Determinants of the effectiveness of travel feedback programs—a review of communicative mobility management measures for changing travel behaviour in Japan

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Abstract

This paper reviews the literature on travel feedback programs (TFPs). These constitute soft measures designed to change travel behaviour, mainly from automobile to non-automobile travel, in mobility management. We classified TFPs according to place, technique, procedure, and communication media, and reviewed the effectiveness of 10 TFPs in Japan. We found that TFPs in Japan reduced CO₂ emissions by about 19% and car use by about 18%, while increasing the use of public transport by about 50%. In addition, we found that TFP effectiveness increased when participants were asked to make behavioural plans to change their travel behaviour.

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1. Introduction

Automobile use has many negative social consequences such as air pollution, traffic congestion, land use patterns with reduced accessibility, and a reduction in the number of rail and bus users, which may in turn lead to discontinued rail or bus services. Consequently, transportation planners in Europe, Australia, and Japan recognise the importance of changing individual travel behaviour from automobile use to modes of transportation such as buses, trains, bicycles, or walking. Mobility management offers a viable, effective transportation measure that is expected to solve transportation and traffic problems. Mobility management focuses on attempting to change travel behaviour using communication; it also aims to manage transportation and traffic systems.

The communicative measures mobility management uses for travel behaviour modification are called “soft measures” (c.f., Jones, 2003) or “psychological and behavioural strategies” (c.f., Fujii, 2003b; Taniguchi et al., 2003); they include the provision of specific information on public transport, travel campaigns, and travel education. A travel behaviour study (c.f., Fujii and Gärling, in press) indicated that personalised communication, which is one type of mobility management measure, is more effective in changing travel behaviour than non-personalised mass communications. Examples of personalised communication include individualised marketing (Brög, 1998), travel blending (Ampt and Rooney, 1999; Rose and Ampt, 2001; Taylor and Ampt, 2003), personalised travel plans (Department for Transport, UK, 2004a,b), and other personalised communication, such as that implemented in Sapporo (Taniguchi et al., 2003). Here, we refer to forms of personalised communication aimed at changing travel behaviour from car use to non-auto transport (such as public transport, bicycles, or walking) as travel feedback programs (TFPs), a term used by Fujii and Taniguchi (2005).

The TFPs mentioned above differ in many ways, but all share a common feature: the participants in each program receive information designed to modify behaviour. Such feedback may be effective because it induces behavioural awareness, an essential element in modification (Dahlstrand and Biel, 1997). This feedback may also prompt participants to increase their knowledge of specific methods...
for modifying their travel behaviour (Verplanken et al., 1997).

A review of TFP effects previously implemented by the Department for Transport, UK (2004a) reported that “individualised marketing” TFPs implemented in several cities in Australia, Germany, Sweden, and the United States, produced a reduction in car use up to 14% (South Perth, Australia), and at least 2% (Breisgau-Hochschwartzwald, Germany). The review also indicated that “travel blending” TFPs implemented in Australia and the United States produced a reduction in car use up to 15% (Adelaide, Australia) and at least 9% (Brisbane, Australia). The Department for Transport, UK (2004a) reported that TFPs implemented in UK cities such as Gloucester, Bristol, and Nottingham had reduced car trips by 7–15% in urban areas, and by 2–6% in rural areas.

Transport for London implemented four different pilot TFPs, called “personalised journey planning” under the brand name TravelOptions, which reduced car use by 5–11% (Transport for London, 2004).

The Department for Transport, UK (2004a, b) also indicated that TFP effectiveness was dependent on location (urban vs. rural areas) and types of TFP techniques (such as “individualised marketing” or “travel blending”). Making effective TFPs requires collecting not only this sort of information, but also information about what determines rates of effectiveness in terms of behavioural change. For this purpose, this paper reviews reported TFPs to evaluate their effectiveness, while considering their type and the situations in which they were implemented.

2. Types of travel feedback programs

Before reviewing examples of TFPs, we describe parameters that may be useful for classifying TFPs: locations, techniques for travel behavioural change, procedures, and communication media.

2.1. Location

TFPs can be implemented in three basic settings: schools, workplaces, and residential areas. The targets of TFPs implemented in residential areas are household members. Examples of this target type can be found in Ampt and Rooney (1999); Brög (1998), the Department of Transport, Western Australia (2000); Rose and Ampt (2001); Taniguchi et al. (2003), and the Department for Transport, UK (2004a, b). In such cases, all daily car use behaviour can constitute a target of the program.

For TFPs implemented in the workplace, the target individuals are office workers and the main target behaviour is commuting travel. Such TFPs can also target all car use. Examples of this type of TFP have been implemented in Toyonaka (Daito et al., 2004) and Kanazawa (Hashimoto et al., 2002), Japan.

Finally, for TFPs in schools, the target individuals include students and the students’ families. Again, the target behaviour is all daily car use. Commuting travel to school can also be targeted. Examples have been reported in Taniguchi et al. (2002, 2003) and Fujii and Taniguchi (2005).

In each location, TFPs have multiple objectives. The objectives of TFPs in residential areas may be to solve transportation problems in those areas, such as traffic congestion and air pollution, while promoting public transport. The objectives of TFPs in workplaces may be to solve similar transportation problems, and more specifically, those that arise from commuting. Likewise, the objectives of TFPs in schools may be to solve similar transportation problems near the school. Another important objective of TFPs in schools is education with respect to the consequences of individual travel behaviours: environmental problems, traffic congestion, and the level of public transportation service. Classes that instruct the public about the relationship between individual travel behaviours and a number of social problems can help to educate people about socially desirable behaviour in our society (c.f., Fujii, 2003a). For this reason, since 2004, transport and education departments have funded a “school travel plan” program for all elementary and junior high schools in England (Department for Transport, UK, 2004a).

2.2. Techniques for changing travel behaviour

TFPs use many techniques to change travel behaviour. These techniques differ in three main ways, based on the following issues: Do they motivate travel behaviour change?; Do they request a plan for changing travel behaviour?; Do they provide individualised information?

Individualised marketing is a type of TFP without motivational support (Brög, 1998), while travel blending includes such support (Ampt and Rooney, 1999; Rose and Ampt, 2001). In one individualised marketing program, participants were asked whether they intended to change their travel behaviour, but received no messages aimed at motivating them to change their behaviour. Participants who intended to change their behaviour were then asked what type of information would be necessary in order to prompt a behavioural change. This type of TFP program was implemented in 2002 in Bristol and London, UK (Department for Transport, UK, 2004a, b). By contrast, participants in a travel-blending program received a booklet describing why an individual’s travel behaviour is important; this booklet was written to motivate participants to change their travel behaviours. Participants also received a booklet describing how they could change their travel behaviour. A TFP implemented in Sapporo, Japan is one example of a program that supports motivation in this manner (Taniguchi et al., 2003).

A TFP that involves planning includes a request that participants make plans with a view to changing their
travel behaviour. Fujii and Taniguchi (2005) proposed a TFP that required participants to devise a behavioural plan for changing their travel behaviour; this was implemented in Hyogo Prefecture (Doi et al., 2004), Suita (Matsumura et al., 2003), and Obihiro (Taniguchi et al., 2005), Japan. A social psychological study on how behavioural intentions are actually implemented indicated that requesting a behavioural plan has a strong effect on actual behavioural change (Gollwitzer and Brandstätter, 1997; Gärling and Fujii, 2002; Fujii, 2005; Fujii and Taniguchi, 2005). Fig. 1 shows the social psychological theory of the process of behavioural change (Gärling and Fujii, 2002; Fujii, 2005).

As the figure indicates, behavioural intention is actually implemented only when implementation intention (Gollwitzer and Brandstätter, 1997) is formed. A behavioural intention (or goal intention) specifies a behaviour that people intend to perform; an implementation intention, however, entails a plan for when, where, and how to implement the target behaviour. Furthermore, Rise et al. (2000) and Fujii (2005) indicated that participants with an implementation intention are more strongly committed to implementing target behaviour than those with only a behavioural intention. Because an implementation intention is formed as a result of making a behavioural plan, requesting a behavioural plan has a strong effect on actual behavioural change. In fact, Fujii and Taniguchi (2005) showed that a TFP with a behavioural plan had a significantly greater behaviour-changing effect than a TFP without a behavioural plan.

The final issue is whether the TFP provides individualised information; e.g., both travel blending and individualised marketing provide individualised information. In one travel-blending program (Ampt and Rooney, 1999; Rose and Ampt, 2001), participants received individualised advice deemed helpful for changing travel behaviour. These comments were based on a 1-week travel diary provided by the participants. The TFPs reported in Fujii and Taniguchi (2005); Hashimoto et al. (2002); Matsumura et al. (2003), and Taniguchi et al. (2002, 2003) provided similar individualised information to participants. In one individualised marketing program (Brög, 1998), participants received information that they had requested previously. TFPs in the United Kingdom followed a similar procedure (Department for Transport, UK, 2004a, b).

In contrast, a simple TFP implemented in Obihiro, Japan provided participants with non-individualised information on how to use bus service, and requested that they make a behavioural plan on how to use the bus (Taniguchi et al., 2005). Although an important TFP characteristic is that it usually provides individualised information, this is not always necessary if the TFP includes a request that participants devise a behavioural plan. This TFP without individualised information actually had a strong effect (about a 100% increase in the frequency of bus use; see Taniguchi et al., 2005). Still, providing individualised information would be preferable even in a TFP requesting a behavioural plan (c.f., Fujii and Gärling, in press).

2.3. Procedure

TFP procedures differ; e.g., individualised marketing involves two or three contacts to conduct a simple survey on behaviour and the intention to change behaviour, give individualised information, and provide further individualised information if necessary (Brög, 1998).

Travel blending involves four contacts (Ampt and Rooney, 1999; Rose and Ampt, 2001) to provide information to motivate a behaviour change and conduct a travel diary survey, provide individualised comments, conduct a travel diary survey, and provide additional individualised comments.

The TFP reported in Fujii and Taniguchi (2005) involved four contacts to conduct a questionnaire survey about travel behaviour, request a behavioural plan on how to change travel behaviour, conduct a simple survey on travel behaviour, and provide individualised information about the travel behaviour change measured by means of two surveys. In the TFP implemented in Hyogo Prefecture (Doi et al., 2004), some participants were contacted twice, once to conduct a questionnaire survey about travel behaviour, and again to request a behavioural plan on how to change travel behaviour.

The simplest TFP includes a single step. TFPs in Obihiro (Taniguchi et al., 2005) and Suita (Matsumura, 2004), Japan provided participants with a single questionnaire and non-individualised information. The questionnaire included a request that participants formulate a behavioural plan on how to change their travel behaviour.

2.4. Communication media

Forms of communication used in TFPs include face-to-face communication, regular mail, telephone, and e-mail. For example, in individualised marketing (Brög, 1998), the first contact is usually via telephone, and communicators often visit target households for the second contact. The TFP implemented in Hyogo Prefecture (Doi et al., 2004) used mail for all communication. In a TFP implemented in workplaces in Toyonaka (Daito et al., 2004), the first contact involved face-to-face communication in a group briefing, and subsequent communication was done via e-mail and an Internet Web site.

3. Effectiveness of TFPs

To investigate the determinants of TFP effectiveness, we focussed on Japanese cases; investigating the effects of different types of TFPs on travel behaviour using cases from one country avoided the problems due to cultural differences. Figs. 1–3 summarise the effects that TFPs reported in previous studies had on CO₂ reduction, car use reduction, and public transport use increase, respectively.
Hashimoto et al., 2002; Taniguchi et al., 2002, 2003, 2005; Matsumura et al., 2003; Daito et al., 2004; Doi et al., 2004; Matsumura, 2004; Fujii and Taniguchi, 2005). Tables 1–3 show the details for residential areas, workplaces, and schools, respectively. The tables summarise each city and year, main objective, techniques, procedure, communication media, effects, and existence of a control group for each TFP. TFP effectiveness was reported in different ways: some programs reported a reduction in the distances cars were used or CO2 emissions; others reported increased use of public transport. These differences were due to differences in each TFP’s main objectives. Note that only some studies included a control group.

3.1. Effects of TFPs on CO2 emissions and car use

Studies done in Sapporo, Ebetsu, Osaka, and Izumi indicated that changes in travel behaviour reduced CO2 emissions by 15–35%, as shown in Fig. 2. The most effective reduction, about 35%, occurred in Sapporo in 2002 (Fujii and Taniguchi, 2005). This reduction was brought about by a group of participants requested to make a behavioural plan. Similar results were exhibited by a group in Osaka (2001), who received individualised information based on their 7-day travel diaries (Matsumura et al., 2003). A TFP conducted in Sapporo in 2002 that did not involve behavioural planning, resulted in no CO2 reduction (Fujii and Taniguchi, 2005), although the authors argued that the absence of a control group prevented knowing whether the TFP mitigated a possible increase in CO2 emissions. Including this case, TFPs had a 19% unweighted mean average effectiveness in reducing CO2 emissions arising from changed travel behaviour (SD = 11%). The Sapporo (2002) results indicated that requesting a behavioural plan had a major effect in reducing CO2 emissions (35% vs. no reduction, for TFPs with and without a behavioural plan, respectively).

Matsumura et al. (2003) reported that the CO2 reduction resulting from a TFP with individualised information differed based on the length of the travel diary survey. The 2001 Osaka TFP resulted in different rates of reduction according to whether 1- or 7-day travel diary surveys were used (20% vs. 35%, respectively). This indicates that individualised comments based on more travel data were more effective with respect to travel behaviour modification. Nevertheless, even a 1-day travel diary was sufficient to reduce CO2 emissions.

Three cases reported a reduction in car use: Kawanishi/Inagawa, Kanazawa, and Osaka, as shown in Fig. 3. The least effective was the Kanazawa TFP (Hashimoto et al., 2002), although there was no control group, as with Sapporo. The greatest results were exhibited during the Kawanishi/Inagawa TFP; car use decreased by about 25% as a result of the TFP, which requested that participants make a behavioural plan (Doi et al., 2004). The unweighted mean average car use reduction in these three cases was 18% (SD = 12%).

3.2. Effect on non-auto transport use

Increased public transport use was reported for Suita, Kanazawa, and Obihiro, and averaged 51% (SD = 36%), as shown in Fig. 4. While the main objective of the study in Kanazawa was to reduce car use, the main objective of the other studies was to promote public transport. The TFPs in
### Table 1
Summary of residential area TFPs implemented in Japan

<table>
<thead>
<tr>
<th>City (year)</th>
<th>Target</th>
<th>Main objective</th>
<th>Techniques</th>
<th>Procedure and communication media</th>
<th>Effect</th>
<th>Control group</th>
</tr>
</thead>
</table>
| Sapporo and Ebetsu (2000) | ca. 200 HHs | CO₂ reduction                          | (a) Motivation  
(b) No plan  
(c) Provide individualised information | (1) Travel diary survey with leaflet for motivation (mail)  
(2) Provide personalised comments (mail)  
(3) Travel diary survey (mail)  
(4) Provide personalised comments (mail) | ca. 15% reduction in CO₂ | No |
| Osaka (2001)        | ca. 100 HHs  | Reduce car use                         | (a) Motivation  
(b) No plan  
(c) Provide individualised information | (1) Travel diary survey with leaflet for motivation (mail)  
(2) Provide personalised comments (mail)  
(3) Travel diary survey (mail)  
(4) Provide personalised comments (mail) | ca. 35% reduction in CO₂ (with 1-week travel diary), and  
ca. 20% reduction in CO₂ (with 1-day travel diary) | Yes |
| Suita (2002)        | ca. 500 persons | Promote PT                            | (a) No motivation  
(b) Plan  
(c) Provide non-individualised information | (1) Provide non-personalised information on bus use with or without requesting a behavioural plan on how to use PT (mail) | Bus use frequency increase:  
- 0% for frequent bus users  
- ca. 25% for non-bus users no behavioural plan  
- ca. 60% for non-bus users with a behavioural plan  
- ca. 50% for new residents no behavioural plan  
- ca. 90% for new residents with a behavioural plan | No |
| Kawanishi/Inagawa (2003) | ca. 700 persons | Reduce car use and promote PT         | (a) Motivation  
(b) Plan  
(c) Provide individualised information | (1) Questionnaire survey (mail)  
(2) Request a behavioural plan on how to change travel behaviour with personalised information on PT use (mail)  
(3) Repeat first questionnaire survey (mail)  
(4) Provide personalised comments (mail) | ca. 15% reduction in car use (2 steps, for PT users)  
ca. 25% reduction in car use (4 steps, for PT users)  
ca. 40% reduction in car use (4 steps and incentives to use PT, for non-PT users) [the average reduction in car use was ca. 25%] | Yes |
| Obhiro (2003)       | ca. 15,000 HHs | Promote PT                             | (a) No motivation  
(b) Plan  
(c) Provide non-individualised information | (1) Request behavioural plan on how to use PT with non-personalised information on bus use (mail) | ca. 100% increase in bus use | Yes |

1Taniguchi et al. (2003); 2Matsumura et al. (2003); 3Matsumura (2004); 4Doi et al. (2004); 5Taniguchi et al. (2005).

HHs: households; PT: public transport.
the latter two studies produced a considerable increase in public transport use. The greatest increase was in Obihiro (about 100%). In this case, the TFP included a request to construct a behavioural plan on how to use public transport.

Matsumura (2004) found that two factors influenced the effectiveness of the Suita TFP: whether the residents were new or old (43% vs. 70% increase in public transport use, respectively), and whether the TFP included a behavioural plan (38% without a behavioural plan vs. 75% with a plan). The TFP was more effective when it targeted new residents and requested that participants make a behavioural plan on how to use public transport.

4. Discussion

This section reviews the literature on Japanese TFPs, i.e., soft measures or psychological and behavioural strategies for changing travel behaviour from automobile to non-automobile use.

4.1. Overall effectiveness

We classified TFPs by location, technique, procedure, and communication media. The 10 TFPs implemented in Japan resulted in a 19% reduction in CO₂ emissions, an 18% reduction in car use, and a 50% increase in public transport use. Since previous TFPs implemented in Australia, the United Kingdom, Germany, and the United States reduced car use by 2–15%, and increased public transport use by 10–44%, it is likely that TFPs in Japan do not produce results substantially different from those reported in other developed countries (Brög, 1998; Ampt and Rooney, 1999; Rose and Ampt, 2001; Jones, 2003; Department for Transport, UK, 2004a, b; Transport for London, 2004).

Although most studies reported overall effectiveness one or a few months after the TFPs intervention, some reported long-term TFP effects. Matsumura found that rates of bus use remained equally high even 1 year after the 2002 Suita TFP implementation (Matsumura, 2004). Taniguchi et al. (2003) found that participants in a 2001 Sapporo TFP still significantly reduced their car use 1 year after the TFP ended, and Someya and Fujii (2005) also found statistically significant long-term effects of a TFP conducted in Kawanishi/Inagawa in 2003. These results imply that TFPs appear to be able to change travel behaviour over the long term.

Some researchers have ascribed all the TFP effectiveness to the possibility that TFP participants were mainly “aspiring environmentalists” (Anable, 2005) who were already very likely to give up their cars. However, this is unlikely because TFPs that were able to successfully involve all of the contacted households (i.e., the Sapporo TFPs in 2000 and 2002) had similar effects to other TFPs.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Summary of workplace TFPs implemented in Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>City (year)</strong></td>
<td><strong>Target</strong></td>
</tr>
<tr>
<td>1</td>
<td>Kanazawa (2001) ca. 50 HHs (100 persons) working in 10 companies</td>
</tr>
<tr>
<td>2</td>
<td>Toyonaka (2003) 100 workers in one company</td>
</tr>
<tr>
<td><strong>Main objective</strong></td>
<td><strong>Techniques</strong></td>
</tr>
<tr>
<td>Reduce car use</td>
<td>(a) Motivation (b) No plan (c) Provide personalised information</td>
</tr>
<tr>
<td>Reduce car use</td>
<td>(a) Motivation (b) Plan (c) Provide non-personalised information</td>
</tr>
<tr>
<td><strong>Effect</strong></td>
<td><strong>Procedure and communication media</strong></td>
</tr>
<tr>
<td>ca. 30% increase in bus use, 50% increase in bicycle use, and no reduction in car use.</td>
<td>(1) Travel diary survey with by hand) (2) Provide personalised comments (mail, by hand) (3) Travel diary survey (mail, by hand) (4) Provide personalised comments (mail, by hand)</td>
</tr>
<tr>
<td>ca. 10 % reduction in car use</td>
<td>(1) Questionnaire survey (e-mail) (2) Request a behavioural plan on to change travel behaviour (e-mail)</td>
</tr>
</tbody>
</table>

| Control group | No |
| No | No |

Hashimoto et al. (2002); Daito et al. (2004). | PT: public transport.
Table 3
Summary of school TFPs implemented in Japan

<table>
<thead>
<tr>
<th>City (year)</th>
<th>Target</th>
<th>Main objective</th>
<th>Techniques</th>
<th>Procedure and communication media</th>
<th>Effect</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sapporo (2000)</td>
<td>150 school students (5th grade) in an elementary school in Sapporo and their families.</td>
<td>CO₂ reduction and environmental education</td>
<td>(a) Motivation (b) No plan (c) Provide individualised information</td>
<td>(1) Travel survey with a class for motivation (in class) (2) Provide personalised comments (in class) (3) Travel diary survey (in class) (4) Provide personalised comments (in class)</td>
<td>ca. 15% reduction in CO₂</td>
<td>No</td>
</tr>
<tr>
<td>2 Sapporo (2002)</td>
<td>130 school students (5th grade) in an elementary school in Sapporo and their families.</td>
<td>CO₂ reduction and environmental education</td>
<td>(a) Motivation (b) No plan (c) Provide individualised information</td>
<td>(1) Travel survey with a class for motivation (in class) (2) Provide personalised comments or request a behavioural plan (in class) (3) Travel diary survey (in class) (4) Provide personalised comments (in class)</td>
<td>ca. 35% reduction in CO₂ with a behavioural plan, no reduction without a behavioural plan</td>
<td>No</td>
</tr>
<tr>
<td>3 Izumi (2002)</td>
<td>200 school students (5th grade) in two elementary schools in Izumi and their families.</td>
<td>CO₂ reduction and environmental education</td>
<td>(a) Motivation (b) No plan (c) Provide individualised information</td>
<td>(1) Travel survey with a class for motivation (in class) (2) Request behavioural plan (in class) (3) Travel diary survey (in class) (4) Provide personalised comments (in class)</td>
<td>ca. 15% reduction in CO₂</td>
<td>No</td>
</tr>
</tbody>
</table>

¹Taniguchi et al. (2002, 2003); ²Fuji and Taniguchi (2005); ³Kinki Transport Agency (2004).
HHs: households; PT: public transport.
4.2. Importance of requesting a behavioural plan

Although the TFP cases in Japan are too few to allow thorough investigation of all the factors that determine TFP effectiveness, our review indicates that requesting a behavioural plan is a determinant of the effectiveness of a TFP. TFPs with behavioural plans yielded the greatest reduction in CO\(_2\) (35% reduction in Sapporo; Fujii and Taniguchi, 2005), the greatest reduction in car use (25% reduction in Kawanishi/Inagawa; Doi et al., 2004), and the greatest increase in public transport use (100% increase in Obihiro; Taniguchi et al., 2005).

The least effective TFP with a behavioural plan was in Toyonaka; Daito et al. (2004) reported that car use was only reduced by about 10%. This TFP differed from others with a behavioural plan in that the Toyonaka TFP used only e-mail and a Web page for communication. Internet communication may have a lesser influence on participants’ travel behaviour than other modes of communication such as face-to-face interviews and mail.

These review results imply that requesting a behavioural plan, first proposed in experimental TFPs implemented in Sapporo during 2002 (Fujii and Taniguchi, 2005), likely increases the effectiveness of a TFP in changing travel behaviour. At least three comparative analyses between TFPs with and without behavioural plans support this view; two of these comparative analyses resulted from a case implemented in Suita during 2002 (Matsumura, 2004). Results of that study indicated that a TFP with a behavioural plan caused a greater increase in public transport than ones without a behavioural plan, both for non-bus users (25% vs. 60% increase in public transport use) and for new residents (50% vs. 90% increase in public transport use). These comparative analyses were made between TFPs with and without a behavioural plan; both TFPs provided the same kind of individualised information to participants, and the only difference was whether or not a behavioural plan was included. Therefore, the results indicate that requesting a behavioural plan had an additional effect on changing travel behaviour.

Another direct test of behavioural plan effectiveness was found in a case implemented in Sapporo during 2002 (Fujii and Taniguchi, 2005). In this case, a TFP with a behavioural plan but without individualised advice (a behavioural-plan TFP) was compared to a TFP with individualised advice but without a behavioural plan (an individualised-advice TFP). The result was that the behavioural-plan TFP had a substantially greater effect on reducing CO\(_2\) emissions than the individualised-advice TFP.

These results imply that requesting a behavioural plan is a promising technique for increasing TFP effectiveness in changing travel behaviour. However, we cannot conclude that TFPs with behavioural plans are always more effective than TFPs without behavioural plans. TFPs that lack a behavioural plan but, e.g., provide further detailed individualised advice such as ones used in personalised journey planners (c.f., Department for Transport, UK, 2004a, b) may be as effective as TFPs with behavioural plans. It is likely that TFP effectiveness is dependent on the quality of information provided, as summarised below.

4.3. Quality of information provided

The quality of information provided to participants was an important factor in determining the effectiveness of a TFP. Matsumura (2004) found that individualised information based on a 7-day travel diary was more effective than that based on a 1-day travel diary, suggesting that high-quality information is more effective than low-quality information in establishing behavioural change.

However, our analysis cannot clearly determine the effects of non-individualised vs. individualised information because only one TFP provided non-individualised information (Obihiro in 2003). This TFP was very effective (100% increase in Obihiro bus use). From a cognitive psychological perspective, individualised information should be more effective, since it minimises the cognitive cost (c.f., Gärling et al., 2001) of searching for information that facilitates a behavioural change. The Obihiro data indicate that although individualised information may help with a behaviour change, it may not be always necessary for a behaviour change, at least when participants are requested to create a behavioural plan.

4.4. Target

The effectiveness of a TFP may be dependent on its targets, but to date the differences between workplace, residential area, and school targets seem to be unclear. One study about the 2002 Suita TFPs implemented by Matsumura (2004) indicated that a difference in targets has an impact. The study found that TFPs might be more effective in promoting public transport in non-frequent public transport users than in frequent public transport users.
users. This supports a finding by Fujii and Gärling (2003), who reported that once infrequent riders had experienced public transport, they used public transport more than the frequent users. In addition, results from the 2002 Suita TFP indicated that TFPs were more effective in promoting public transport use for new residents than for old residents; new residents were less likely to develop travel behaviour habits (c.f., Fujii and Gärling, 2003) that could impede change in travel behaviour resulting from TFPs.

4.5. Concluding remarks

Because we only reviewed 10 TFPs, we are not able to determine all the important determinants of TFP effectiveness. Nevertheless, we found that if a TFP required participants to create a behavioural plan for their travel behaviour, it resulted in a dramatic increase in TFP effectiveness in terms of behaviour change. In addition, we found that individualised advice based on richer information tended to be more effective, and TFPs may be more effective for new residents. TFPs may also be more effective in promoting public transport for non-riders than for frequent riders.

Importantly, we found that TFPs are effective soft measures for promoting travel behaviour change in a non-Western country, i.e., Japan. Furthermore, the effects of TFPs in Japan did not differ from effects found in Western countries; soft transportation measures based on communication programs, such as TFPs, appear to be effective not only in Western countries, but also in other cultures. To demonstrate the effectiveness of soft transportation measures, more case studies will need to be conducted worldwide.

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