, except for one day, to drive by car. She remarked that the train was neither more comfortable, nor cheaper or faster than the car. One participant changed her behaviour by choosing a different but very similar route in order to get the reward. Once the project is over she thinks that as congestion seemed to her to have diminished that she will probably drive again during the rush-hour. One other participant did not really develop a new routine and floated between different options each day. She somewhat lost her interest in the program and the reward as well and already had decreased her efforts during the program.

All others seemed to develop an intrinsic motivation. In reflecting upon those motivations it turns out that the value of the reward decreases:

- I: Was the reward important for you to get involved in the program?
 P: At first, it was the motivation to participate, yes.
 I: Is it still as important now?
 P: No.
 I: And why not?
 P: Because for me the most important thing is to be sure that I get to work on time. By participating in this program I know that that is the case. That I also get a reward is just a nice bonus' (P-02)

'Well, if you ask me what pulled you in, it's the reward. But if I have to say what the biggest gain is, it is driving without congestion. That's the most important thing to me. That's just what I hate most, those traffic jams.' (P-10)

Their motivation is centred on avoidance of congestion (5x), certainty of being at work on time (2x) and other time benefits (2x). The newly developed reasons for RHA have a personal interest component, such as relaxed driving, driving faster, time benefit, being at work on time, matching individual state, or a longer working day. Those participants maintained their new routines now that the program has ended. It is self-evident for them to continue to benefit from the advantages that they have discovered during the program.

4.5 Typology of participants

When looking at the different participants in our interview sample, we can construct four different types (shown in Table 2). We describe below each of the four types and illustrate them with a brief case description.

TABLE 2: Four types of Spitsmijden participants

	Stabilizers	Flexibles	Relapsers	Floaters
Motivation sustainment	personal gain	personal gain	reward	novelty
Importance of reward	initial	initial	continuous	initial
Options for travelling	one	various	one	various
Information sources used	none or one	many	none or one	none or one
Long term behaviour	continuation	continuation	decrease or stop	floating

Stabilizers

Six participants in our sample can be labelled as stabilizers. They are stimulated by the reward to join the program. After this initial trigger they reflect upon their transport alternatives. Often they do not need major adjustments to their usual behaviour to earn the reward. The project matches their travel experiences having now become more explicit. They select mainly one option for travelling to work and that is mostly driving before the rush-hour. Since they choose this option anyway they do not usually require consulting travel information sources. When participating they discover personal benefits of driving outside the rush-hour, like more time to spend at work or driving more relaxed. These benefits become more important than the reward and eventually they will continue to travel outside the rush-hour even when the reward cannot be earned anymore. Vignette 1 provides an example:

P-02 already had got up quite early, to make it to her shift transfer, but still met heavy traffic. She already had noticed that it became heavier when travelling and that made her feel uncomfortable. Public transportation is not an option due to longer travelling times. Since joining the project she drives only before the rush-hour. To accomplish this she had to get up somewhat earlier than she used to. Her new behaviour gives her peace of mind. First, it is still quiet on the road and she is certain of being on time at work. This is important to her because she will not miss the shift transfer. Second, she has more time available to start her work and for the shift transfer. She says she will definitely continue her newly found rhythm and benefit from these advantages. However, as she is not leaving her work earlier in the afternoon she has longer working days than before.

Vignette 1

Flexibles

Three participants can be depicted as flexible. Although flexibles had already adjusted their travel decisions to the daily circumstances quite often, the reward encouraged them to reflect even more on their travel decisions. They use different options and on a daily basis pick the option that seems most beneficial. They weigh factors relating to traffic, work and to a lesser extent personal circumstances. In making the right choice they use several sources of travel information available to them, such as internet, radio and Teletext at home, as well as during their trip. They all experience quite an amount of flexibility in their jobs. In the exploration stage they discover a personal gain in participating in the program which becomes more important than the financial reward. In addition, they have a general interest in transportation and are committed to the program in a sense that they like to think about plausible solutions. They will later sustain their behaviour when the program has come to an end. This is demonstrated in vignette 2:

P-06 prefers to drive before the morning rush-hour, but he has a lot of alternatives available such as driving after the rush-hour, by working at home and later working at an offsite location, or by working at home all day or by using a different route. During the years he has tried all alternatives, like alternative routes and even going by motor cycle, but he concluded that it does not really work. His agenda allows him a lot of flexibility. Automatically, he consults many sources of travel information in the morning to see what the best option is. Although, he regards the reward as satisfying, the time gain gradually got much more important. In addition he says he only had a moderate change to his regular behaviour, needing to get up earlier on most days, but he got used to it and suggests he will maintain his (new) behaviour.

Vignette 2

Relapsers

Two participants are labelled relapsers since they decreased their efforts to avoid the rush-hour already during the project or immediately afterwards. Relapsers are motivated to enrol in the program because of the financial reward. They are tempted to change their behaviour quite drastically although they can earn it just by slightly changing their behaviour. They mostly pick one option and stick to this to earn the reward. Already during the project or after the project their interest wanes and they return to their former routines. Some of them will continue a smaller adjustment, for instance for only one day, or they start with a new exploration phase, for instance when they believe traffic flow has improved. They do not discover a personal gain in a change of their travelling behaviour (see vignette 3).

P07 had always driven during the peak. As soon as the project began she started travelling by train in order to get the reward. A disadvantage of this was being somewhat too early or too late at work. As soon as the project ended she started taking the car again except for one day per week. She used this period to conclude that travelling by car is more comfortable and not really more expensive than taking the train. She hardly uses any travel information, neither when travelling by train nor when driving by car. She does not like working at home and it is not really possible in her case thinking that it could well create a precedent for other colleagues (that would not be allowed).

Vignette 3

Floater

There is one participant in our sample we designated as a floater. A floater is inspired to enter the program by the reward and its novelty. Earning the reward is experienced as a challenge and the floater is initially quite fanatic. But during the program interest diminishes as the floater does not appreciate any regularity. A floater neither has a preferred transport alternative nor a schedule. Work is not a top priority; other aspects are equally important. The daily decision is guided by different factors concerning one's personal agenda, mood, work duties and to a lesser extent traffic. Sometimes one information source is used. Although the reward is liked, it is not really needed. When the program is finished the decision takes place on a daily basis as usual. An example is presented in vignette 4.

P-01 entered the program because of the reward and was quite enthusiastic in checking her watch trying to gain the reward. She discovered that avoiding the peak-hour was a time gain, but quite soon she found out that she could avoid the peak but not within the strict two-hour timeslot of the project. She lost her interest in the program. As she remarks she did not abandon the project. The agenda can be adjusted to her travelling wishes and the other way around. Work is paramount especially when it is busy. On a daily basis she decides if and at what time she will leave home taking the working and the private agenda into account. It happens regularly that the evening before she decides to leave early, but then sleeps in and travels late. Then she makes long working days to make up for lost hours.

Vignette 4

5. DISCUSSION AND CONCLUSIONS

The results invoke discussion on both a substantive and a methodological level. We also relate here to the inherent connections between previous findings based on quantitative approaches and the new results obtained through qualitative methods. In this sense the study represents an application of mixed methods.

From a substantive point of view, the results provide interesting insights into individuals' process of behavioural change in response to a changing context. Literature in the area of behavioural change has put forward various theories of the mechanisms of behavioural change. *Theory of Planned Behaviour* (TPB) (17) asserts that behaviour is affected by behavioural beliefs held about choice options, leading to attitudes toward the choice options, eventually, choosing the option that is believed to result in the most favourable consequences. In a more longitudinal sense, this suggests that behaviour leading to a positive outcome is more likely to be sustained, since the beliefs about the outcome will become positive (reinforcement learning: 33). In addition, TPB states that conformation to social norm plays a role i.e. perceived approval of the behaviour by peers may play a significant role. TPB also highlights the importance of perceived behavioural control i.e. having control over factors that might hinder or facilitate the behavioural change, will positively contribute to it. *Theory of Interpersonal Behaviour* (TIB) (20, 21) extends TPB by stressing the role of habit in behaviour i.e. the more habitual the behaviour, the less conscious decisions are made and the less likely one is to change behaviour in response to a change in context. These theories have usually been thought of and tested in terms of before/after introduction of some policy, rather than as an ongoing process.

An interesting outcome of our approach is that it provides insight into the process of behaviour-change rather than just measuring its occurrence. We observe that for most respondents, various mechanisms suggested by the aforementioned theories are at play during participation in the program. Although considerable heterogeneity exists in the process of behavioural change, certain types of participants can well be distinguished. This is something we were unable to uncover in previous quantitative studies of Spitsmijden. The motivation of Stabilisers and Flexibles underwent a change; whereas initially the reward is the extrinsic motivation, intrinsic motivation takes over once the participants experience positive outcomes of their behavioural change. In line with TPB, this changes their beliefs about behaviours such as early departure, leading to sustained (internalized) behavioural change. However, if the reward is the only reason (motivation) for RHA and no positive effects of the change are experienced, beliefs about it will not change, intrinsic motivation will not develop,

and behaviour is not sustained after the rewarding ends as was the case for the Relapsers and Floater.

This suggests that achieving behavioural change may well be possible without investment in infrastructure (i.e. soft policies of providing information) by making travellers more aware to the outcomes of their travel options, provided that attractive alternatives exist. Thus, a vital function of the reward appears to be to trigger experimentation, leading to belief updating, change of attitude toward travel options and eventually behavioural change. This further explains previous findings from Spitsmijden 1 suggesting that (in retrospect) self-experimentation supported the change of behaviour (15).

Another result is confirming earlier quantitative studies, that to most parts, minor behavioural changes were required to earn the reward. Thus participants were more likely to choose departure times closer to their original ones. One way of interpreting this was in terms of effort perception. The interviews suggest that there is also a likely relationship between belief modification and the effort required for the behavioural change. If the new behaviour requires only a minor modification of the current behaviour one is more likely to explore this option and change ones beliefs which will support a behavioural change. Furthermore, in line with TIB, the results indicate that habit plays a role in travel decision making. Some participants indicate that they had become increasingly aware of congestion worsening and longer travel times, but apparently habit prohibited them from acting upon it. For those, the reward served as a trigger to reconsider their options at a more active level. This led them to modify their beliefs about the outcomes of travel options, change their attitude toward the options and eventually change their behaviour. Once behaviour changes, a new habit kicks in, for some, who establish a new behavioural pattern that is consequently sustained and internalized.

Regarding support measures applied by certain participants, most prominently mentioned is the use of travel information to optimize travel choice. Flexibles unlike Stabilisers, whom establish a new habit, seek to optimize in terms of travel time, arrival time etc. per day. Stated in TPB terms, the support measures help them to have better control (i.e. certainty) over the outcome of their choices and select the optimal one. This outcome is in line with an earlier study (15), who found that participants with a higher availability and frequency of using traffic information display more flexible behaviour.

The interviews did not reveal clear instances of social norms affecting behaviour as suggested by NAT (19). Although our participants state explicitly that behaviour of colleagues or friends did not affect their decision to participate, personal norm seems to play a role for some. In particular, mentioning of reasons such as contributing to research into peak traffic, helping to reduce congestion, etc. Similar considerations for participation were mentioned by (16).

Taking this all together, leads to the following figurative model of behavioural change (see Figure 1). For all interviewed participants, the reward encourages them to be involved in the program and to make them reflect on their current behaviour and travel options. In effect this comes down to breaking their habit. After an exploration phase, participants identify one or multiple preferred options. If these options have intrinsic advantages (apart from earning the reward), beliefs and attitudes about the alternatives and behaviour are updated, as suggested by TPB and reinforcement learning theories. Depending on decision making styles, some will determine a single preferred travel option which is repeatedly chosen and thus develop a new habit. Others will aim to optimize their travel each day, depending on the specific situation. They will use traffic information as a supportive measure, thereby

increasing their degree of control over the outcome of their choice. If the new choice option is inferior to the behaviour before reward (i.e., the reward is the only motivation for behavioural change), beliefs and attitudes are not updated in a positive sense, and the new behaviour is not reinforced. For some, personal norms regarding desirability to contribute to research and insight into reduction of congestion may serve as an additional factor contributing to behavioural change. A note that needs to be made is that this behavioural model is based on a selective sample of respondents suggesting that the above model describes the behaviour of the more responsive participants in the program.

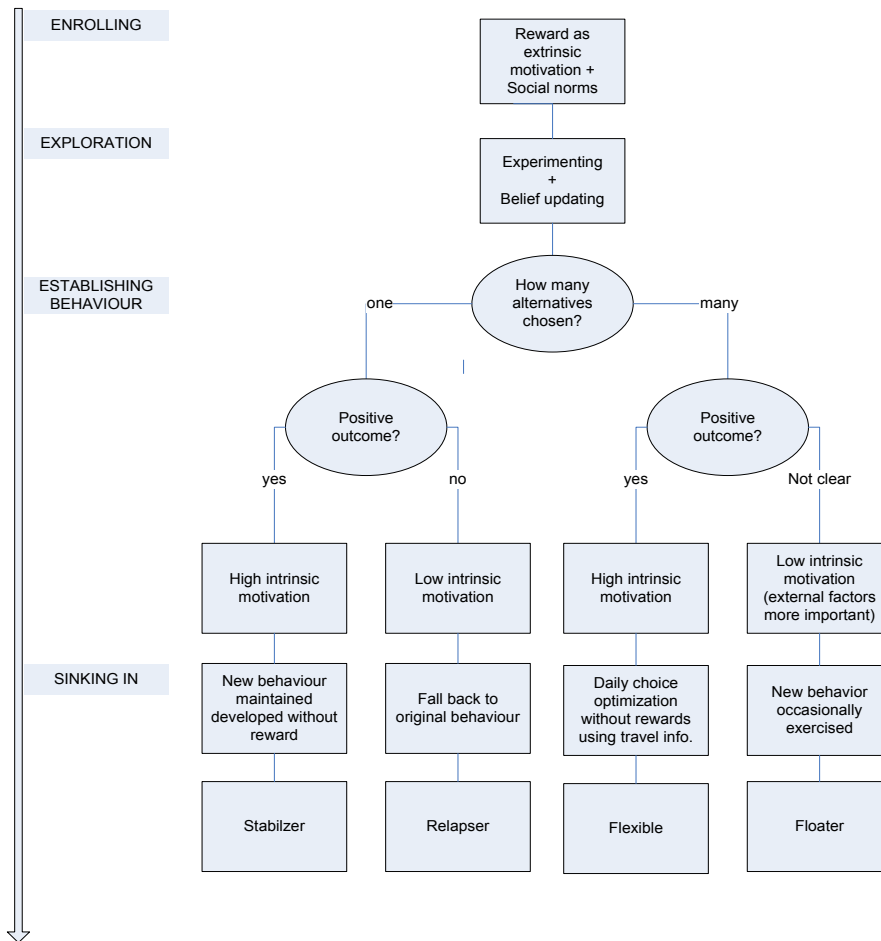


FIGURE 1: Behavioural adaptation processes

On a methodological level, this study constitutes an interesting opportunity to learn about the added value of qualitative research when investigating processes of behavioural change. Whereas with the quantitative analysis, beforehand, we obtained substantial indications and associations related to the change of behaviour, the nature of the behavioural change process was only further elucidated following the analysis of the interviews. Furthermore, the interviews have allowed us to distinguish various phases (such as enrolment, exploration, sinking in) and motivations during these phases (monetary reward, impact on daily schedules, etc.). An additional advantage is that when focusing on the process, it is possible to identify typical patterns of behaviour in responding to the reward allowing for a more complete description of behaviour as well as acknowledging the apparent heterogeneity in typical response patterns. Thus the use of qualitative techniques is very

helpful in obtaining more complete and richer descriptions of behavioural processes than would be possible using solely quantitative techniques. Clearly, this application logically follows up on quantitative studies that were carried out previously, and lead to a set of focused research questions. As such this study can be regarded as an exemplary application involving a 'mixed methods' approach. A final note concerns the sampling procedure. Sampling based on quantitative data is, in our view, an advisable approach as it allows to link qualitative to quantitative outcomes. In our case it suggests that the identified behavioural patterns are found for more motivated participants, whereas for other participants this might be different and require additional research (e.g. reasons behind dropping-out). This might have gone unnoticed if we would have applied a simplified random sampling amongst all participants.

With respect to policy implications, we note that the effect of the reward turns out to be different than expected. Instead of being the main motivator of behaviour throughout the project, it serves to trigger reflection and finding better choice options. This warrants the question how rewards are best applied. If the main effect is to trigger reflecting, they could be applied for a shorter period and at more locations. In this way the effect will be more durable and cost effectiveness would be increased, by aiming for intrinsically supported behaviour changes. In this way, rewards play a similar role as providing information in so called soft policies (e.g. 34) i.e. breaking people's habit and leading them to make conscious travel decisions.

Notwithstanding the valuable outcomes, further research is required to clear up some unresolved issues. First, a remaining issue is how the rewards affect motivations and awareness of participants who do not strongly respond to the reward but still decided to enrol in a programme such as Spitsmijden. This would require additional interviews with this group which has been missing in this study. Second, it would be interesting to use the classifications obtained from the interviews as a base for further quantitative analyses, e.g. by carrying out cluster analyses on day-by-day peak avoidance data that is available and relating these clusters to socio-demographic data. The possibility to use structural equations modelling for better understanding of the behavioural processes involved is also worth considering.

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APPENDIX - TOPIC LIST

INTRODUCTION

The nature of the interview is to gather information on your experiences in the course of Spitsmijden. The information you will provide will allow us to better understand the behaviour of travellers participating in the program and for improving it in the next phases of implementation.

RECRUITMENT PHASE

Could you tell me how you became involved in the Spitsmijden research project?

- How did you know about it? Form where / who did you receive the information?
- Are there other members of the family who participated / who did not participate? Was this influential in the decision?
- Nature of decision: individual or family? Easy or difficult?
- What was decisive in deciding to participate?
- Did you involve your workplace in your decision? How did they react? Were they supportive? In what ways?

EXPERIENCES IN THE COURSE OF THE PROGRAM

What are your experiences until now?

- How does it work out for you? Difficulties?
- Could you tell me about the days in an ordinary week?
- Nature of decisions: schedule the week or daily basis? Individual or family? Other?
- How long are you participating? Do you like it? Has this changed in any respect?
- Any other experiences that you think of as relevant?
- If you stopped participating - Why?

MOTIVATIONS AND STIMULI

For you, what mainly influences to drive or avoid the morning peak?

- Stimuli to avoid (complete!)
- Constraints to avoid (complete!)
- Have any changes taken place since you joined the program? What kind of changes?
- Do you use any support measures to guide your decision? What kind of measures? (Explanation).
- Do you use traffic information in your travel decisions? Has this changed as a consequence of participating in the program? In what ways?
- Has the project influenced your awareness of travelling decisions? In what way? How did this come about?
- Were there any decisive events in the period that you are participating? What kind of moments/events?

EFFECT OF THE REWARD

In the program you are rewarded for avoiding the morning peak. Is that important for you?

- Have you used the reward? In what way?

- Was the reward important for your decision to participate? Is it equally important now or has its worth diminished? How come?
- What about other factors (complete?) Are they more important now or less important?
- What will you do if the project ends and the reward stops? Awareness? Behaviour? Other?
- How did you go about gaining with the reward? Did you have a favourite option (before/after the peak / public transport / work at home)? Did you have other options? When were they chosen? Was this different before you started? Has this changed in the course of the program? How?

EVALUATION

If you were to evaluate the Spitsmijden project, how would you do that?

- In your opinion, what is important for people in terms of travel decisions?
- What did you like about the program? What would you definitely change?
- If you were to decide now on participation, what would you choose? Why?