



Delivery Report for

MeBeSafe

Measures for behaving safely in traffic

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Abstract

This deliverable describes the coaching interventions developed for heavy goods vehicle (HGV) and car drivers in WP4 of MeBeSafe. Coaching is usually defined as a developmental and educational relationship between people (i.e. offline coaching), but has been extended in this work to guidance delivered by technical systems (i.e. online coaching). The aim of the coaching implemented in WP4 is to effect a change towards safer driver behaviour.

For HGV drivers, the report includes brief descriptions of the coaching support functions in the DriveMate app, principles applied for the coaching scheme, and behavioural techniques taught to the drivers. Furthermore, one section describes possible future development of the app and associated coaching, including functions for goal setting, driver input, positive feedback, etc.

For car drivers, the report includes an overview of the reasons underlying the chosen approach toward coaching in the context of increasing the use of Active Cruise Control (ACC) in privately owned vehicles, principles applied for the coaching scheme, and the resulting implementation that will be used during the field trials.



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Acronyms / Terminology

Coaching	The social/educational interaction between two or more individuals with the aim of improving the coachee's performance in some area of endeavour
DriveMate	The name given to the MeBeSafe truck driver coaching app
Offline coaching	The term used in the MeBeSafe proposal for human interaction for improved driver behaviour
Onboarding	The preparatory information about coaching techniques given to the drivers in the DriveMate app before the actual coaching sessions are started
Online coaching	The term used in the MeBeSafe proposal for the actions of the Drivemate app and Volvo's in-car driver support
Safety topic	A traffic safety theme (like fatigue in driving) for discussion in the truck driver coaching session, suggested by the app to the drivers. Also, the phrase is used for the information contained in the app which is used by the drivers as a basis for discussion
V0	The first version of the Drivemate app delivered to the truck drivers, where no coaching sessions are undertaken. Measurements are made and data gathered, but no information or feedback is given. So-called on-boarding sessions are delivered approximately every two days, eighteen times. Onboarding is in this case short texts about coaching techniques
V1	The first version of the app where coaching is introduced



V2

A more advanced version of the app, with control for road complexity in the feedback and more coaching functions, and possibly with the inclusion of video in various forms

1 Executive Summary

The MeBeSafe system to improve driver behaviour is based on coaching. Coaching is an educational method which aims to improve performance (in sports, work, interpersonal relations etc) by personal interaction between two people.

In this project two coaching systems have been developed. One is aimed at professional heavy goods vehicle (HGV) drivers with the objective to decrease harsh braking events. This is a combination of online (app based) and offline (face-to-face) coaching. The other coaching system is app-based (online coaching) and aimed at (Volvo) personal car drivers with the objective to increase ACC use.

1.1 HGV coaching

The MeBeSafe system to improve coaching for HGV drivers is based on online and offline coaching. For online coaching an app was developed (the DriveMate app; see D4.4). This app measures driving behaviour and gives feedback about driving performance to the drivers. In addition the app gives coaching alerts; indicating when drivers should meet with their partner/colleague for a short, informal, face-to-face coaching session. During this session they can discuss the feedback from their trips, safety topics (suggested by the app), or other topics they feel are worth discussing.

The general routine for setting up the MeBeSafe coaching system at a trucking company is as follows:

- 1) Meet with the drivers, supply them with phones and cradles for mounting the phones on the dashboard and give them an introduction to MeBeSafe, DriveMate, the rules applied, and coaching. Instead of a physical meeting with the drivers, they can also be introduced to the system by viewing a PowerPoint presentation that was developed for this purpose (see Appendix D).
- 2) Baseline measurements are started straight away. The drivers have access to VO of DriveMate, which only records data and presents the onboarding

sessions (coaching instructions, see Appendix A) every second day. Pairs of drivers are decided upon.

- 3) When the onboarding is finished (after about eight weeks), coaching alerts start appearing, and trip summaries are given. The coaching alert contains safety topics (see Appendix B), recorded events and a summary of all the trips since the last coaching session.
- 4) Over time, the time in between coaching sessions will increase to a maximum of six weeks.
- 5) When the safety topics have all been presented, this part of the coaching alert will be discontinued.

In WP4 a great number of ideas and possibilities for the app and coaching were explored, which could not (yet) all be realized in the app that has currently been developed. However, many of the ideas can easily be added to the framework of the existing app (e.g. advanced topic presentation, goal setting features and using video footage for coaching. Some of these features will be added to the app and coaching system in the field test in WP5.

1.2 Coaching for ACC use

For coaching first time ACC usage in MeBeSafe, a Test Drive Prototype App is currently being developed within VCC. The app will be tied to the vehicle ADAS data streams and can thus determine when it is a suitable time to test ACC. The app is integrated in the main infotainment system Sensus, which means that interactions between driver and system can be voice controlled. The basic principle for the ACC use app is that when suitable driving conditions are identified during the drive, the app asks whether the driver would like to try activating ACC. This dialogue can either be scripted to be activated by the system when conditions are fulfilled or to be initiated by the driver when s/he feels the time is right. If the response is affirmative, the app describes which button to press, what information to expect in the Driver Information



Module (DIM) if activation is successful and also instructs the driver to take the foot off the accelerator in order to let ACC regulate speed and distance once a successful activation has been confirmed. The app also talks the driver through how to change the lead vehicle following distance if the driver perceives the current setting to be either too short or too long.



2 Contribution by each Partner

This deliverable was written by Anders af Wåhlberg, with contributions by Norah Neuhaber (section 4.5.13 Driving competencies surveys) and by Mikael Ljung Aust (5. Part 2: Coaching of car drivers in use of ACC).

All other partners in WP4 contributed by giving their feedback on the development of the coaching scheme and reviewing this deliverable. More specifically, Shell contributed with the access to HGV drivers and the development of the DriveMate app (contributions by Cygnify and Cranfield) which is reported in a separate deliverable (D4.4 – App to induce behavioural change). All partners fulfilled their tasks in satisfactory time and quality.

3 Introduction

This report describes the final proposed coaching schemes. It has two distinct parts, both about coaching of drivers. The first part (Chapter 4) reports on an app-based coaching system for Heavy Goods Vehicle (HGV) drivers. This was developed to be generic and applicable to all truck drivers with little effort needed for adaptation to local circumstances. This deliverable describes the part of the app (DriveMate) which is directly relevant for online and offline coaching, without going into any technical details. For such information, interested parties can turn to Deliverable 4.4 – “An App to induce behavioural change” which is the documentation of the actual app.

The second part of the deliverable (Chapter 5) is about coaching personal car drivers to use Adaptive Cruise Control (ACC) more frequently.

The term coaching is used in a rather loose sense in this work. It usually implies an educational relationship between persons (offline coaching), but has in the MeBeSafe project also been applied to targeted information and procedures delivered by technical systems with the aim to change the behaviour of drivers (online coaching).

4 Part 1: Coaching of HGV drivers

4.1 Introduction

4.1.1 Overview

This description of the MeBeSafe truck driver coaching system has two distinct parts; what has been realised and implemented so far (4.1-4.4), and planned and possible developments (4.5). Within Chapter 4, descriptions are given of the problem of truck driver safety, coaching, and the specific system to deliver coaching which has been developed in WP4. Also, the procedure for delivery is briefly described.

Only some of the features identified in the the overall plan for the app and coaching have realised within WP4. However, the features which were not included are still part of the overall system, and can easily be added to the existing platform.

4.1.2 Trucks and truck drivers

The amount of cargo transported around the world is increasing steadily, and so is road transportation. Trucks used for long and short haul transportation are usually safer than passenger vehicles as assessed by the number of crashes per million kilometers travelled, but they are an important reason for the total road crash death toll (FMCSA, 2018). This is because they are involved in a large share of severe crashes (Chang & Mannering, 1999), due to their sturdiness and size (Khorashadi, Niemeier, Shankar & Mannering, 2005; Scott & O'Day, 1971; Wolfe & Carsten, 1982).

Truck drivers tend to be highly experienced (Maycock, 1997), although turnover is very high in some countries (>100%/year in some studies; Min & Lambert, 2002)). They are usually solitary workers with great responsibility and stressful work situations (de Croon, Sluiter, Blonk, Broersen & Frings-Dresen, 2004). Also, the lack of physical exercise on the job makes them vulnerable to becoming overweight (Anderson et al., 2012) and having various other life-style-related medical conditions (Apostolopoulos, Sönmez & Shattell, 2010).

4.1.3 Coaching

Coaching is an educational method which aims to improve performance (in sports, work, interpersonal relations etc) by personal interaction between two people. In contrast to teachers who act as instructors, coaches usually function as discussion partners. It is usually considered to be an effective method, although evidence so far suggests a weak or possibly medium effect (Jones, Woods & Guillaume, 2016; Eby et al., 2013; Allen, Eby, Poteet, Lentz & Lima, 2004; Underhill, 2006; Pan, 2006). It has a long history in human development, for example in the form of apprenticeship. There are many specific variants and techniques used, and a rather large industry of professional coaches for all kinds of professions and personal matters.

4.2 The MeBeSafe coaching system for HGV drivers

4.2.1 Preparatory work for development of the HGV driver coaching system

Much of the work put in to identify effective coaching methods was undertaken in WP1 of MeBeSafe, where various approaches to coaching were studied and reported in D1.1 - Integrated framework. Meanwhile, the circumstances of an actual delivery of coaching in transportation companies were studied in WP4. In the same WP, the principles of an app which could deliver and support coaching were planned. These three different knowledge bases yielded restrictions as well as possibilities for what became the MeBeSafe coaching system.

4.2.2 Basic principles of the MeBeSafe coaching system for HGV drivers

4.2.2.1 Peer-to-peer coaching

As described in D1.1, there are several possible ways of delivering coaching to drivers; using professional coaches, managers and peers. It is even possible to do self-coaching, where the same basic principles are used, but without the actual human contact. A professional coach is capable of delivering personalized support, but is

expensive, and it may not even be possible to find enough coaches who are knowledgeable on truck driving. As truck driving today is rather highly specialized and regulated, it was deemed to be important for the coach to be a specialist in truck driving if relevant coaching should be delivered. It was therefore decided to opt for **peer-to-peer coaching** for truck drivers.

4.2.2.2 Empowering the driver

The MeBeSafe coaching system is based on providing drivers feedback on their own driving behaviour / performance. In all telematics systems known to us that measure driver behaviour, the system is used for surveillance, i.e. the driver behaviour data is passed on to the company and used by managers to try to influence behaviour. In MeBeSafe, a decision was made to take a radically different route, and to not pass on data for individuals to the company. In the DriveMate app (described in 4.2.3), the driver decides before each trip whether to record any trip data at all. Furthermore, the data for each driver can only be accessed by the driver and the MeBeSafe researchers (in anonymized form). In the database, each driver is only represented by his/her randomly generated ID. At any point in time, all previously collected data can be deleted upon request by the driver. .

In the preparatory coaching training, drivers are informed about these rules, and it is underscored that the system is not built for surveillance, but as a support tool for the drivers so they can improve their driving. It is also emphasized that they own the data they have produced, and do not need to share it with anyone.

In the coaching sessions, the drivers are given the freedom to discuss whatever topics they find interesting. Again, it is emphasised in the instructions that the coaching sessions are for the drivers' own benefit and development, that they are the professionals who have extensive knowledge about driving, and that they are trusted to use the system for the benefit of all drivers.

4.2.2.3 Flexibility

One of the main principles employed in the MeBeSafe coaching system is that it should be flexible and simple to deploy. The DriveMate app, should be self-explaining and easy to use. Similarly, different drivers can start at different times and follow their own educational trajectory.

The peer-to-peer coaching is also implemented in a flexible way. The app support could, in principle, be used for single drivers, dyads, and larger groups.

Although not really a part of coaching in a strict sense, it can also be mentioned that the decision was taken in MeBeSafe to make all measurements of behaviour by smart phone. By not using data from the vehicle CAN-bus or custom-built IVMS, many technical issues (compatibility, mounting etc), and costs, could be avoided. The system can, in principle, be used on any vehicle, although the current algorithms that calculate driving performance are based on large, heavy vehicles. Using it on other vehicles will return data which is not fully reliable, unless the algorithms are changed to suit the particular vehicle type.

4.2.2.4 Coaching supported by an app

In traditional coaching, people meet up to talk about issues, often work-related ones. This exchange can use information from measurement systems as topics, but the process is dependent upon the participants' choices and active participation. The use of an app for coaching facilitates the use of the peer-to-peer model, as feedback and guidance concerning topics are handled by the system implemented on the phone.

The DriveMate app (see Figure 1) was developed for this purpose, and can be divided into three main functions :

- Collecting data on driving behaviour
- Interpreting and visualizing collected data
- Enabling coaching for the drivers

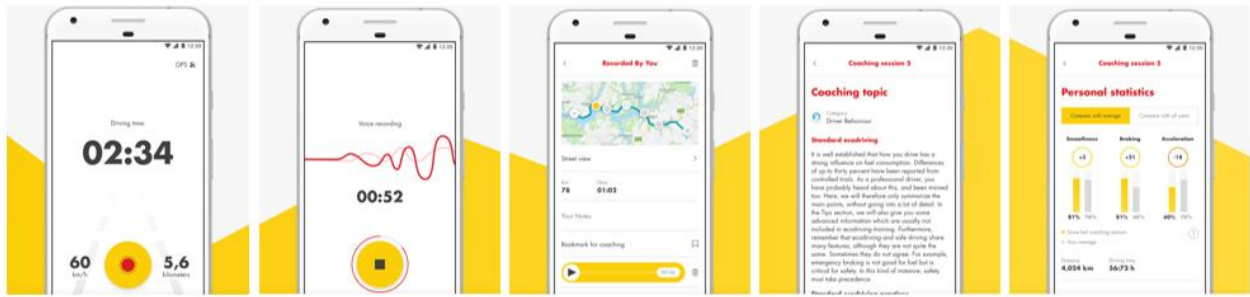


Figure 1 Screenshots from the DriveMate app: First, the screen during recording of a trip. Second, the event recording function. Third, a recorded event. Fourth, a safety topic from the coaching alert. Fifth, summary statistics of trips since the last coaching session.

4.2.3 Coaching-related features of the DriveMate app

Before every trip a driver can activate the DriveMate app trip recording by pressing a big 'start drive' button (see Figure 2; first screenshot). When activated, the DriveMate app will record driving behaviour automatically.

4.2.3.1 Recording function

Whenever the app trip recording is activated and detects that the phone is moving, an event recording function is available. If the screen is touched, an event is recorded in the trip. Also, sound is recorded until the recording is stopped (see Figure 2; second and third screenshot). The event can thereafter be viewed in the trip summary, and written notes made. In V1, the event recording includes a streetview from Google of the place where the recording is started. In V2, it is possible that this will be replaced by a video recording, starting from 30 seconds before the function is initiated, i.e. video is continuously recorded but only saved if the record function is activated. The length of the video is from 30 seconds before the record button is hit, up until recording is stopped. In this way, the driver can record events after they have happened.

As the events, whether recorded by DriveMate or by the driver, turn up in the coaching alert, the drivers can use their own experiences in coaching, discussing events which they have found interesting in some way.

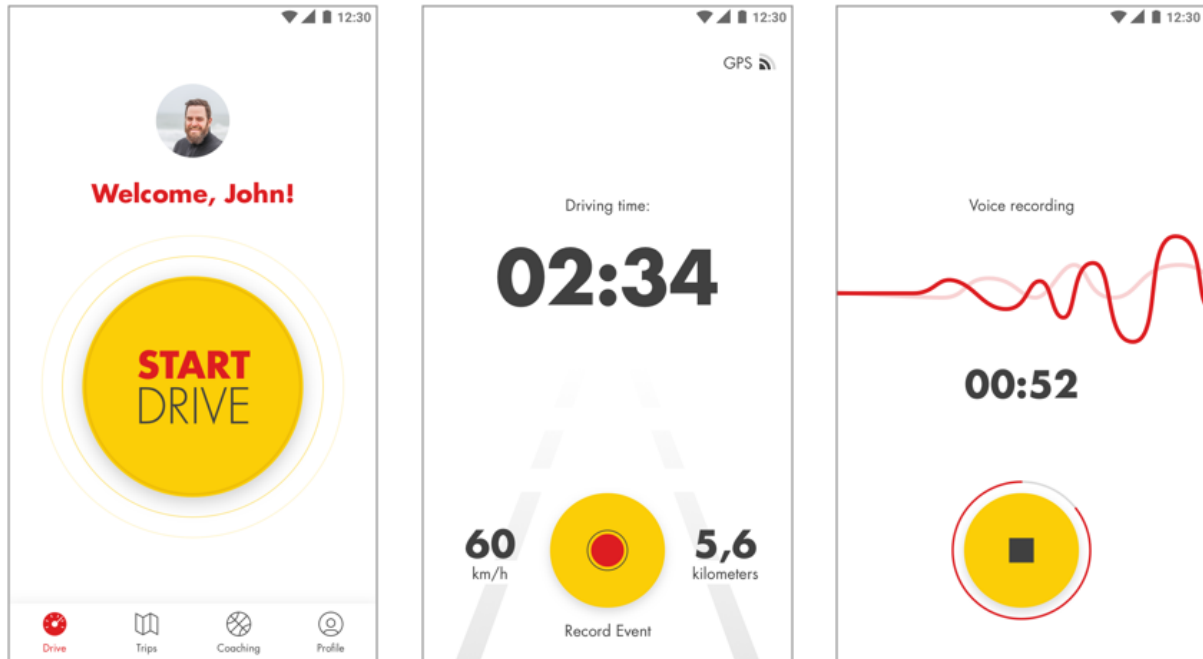


Figure 2 Screenshots of the app: the button to activate datacollection of the trip (1), during trip recording (2) and during an event recording (3).

4.2.3.2 Trip summary

In the DriveMate app, driver behaviour is summarized over trips (see Figure 3). These trips can be of varying length, as the driver chooses when to start and end them. The information conveyed is three summary variables (harsh braking, harsh acceleration, and smoothness of driving), as well as a map of the road driven, with events marked. These events are those of harsh braking and acceleration recorded by the app, and events recorded by the driver (see 4.2.3.3).

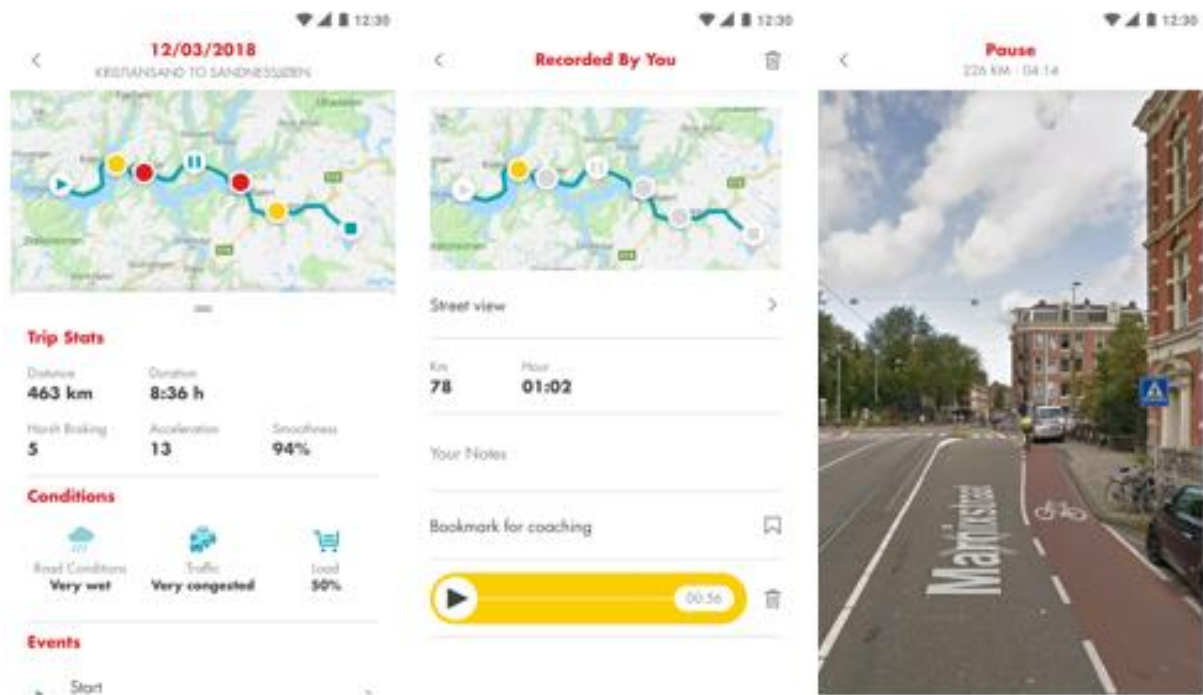


Figure 3 Example of a trip summary: Overall statistics (1), the details of a driver-recorded event (2) and the streetview of the place where the event was recorded (3).

4.2.3.3 Coaching alert

The coaching alert comes up in the app with a period of two weeks in between when drivers first start with the coaching sessions, increasing over time to a maximum of six weeks (see Figure 4). The alert features summary statistics of the trips undertaken since the last coaching session, a suggested safety topic with text and links about this (see Appendix B), and recorded events.

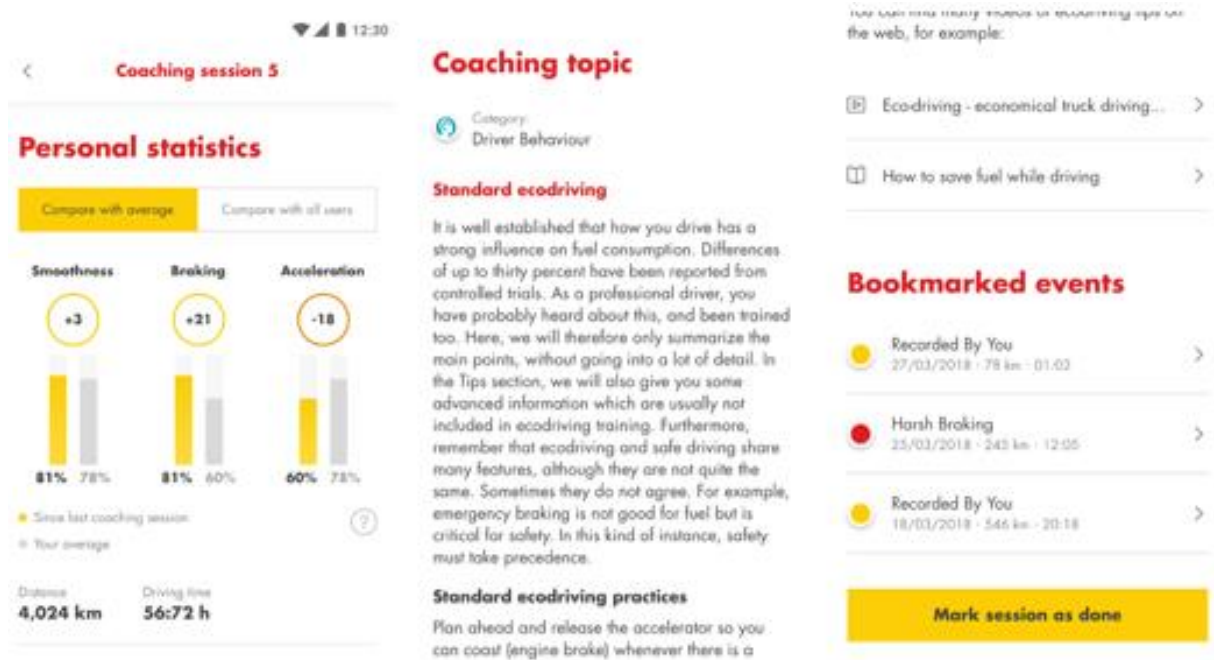


Figure 4 Example of a coaching alert.

4.3 Behavioural principles used in the MeBeSafe truck driver coaching

4.3.1 Cognitive-behavioural therapy techniques

In WP1 (D1.1), various possible principles and methods for coaching were reviewed. It was concluded that cognitive behavioural therapy (CBT) was the most well-validated approach, and that these methods were also possible to apply in a truck driver setting using peer-to-peer coaching without extensive training. From the many techniques for behaviour change used within CBT, five were selected as the most efficient ones for the drivers to learn and use. Some further techniques were also implemented in the app. These techniques will be shortly described in the next sections. The educational material for the drivers on coaching can be seen in Appendices A and C.

4.3.2 Self-monitoring and self-reflection

It is a common problem in therapy that clients are not aware of their own behaviour and/or its consequences. This would actually seem to be the case for most people. Several cognitive mechanisms cause this problem, such as the amalgamation of repeated events into a single memory. This can lead to strong under-estimation of, for example, occasions of speeding. Such errors can be a reason for a belief that there is no reason to change.

To make a person more aware of his/her behaviour, information about this can be gathered in different ways. The most important feature, however, is that a person should learn to look for this information, actively gathering, pondering and using it.

4.3.3 Goal-setting and graded tasks

To be able to change behaviour, it is usually necessary to know what is desirable. It is thereafter a matter of trying to behave according to this model in real life. This is goal setting; trying to achieve something by consistent behaviour. This is a very important mechanism in behaviour change,

However, goals must be realistic and preferably short-term. Humans will not try to strive for improvement if the final goal is considered to be impossible, or too distant. In general, people will prefer to have their goals expressed in parts which are achievable within weeks. Therefore, the principle of graded tasks is applied within CBT. The tasks can be to do certain things for a certain time, which can either be an improvement in itself, or be expected to lead to a certain improvement on a criterion.

Applying this to truck drivers, they are taught to use the trip information from the app as a measure of behaviour, and to set realistic goals for changing the values, for example reducing the number of harsh braking events by two percent in two weeks.

4.3.4 Social support

Humans are very sensitive to what behaviour they consider to be socially sanctioned, and will usually try to conform to these perceived norms. However, norms differ between groups, and often it is not really well known what the actual norm is. Supplying people with statements about what is considered good or bad within a certain group therefore makes it easier for them to conform to these norms.

4.3.5 Instruction

In some instances, it is necessary to tell or show how certain behaviour is to be performed. This method is actually very close to old-fashioned teaching, but in coaching it is a complimentary to the other methods, not the main technique.

4.3.6 Feedback

Feedback is usually defined as information or consequences resulting from behaviour which is sent back into a loop which defines the behaviour, and therefore further shapes this in a desired direction. In MeBeSafe, however, a distinction has been made between the information provided by the app (trip data, events and safety topics), and the qualitative judgements made about this information. Only the latter is called feedback in this coaching approach. Currently, only the drivers provide feedback in their coaching sessions, while the app is limited to information only.

Feedback in MeBeSafe therefore refers to the act of evaluating information, with the intent to improve driver behaviour. Feedback is thus used to encourage good behaviour by showing that certain behaviours are preferred by other people, i.e. a specific instance of social support.

4.3.7 Information on consequences of behaviour

The underlying reason for the technique of supplying information about causes and effects is that many people do not know how different factors are associated, like

sugar intake and obesity, and therefore do not know that one thing is causing another. Similarly, what the consequences might be are often not known. This may be especially important in traffic safety, as people have a lack of understanding of very rare events with large impacts (Hertwig & Erev, 2009).

This principle is not explicitly taught to the drivers, but is included in the app in what is called the safety topics (see Appendix B). These topics are texts which are presented to the drivers before a coaching session, with the suggestion that this should be discussed by the drivers. For example, the reasons for fatigue and its association with crash involvement are described.

4.4 Implementation of the MeBeSafe truck driver coaching system

4.4.1 Procedure

The general routine for setting up the MeBeSafe coaching system at a trucking company is as follows:

- 1) Meet with the drivers, supply them with phones and cradles for mounting the phones on the dashboard and give them an introduction to MeBeSafe, DriveMate, the rules applied, and coaching. Instead of a physical meeting with the drivers, they can also be introduced to the system by viewing a PowerPoint presentation that was developed for this purpose (see Appendix D).
- 2) Baseline measurements are started straight away. The drivers have access to VO of DriveMate, which only records data and presents coaching instructions (called 'onboarding sessions' (=, see Appendix A) every second day. Pairs of drivers are decided upon.
- 3) When the onboarding is finished (after about eight weeks), coaching alerts start appearing, and trip summaries are provided. The coaching alert contains safety topics

(see Appendix B), recorded events and a summary of all the trips since the last coaching session.

4) V2 of DriveMate will feature better feedback and coaching tools. This will be implemented when WP5 has started.

5) V2 of DriveMate is planned to also contain video features. Although the final version has not been decided upon, it is possible that this will be voluntary for participating drivers, especially if an inward-facing camera is included.

6) Over time, the time in between coaching sessions will increase to a maximum of six weeks.

7) When the safety topics have all been presented, this part of the coaching alert will be discontinued.

4.5 Possible future coaching features of the DriveMate app

4.5.1 General

The development of the coaching system in WP4 yielded a great number of ideas and possibilities for the app and coaching, which in the end had to be distilled into only a few features, due to budget restrictions. However, many of the currently discarded ideas can easily be added to the existing app, as many of its functions are low-cost versions of the original ideas. These developments will improve upon the system in terms of user friendliness, number of features and behavioural mechanisms applied. Many of these planned features of DriveMate are about fine-tuning the system's information handling and feedback, i.e. making it respond to specific behaviours of the drivers.

4.5.2 Library

In the current version of the app, the safety topics and coaching information (see Figure 4) are stored in a list after they have been presented and can therefore be

accessed again. This simple function works well as long as the amount of information is rather small. However, as the amount of texts, pictures, links and videos increase (see also Tips), there will surface a need for a more advanced information storage system, preferably with some sort of search function, but definitely with several different categories of information and sorting functions.

4.5.3 Advanced topic presentation

Currently, safety topics are presented in the same fixed order for all drivers and not repeated. In a future version, the order of topics and how they are handled after session alerts could be improved upon. For example, after presentation, safety topics could be marked as 'Discussed' and put in the library. If they were not discussed, they would be put into the list of upcoming topics for presentation again at a later date. This function would make the safety topic feature more flexible and comprehensive, as it would allow drivers to skip the topic for the time being in favour of some currently more interesting thing to discuss, while retaining the topics for consideration at a later date.

4.5.4 Goal setting feature

One of the most powerful behavioural mechanisms identified in D1.1 was that of goal setting. Having a self-set goal to work against usually inspires people to improve, and it also requires the act of self-observation.

A goal setting and feedback mechanism in the app would allow the drivers to set goals for themselves ('This month I should increase the smoothness of my driving by 2%'), and get feedback on whether they are achieving their goals or not. Currently, the goal-setting technique is only applied by the drivers in a semi-manual fashion (i.e. they have no function in the app which can keep track of this for them, only the trip summary which gives them the trend of their behaviour), and the principle relies on them to keep track of the differences. This, however, might be difficult, and a goal

calculator which indicates the degree of success in reminders would strongly enhance this feature. The reminders could be semi-randomly presented on start-up of the app.

4.5.5 Tips section

The tips feature is a section of the app where the drivers can add information themselves. The point of the tips feature is that drivers can share driving- and work-related information, a common feature of social networks. However, from a coaching perspective, it increases the drivers' interactions with the app, and therefore the probability that they record data and use the app in other ways too. Also, it takes advantage of the drivers' knowledge of their specific environment, making this knowledge accessible to all drivers. However, the tips section makes it necessary to choose a moderator to oversee the postings, to ensure that it is not used for other purposes than to facilitate work and safety.

4.5.6 Positive feedback and detection of positive events

One basic principle of the MeBeSafe coaching system, which was meant to be applied and which would have made it different from other systems, was the use of positive feedback to the drivers. In all other known telematics systems, feedback is based upon negative events (speeding, deceleration, jerks, etc) and negative feedback (the driver is reminded he/she has done something wrong). In MeBeSafe, it was decided to try to avoid this negativity, and instead use positive feedback, trying to reinforce the good behaviours that actually exist. However, identifying positive (safe) behaviour is more difficult than spotting risky behaviour, and truck driver data, including video, is needed for this development. Currently, negative feedback is used in DriveMate, but it would be preferable to replace most of this with positive evaluations instead.

4.5.7 Holding complexity of the driving environment constant

One problematic feature of driver behaviour measurements and feedback, which has been identified both by the pilot study drivers and the MeBeSafe researchers, is that driver behaviour is strongly influenced by the environment. In essence, drivers get good scores when driving on highways, and bad scores in cities. However, this is not the actual point of these systems. What should be measured is how well drivers perform in certain situations. For example, five harsh braking events in an urban environment might actually be good behaviour, while the same number of events on a highway is very bad. The features of the driving environment which differ between urban and rural environments is usually called complexity in traffic safety research (Cantin, Lavallière, Simoneau & Teasdale, 2009; de Craen, Twisk, Hagenzieker, Elffers & Brookhuis, 2009; Jahn, Oehme, Krems & Gelau, 2005; Rudin-Brown, Edquist & Lenné, 2014).

Complexity of the driving environment is a topic which has been discussed in MeBeSafe and which is under development, but has so far not been implemented in the app. In the future, the trip statistics would be calculated taking complexity into account, thus making driving in cities and on highways comparable. The term complexity refers to the difficulty for a driver of navigating a driving environment, for example concerning number of junctions and other road users and their trajectories. As the number of junctions, road users and other features increases, so does complexity, as it is the sum of all these. This topic has rarely been investigated in traffic safety, and there exist no empirically validated way of quantifying it. Complexity can also be defined as having a close relation to the concept of the driver's cognitive load. Where there is much information to process for safe travel to be possible, complexity must be high.

Strictly speaking, the issue of complexity is a feature of the app and trip information, not coaching. However, holding constant the complexity of the environment of driving



in the results would overcome one of the issues that drivers say that they have with standard telematics software; that it does not take into account where you are driving. Basically, all drivers get bad scores in cities and good scores on highways.

If the drivers' scores on their trips can be weighted for the complexity of the environment, scores from different areas could be compared, which would make coaching easier, as the drivers in their discussion would not have to take into account this factor.

4.5.8 Personalisation of features

Giving information and feedback to drivers in a single format (for example percent only, and not additional statistics) is difficult, because different people prefer different things. When it comes to driving information, it would be possible to give the drivers the choices of different settings for trip summaries, type of visualisation of data, and frequency of feedback.

4.5.9 Personalised feedback and topics

One of the interesting possibilities of measuring actual driving behaviour is to make coaching (training, education) dependent upon individual driver behaviour, instead of general principles for safety. Currently, only the trip statistics in the MeBeSafe system are personalised, while coaching is only individualised in the sense that the driver may use his/her events and other trip data in the coaching. However, the presentation of safety topics in the app could be made dependent upon driver behaviour, feeding the drivers the currently most relevant topics.

However, such a feature depends upon extremely sophisticated measurements and algorithms (or manual treatment), which currently do not exist. Speeding is probably the only exception to this rule, as it is relatively easy to detect. Fatigue and distraction, on the other hand, are very difficult to detect, and the risk of many false positives is high.

Another drawback of using personalised safety topics in the DriveMate app is that the app could run out of topics of a certain kind. Sooner or later, it would have to present other safety topics (and then the dependency on driver behaviour would be lost anyway) or keep repeating the same ones. The advantage of personalised safety topics would therefore be small, and dependent upon a fair amount of development work. This kind of personalised feedback would also be negative, as it would be triggered by bad driving.

4.5.10 Random positive reinforcement

An app with only a few features which repeats the same kind of information can easily become boring for the user. A feature which would counteract this would be a message about traffic safety, which would be sent semi-randomly, i.e. the drivers would not be able to predict when it would appear. This would not be associated with the coaching alert in any way. The topic would be similar to the safety topics in coaching, but more narrow in scope. For example, a picture of an unusual truck crash or a video of an interesting driving situation could be sent. Using the app would thus be reinforced by the extra, non-repetitive, material.

4.5.11 Real-time warning

Although a general principle of no information during driving was applied, a few exceptions were also suggested within the development team. One of these was a real-time calculation of driving behaviour which would give an auditory warning if the driver's behaviour deviated strongly from his normal behaviour. This could, for example, indicate fatigue.

However, this feature would need a fair bit of research to develop algorithms which could actually do this with any reasonable degree of precision and validity. Warnings based upon pure acceleration behaviour would probably not be useful, because driver behaviour differs considerably due to the road environment (i.e. complexity).



To this real-time warning could also be connected a message service to the driver's supervisor which would be activated if the driver does not respond to the in-cab warning by altering his behaviour or taking a rest. This means that if the driver's behaviour would differ very strongly from his normal behaviour, his supervisor would be alerted to this.

It can be noted that this feature of the app would break the rule that no information on the individual driver should be forwarded to the company. However, the setting would be very conservative, so that only very extreme deviations would be flagged. Also, the drivers would have one or two warnings before the supervisor was notified, and would therefore have ample time to avoid this. This would carefully be explained to the drivers, and it could also be built as a voluntary feature, which the drivers could use for their own benefit.

4.5.12 Coaching using video

The use of video in truck driver coaching has great potential, as it makes it easier for drivers to discuss what might be hazardous, what the reasons for crashes might be etc. Future development of the app would therefore continue along two different paths.

The coaching alert would be extended to include a video topic, where the drivers are shown a filmed event which is used as the basis for discussion. These videos could be from several different sources. First, there exists a large number of videos of road crashes on the internet, which could be manually searched, identified and put into a library for the app. However, crashes are not the only type of events which is interesting. Using the video analysis of Cygnify (see D4.2 – Coaching Methodology) it would be possible to identify video sequences from existing road user material such as the UDRIVE database at SWOV in the Netherlands, which show near misses etc. where the driver is able to save the situation. Finally, the coached drivers themselves could record videos of events from their own driving (record function of the app).

Using complexity indexes in conjunction with driver behaviour data from the app, it would be possible to record videos from good driving by the MeBeSafe drivers in very difficult situations.

Video could with all these features implemented be a very powerful addition to the coaching, where not only bad/risky behaviour could be discussed, but the main focus would be on ways of preventing risky situations from happening, and saving them if they do occur.

4.5.13 Driving competencies surveys

In Deliverable 4.1 – Driver profiling, a basic driver competence matrix was proposed which incorporates all three aspects of competence: *attitudes*, *knowledge* and *skills* (Stanton, Walker, Young, Kazi & Salmon, 2007), mapped to the basic driver competences *risk assessment*, *regulation* (attention) and *self-appraisal*. The skill-level is to some extent covered by the behavioural data collected within the DriveMate app. In order to incorporate the attitude and knowledge levels, short surveys, tailored to specific topics (e.g. speeding, distracted driving, fatigue, etc.) can be used in a later version of the app. Based on these surveys, the drivers are presented with tailored feedback, suggesting suitable topics for the coaching sessions.

For the measurement of drivers' attitudes, existing surveys were reviewed in order to find validated surveys which can be completed by the drivers. The Driver Attitude Questionnaire (DAQ, Parker, Stradling, & Manstead, 1998) is one survey, which seems to be suitable for the purpose of the MeBeSafe project. This survey assesses attitudes towards four common traffic violations: speeding, close-following (tailgating), drinking and driving, dangerous overtaking with 10 items per traffic violation. Drivers indicate in as how far they agree with the statements on a 5-point scale ranging from *strongly agree* to *strongly disagree*. The median values are used as cut-off values. Based on these values, two different types of feedback are given: if the score is above the cut-off value, it is suggested to incorporate this topic within the next coaching

session (feedback 1). If the score is under the cut-off value, the driver's attitude to this specific topic is already adequately formed and therefore no coaching in this direction is needed (feedback 2).

In order to measure drivers' level of knowledge it would be feasible to present drivers with a small number of facts per specific topic (e.g. 5 facts about speeding, distracted driving, etc.) and simply ask them to rate how surprised they are about these facts. This was motivated by the approach incorporated within the Driver Attitudes & Behaviour survey conducted by the Road and Safety Authority Ireland (O'Mahony & Tapley, 2015). The rationale for this approach is as follows: if a driver is not surprised about a certain fact it is because s/he is already aware about this safety driving aspect and therefore, there is no benefit in discussing this topic within the next coaching session (feedback 2 is given). If, on the other hand, the driver indicates being surprised for a majority of facts him/her, the feedback is given to discuss this topic at the next coaching session (feedback 1), as the driver could benefit from this discussion. A collection of safety driving facts for the central topics of speeding and unsafe driving behaviour, distraction and fatigue was compiled and, if needed, reformulated in order to make them accessible for a wider audience (see table in appendix C).

4.5.14 Safety topics tests

Several of the safety topics which are suggested by the app for coaching discussions concern personal habits and circumstances. For example, stress in your life could have a detrimental effect on your driving. However, many people do not realize that they are stressed, or fatigued, because it has become an accepted part of life. To make drivers aware of their own status on such things as amount of exercise taken, in relation to what can be considered healthy, several tests have been identified which can be put online for the drivers to take. The answers are summed and the sum related to norms for the general population of people (most norms refer to a random sample of all people in a country), and an interpretation of this given to the driver



('your value for stress is below average, this is good'). No data are recorded, and the drivers can take the test whenever they want to.

4.5.15 Advanced coaching alert

In the current version of DriveMate, the time in-between coaching is governed by a very simple algorithm, which only calculates the time since the last session and adds some extra time after each session, until a maximum time of six weeks is reached. In the advanced mode, the time in-between sessions would be due to the behaviour of the drivers in each coaching pair. If one of the drivers is below a certain threshold in driving behaviour, the time in between sessions is shortened. Similarly, if behaviour of both drivers is well above average, time is increased.

5 Part 2: Coaching car drivers to use Adaptive Cruise Control (ACC) more

This description of the MeBeSafe car driver coaching system for increasing the use of Adaptive Cruise Control (ACC) has two distinct parts. The first part covers what has been done and developed until now. Descriptions will be given of the problem that coaching is intended to address in this particular context (section 5.1), what form the coaching will take given the problem formulation (section 5.2) and lastly the specific means for delivering coaching that have been developed in WP4 (section 5.3).

5.1 The problem to solve with coaching in an ACC usage context

The primary objective of the use case for nudging drivers toward increasing their ACC usage is about developing and installing an in-vehicle nudging mechanism that reflects drivers' ACC usage in such a way that they become more inclined to use it. This main part, which can be said to nudge those who already are ACC users, is described in WP2 and will not be further discussed here.

The initial objective for coaching in the ACC use case was to use coaching to further enhance the effects of nudging provided to ACC users. However, VCC's ACC usage pattern analysis has revealed that coaching can have an even more important role to play, which comes from giving it a slightly different role compared to the initial specification in the DoW.

When starting on the coaching work for ACC users, we first collected several large naturalistic data samples (i.e. log data from vehicles being used in a normal, everyday way) from 62 Volvo drivers in Sweden and China respectively. This data captures how drivers use ACC in what can be called the baseline condition, i.e. how they use it today with neither nudging nor coaching applied.

In *Figure 5* below, ACC usage data from a subset of these drivers is shown. This particular subset comes from 19 Swedish Volvo Cars company car drivers and was collected over a 6 month period.

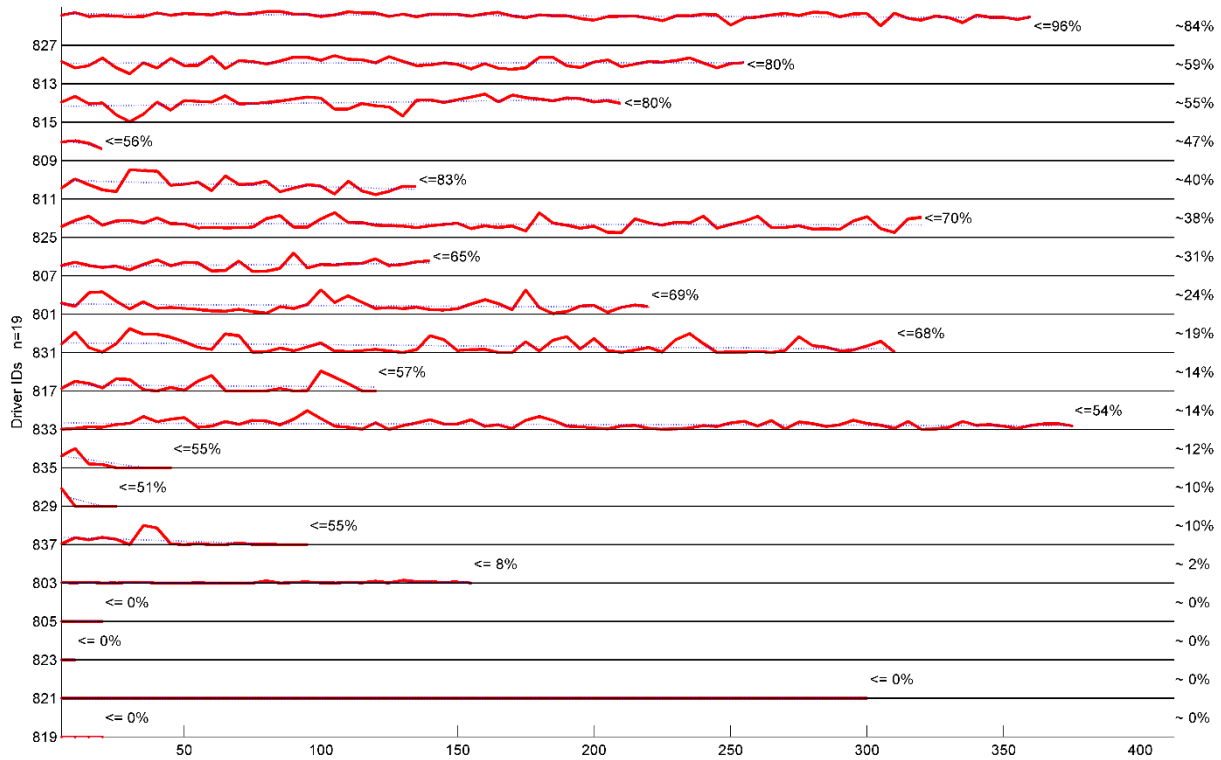


Figure 5: ACC usage ratio averaged over 5 hour bins of driving at speeds above 30 kph. Numbers to the far right indicate average usage across all data; numbers closest to red lines indicate the highest bin value reached by each driver. Analysis capped to driving above 30 kph due to ACC not being available below 30 kph on vehicles with manual gear shift.

As can be seen in the *Figure 5* (and which is further corroborated in the analysis) there are some clear patterns in the data. First, the level of ACC usage is far from uniform across the population. The range of average individual usage levels spans from 0 % to 64 %, i.e. from no usage at all to usage two thirds of total driving time. It is thus clear that not all drivers use ACC in the same way. There is significant between-driver variability when it comes to usage level.

Second, looking at each individual, one can see that drivers show quite consistent within-driver behaviour when it comes to their level of ACC usage over time. In other words, they seem to have settled on a level of usage they are comfortable with, and that does not change very much over time (or at least not within the 6 months of data collection underlying this data sample).

Third, the overall picture of the usage levels indicates that it is possible to group the ACC users into three larger ACC user types. There is the intensive user type, i.e. drivers who use ACC a significant portion of their driving time (say above 25 %, though exactly where to draw the line can and should be discussed). Then there are the modest users, who use ACC sometimes but to a lesser extent (say within 10-25 %). Finally, there are the non users, i.e. those who do not use ACC at all (or where there is some initial usage but none later on in the data sample).

Based on interviews with the drivers who were part of this naturalistic data collection, a clear difference in mindset could be identified in particular between users and non-users. Both the intensive and modest users were well aware of how ACC operates and comfortable with using it while driving. Drivers in the non-user group however to a large extent showed fear of activating ACC. They did not trust it to be capable of actually regulating speed and the distance to lead vehicles, and were worried that something might go wrong or get out of control if they tried. In the words of one participant: "Are you kidding? I would never put my life in the hands of a driving robot."

As *Figure 5* shows, the non-users are a large group within the total population. Given this analysis, it is therefore clear that ACC oriented coaching would have its largest impact not on drivers who are already using ACC to some extent, but rather on drivers do not use ACC at all because they are afraid to activate it and thus to delegate a part of vehicle control to the function. Quite logically, nudging toward increased usage of a function can only work if the drivers are function users. Non-users therefore first must become ACC users before nudging toward increased usage can be applied, and

this is where coaching can be particularly helpful and effective, and hence what will be the application of coaching in this ACC usage context.

5.2 How to coach drivers who are afraid of activating ACC

Coaching can take many forms, as described earlier. Those will not be re-iterated here. Before going into the specifics of how to apply coaching here, it is however worth pointing out some key differences between coaching private drivers in their own vehicles and coaching drivers who are under fleet management, in order to understand the design choices made.

First, while drivers under fleet management can be made to adhere to company policies and/or training in fairly strict ways, private car drivers cannot be pushed in the same way. There is no management present that can push a reluctant person forward. Now, although the MeBeSafe coaching system for truck drivers described earlier actually constitutes an exception to this approach, as it is designed to empower drivers rather than force drivers (the drivers themselves are in control of how they organise and use the coaching tools that we offer them), it has to be acknowledged that private drivers are not subject to any leverage or peer pressure of any kind. Any means of coaching private drivers therefore must be designed such that drivers find it worthwhile to pursue out of their own interest and without feeling forced to comply.

Second, the driving pattern over time for private car drivers differs a lot from that of professional drivers. Private drivers drive much less, at less predictable times than professional drivers and typically outside regular working hours. A coaching scheme for private car drivers therefore cannot be scheduled in the same way it can for a professional driver. Instead, it has to be designed such that it is instantly available whenever the driver would like to be coached, and that time could occur throughout a much larger portion of the day. In summary, for this to work, the coaching has to be perceived as a readily available and attractive resource, which the driver can access at any time s/he desires to do so.

As for how to coach these drivers, interviews and case studies with drivers who have ACC in their vehicles but do not use it have made it quite clear that not all of these drivers will be coachable, in the sense that they could become ACC users if given the right guidance through the activation process. They are simply too deep in their scepticism toward this type of technology to be persuaded otherwise within any short to medium time frame.

However, it is also clear that a majority of the non users could become ACC users under the right circumstances. In particular, what they report lacking, is the possibility to test ACC activation under controlled circumstances with someone at their side instructing them what to do and what to expect in terms of vehicle behaviour, before they will consider using the system on their own. Once through one or two such “moderator supported” activations, they could become comfortable with using the system on their own without guidance.

5.3 The Interactive Quick Guide - a private car ACC coaching system

Given the described general limitations for a private car driver coaching system , it follows that the system needs to be present in the car and accessible while driving. Now, given the findings from the interview study summarised in the former section, i.e. that one or two coached ACC activations may be sufficient to transfer a driver from the non-user to the user group, one could in principle offer this as a personal service, e.g. offering a test drive that includes ACC activation with personnel from the dealership coupled to a car purchase.

Still, as this obviously would be labour intensive, and not all who get access to an ACC equipped car do so in conjunction with a car purchase, another approach would be to let these drivers test ACC activation by means of an interactive in-vehicle app, much like the DriveMate app described above, but with different content. The app will be tied to the vehicle ADAS data streams and can thus determine when it is a suitable time

to test ACC, and then instruct the driver how to engage and disengage, as well as change time headway while ACC is active.

For coaching the first time ACC usage in MeBeSafe, VCC has further extended the capabilities of a Test Drive Prototype App currently being developed within VCC. The app is integrated in the main infotainment system Sensus which means that interactions between driver and system can be voice controlled. It also means that it is possible to send the driver out on a specific route, with visual and auditory guidance, and set specific interaction points where it is suitable to test ACC for the first time.

The basic principle for the app is that when suitable driving conditions are identified during the drive, the app asks whether the driver would like to try activating ACC. This dialogue can either be scripted to be activated by the system when conditions are fulfilled or to be initiated by the driver when s/he feels the time is right. If the response is affirmative, the app describes which button to press, what information to expect in the Driver Information Module (DIM) if activation is successful and also instructs the driver to take the foot off the accelerator in order to let ACC regulate speed and distance once a successful activation has been confirmed. The app also talks the driver through how to change the lead vehicle following distance if the driver perceives the current setting to be either too short or too long.

Current testing of the prototype app to validate the app based coaching concept indicates that it is well received by test participants, and that trying systems out in traffic under guidance is a highly appreciated feature. However, it was also very clear from pilot tests with the non-users group that the presence of another person in the vehicle was perceived as highly comforting, and may well have been instrumental to those non-users daring to activate ACC. To be able to isolate the effect of the coaching itself from the format of delivery, i.e. being coached by an app versus having a coach present in the vehicle or having a test leader doing remote coaching by simulating what the app would do over a voice interface (so called Wizard of Oz methodology),



the field trial will include all three setups and evaluate their respective effectiveness, to make sure that the app implementation is not dependent on real human presence to be effective.

Of course, having a dialogue with a real test leader rather than an app can become two very different things if one is not careful in the study design. In the setup of the respective approaches described above, extra care will therefore be taken to ensure that the dialogue itself, along with any other interactions such as training opportunities, is structured exactly the same way regardless of whether it's the app or a remote human test leader doing the coaching. Using a "Wizard-of-Oz" type of approach is a very powerful tool when it comes to overcoming certain technical barriers, but it is very important to carefully avoid creating involuntary interaction artifacts when using it.

6 Deviations from Workplan

Task 4.3 is described as: “This task provides several coaching schemes to be tested in a pilot study using simulators, and finally evaluated under the field trails in WP5”. In reality we have developed one coaching scheme for private car drivers and one coaching scheme for HGV drivers. Also, rather than using simulators, we have user-tested our coaching schemes in real-world using target groups of (Volvo or HGV) drivers. The result of these pilot tests will be reported in D4.5 – Report on effective feedback.

There are small deviations from the Description of Work (DoW) in the sense that the DoW on occasion describes that Volvo will develop an app for drowsiness alert. This is an error in the General Agreement (GA). The Volvo app developed in this project is aimed to coach Volvo drivers to use their ACC more often. The drowsiness alert (not an app) that is developed in MeBeSafe will be described in the deliverables of WP2.

We intended to develop and test the final DriveMate app within the scope of WP4. Due to changes within Shell; we were only able to develop and test a basic version (V1) of the app. The full potential version (V2), with more features (see section 4.5) is currently being realized and will be ready for use in the WP5 field tests.

7 Conclusion

This deliverable describes the coaching systems that were developed in WP4 of the MeBeSafe project. In this project two coaching systems have been developed. One is aimed at professional HGV drivers with the objective to decrease harsh braking events. This is a combination of online (app based) and offline (face-to-face) coaching. WP4 has showed that it is possible to develop a low-cost coaching scheme for transportation companies. This coaching scheme measures driver behaviour via a smart phone, and feed these measurements back to drivers in an app designed to support face-to-face coaching. The effectiveness of this coaching scheme will be tested in the WP5 field trials.

The other coaching system is app-based (online coaching) and aimed at (Volvo) private (i.e. non- professional) car drivers with the objective to increase ACC use. To be able to isolate the effect of the coaching itself from the format of delivery, i.e. through an app versus having a person present in the vehicle or having a real person doing remote coaching over a voice interface, the field trial will include all three setups and evaluate their respective effectiveness, to make sure that the Volvo app implementation is not dependent on real human presence to be effective.

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Appendix A: Onboarding sessions; coaching instruction material presented in DriveMate

The content of this manual is included in the app (presented on coaching alert screens as topics during baseline measurements) and used by drivers at their leisure (added to coaching sessions undertaken after use by drivers). The content is presented in the numbered sequence below. The category for each is the title for the first number. When all sections have been presented, and baseline measurements have ended, they are followed by the safety topics in the document 'Information web pages setup', i.e. coaching starts.

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1. Introduction to coaching

- 1.1 The DriveMate system for driver coaching

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A1. Introduction to coaching

A1.1 The DriveMate system for driver coaching

Welcome to the DriveMate driver development by coaching pages. This introduction will give you some tools for how to be a coach for other drivers. The material presented is mainly based upon behavioural cognitive techniques for behaviour change.

The aim of the DriveMate coaching sessions is for drivers to have the chance to discuss their work with a colleague who knows the environment, the company, the vehicles and the problems involved, with the ultimate goals of reducing stress, fatigue and dangerous driving. However, the DriveMate coaching is not just about driving behaviour, but about work as a driver in general. This includes things as social support within and outside the company, family life, health etc. A driver's situation in life



influences his or her driving, and it is therefore important to talk about such things too, and how they might influence work performance. Drivers should, for example, encourage each other to exercise, get enough sleep, eat healthy food, and try to balance work, family and social life to achieve a harmonious life. A more positive lifestyle is not only good for health and well-being, it is also good for traffic safety.

The DriveMate app has been developed to support the above-mentioned goals. First, it provides objective information about your driving behaviours, and compares these to the company average. Second, it guides your coaching sessions by giving you safety topics to discuss. Third, it gives you information about specific events which have happened during your driving.

A1.2 Coaching other people

Coaching is a method for performance improvement and personal development, which has similarities to mentoring and teaching. It usually concerns work behaviour and performance, but the principle can be applied to any human situation. In essence, it puts into systematic use the old principle of sharing information and ideas between people. Humans need comradeship, and most often benefit from discussing whatever is on their minds. This is especially important for truck drivers and similar professionals, who work alone most of the time.

In this introduction to DriveMate you will be able to read about how to do peer-to-peer coaching. It covers the same topics which were described in the class-room introduction, but in some more detail, and with further links to other material. The information given here should be useful for you when you talk and think about your own work and driving as well as that of your peer's, but might also come in handy in many other situations in life. However, reading, understanding, accepting and applying the methods described here is down to your own choice, it is not something you have to do. Furthermore, what DriveMate offers are various tools to help you, but you are still the driver and have the responsibility of doing your job as well as you can.

A1.3 Driver coaching

Coaching aims to increase people's awareness of their behaviours and their ways of thinking and feeling, and teach them to take responsibility for their own behaviours. It is also a problem-solving process. This should, for example, ensure that you take ownership of problems rather than believe that they are outside of your control. For drivers, coaching should increase your interest in, and knowledge about, driver behaviour and driving skill, your enjoyment of work, and ultimately your driving performance and safety.

Being a professional driver usually comes with a great deal of responsibility, irregular work hours, and working alone, often under stressful circumstances that demand high skills, caution and precision. In other work environments, working in a group means that problems can be discussed and solved with people who share them. This is the kind of support which most drivers do not have regular access to. Therefore, peer-to-peer coaching is used in DriveMate for alleviating the kind of social and personal isolation that many professional drivers may experience.

The coaching undertaken should not just focus on driving behaviour and work, but should also cover the driver's life situation that might impact on how he or she drives. Social relations between drivers are encouraged in the DriveMate system. Coaching sessions are not just about traffic safety, but an opportunity for drivers to get to know each other and help each other improve in many ways. It will help you handle your work situation as well as life in general.

A2. Coaching in DriveMate

A2.1 Self-coaching and peer coaching

In DriveMate, there are two or three different ways of doing coaching. You can be your own coach, you can pair up with a peer, and you can team with several peers. The material provided by the app remains the same. The only difference within the



app is that when you are associated with a peer, you will both receive the coaching alerts at the same time. You both need to enter the date for the coaching in the app. Otherwise, you will read the same material, and get the same information about your own driving.

The difference for you is that for self-coaching, you do all the work on your own. In peer coaching, you team up, meet up, and work together with another driver. If you have not teamed up with a peer, some of the material on coaching might not seem relevant to you. However, sooner or later, you may become a peer coach, and it is good to prepare for this. Also, many of the techniques and tools described are actually useful in self-coaching too, as well as in your day to day life.

Finally, there is also the option of a driver teaming up with two or more peers. All these solutions work the same way, but may be more or less practical for different companies and drivers. The choice of the exact model for coaching can therefore be selected by those concerned, and may also change over time.

A2.2 The coaching alert

About every two weeks, you will receive an alert for a coaching session. You should then review the information you receive in the alert. There are three categories; a summary of your driving since the last coaching session, a suggested safety topic, and events recorded by you and by the app. From these categories, you should select some for discussion with your peer. The safety topic is a text about some aspect of safe driving (like fatigue), sometimes with pictures and links to further reading or film clips.

The point of the safety topics is that you might never have given such aspects of driving any real thought, and might benefit from discussing them with your peer to compare your experiences. If you want to know more, the app has suggestions on further information sources. Then again, you might both have the experience that the



topic suggested is not a problem for you in your driving. In such a case, you can disregard it and instead discuss something which you agree is more useful or relevant.

It is important that you contact your peer and agree on a time and place for the session (for about 30 min). After the session, please mark the session as undertaken.

The coaching alerts will be stored as 'Previous coaching sessions', so you can go back and revisit all the information from any session if required.

Sometimes, the safety topic will be replaced by a request for a meeting with your supervisor. You and your peer should then contact this person and agree on a time for meeting. This meeting replaces the coaching session, as it has a similar purpose, although the content is different.

A2.3 The coaching session

When doing a coaching session with your peer, it is important to ensure both quality and efficiency. You can achieve this following the advice provided here. However, remember that coaching will be a recurring event. Do not worry if you do not have the time to cover everything you had planned to talk about. There will be more sessions to come. To help you in running the coaching sessions, here are some tips and advice;

1) First of all, find a good place for your session. It should be comfortable and without intrusive noise if possible. The environment should allow a private conversation to remain private. Remember that at times you might discuss sensitive topics. For example, meeting at a trucker café might not be a good idea, depending on whether your conversation can be overheard. If a physical meeting is difficult to achieve, you can also use an online video meeting tool, such as Skype, or telephone. However, these technical solutions cannot really replace the face-to-face meetings, although they can be useful as a stop-gap.

2) If coaching is to be effective and helpful, some degree of structure and discipline needs to be applied in the sessions. Among the first things to do is to agree what you should talk about in each meeting. The app will suggest a number of things which can be discussed, but these are just suggestions. You do not have to talk about these things at all. The app aims to be a help, and a source of information and reminders, but not an exact guide.

3) Keeping track. At the end of your session, it often helps to make notes about what has been said, especially if you have agreed on next steps or a goal. Notes can also be useful if there is an action point, like checking up on some fact, or to talk to someone.

4) Prepare yourself. As we have mentioned, the app will suggest topics which you can discuss. For some of these you can find links to further information. Reading this is a good way to prepare for the sessions. However, the most important thing to do is to make a note (mental or otherwise) about something which you think is an issue that needs to be discussed. For example, this can be some incident on the road, or a long-standing problem with a place of delivery, or a peculiarity with one of the trucks. The important thing is that you have an idea about what you want to discuss with your peer.

A2.4 Supervisor meetings

About once every three months, you and your peer should meet your manager for a discussion about how you are progressing. The app will tell you when this is due, and then you should contact your supervisor and agree on a meeting. You can meet up together with your peer or only with your supervisor, depending upon what is best from a practical perspective. Remember that your manager will not have access to your personal data, only averages calculated for all drivers.



This is a meeting where the drivers should report on the status of coaching and driving, and discuss problems which the supervisor can help out with. For example, this could be changing schedules to accommodate sleep patterns, or changing routes to increase efficiency. However, what drivers choose to report about their own behaviour is something they decide for themselves. It is not mandatory in any way to share your actual data with your manager or your peer.

A3. Coaching techniques

A3.1 Introduction

The pages about coaching techniques describe what you as a coach and peer do in a session, and how you behave and respond. Later on, you will see pages about coaching tools. The distinction between these two categories might not be very clear, but tools tend to refer to specific cognitive mechanisms, while coaching techniques are more like general social rules for behaviour.

For coaching to be a good experience, the coach needs to be dedicated to the task, motivated to help, and know some basic coaching techniques. In order to coach others, a thorough knowledge of the tasks involved is necessary (which you as a professional driver already have about driving). This section will give you some basic tips about how to coach. In many ways, you might find that the advice given here is similar to how a supportive friend might behave in a discussion.

Further on, you can also learn about specific techniques for behaviour change. Here, the topic is more about creating an atmosphere of trust and relaxation. In peer-to-peer coaching, you should feel trust and confidence in the other person, and be able to share your thoughts and opinions with your peer. This positive coaching environment can be created by using the techniques described here.



A3.2 Preparations before the meeting

a) Prepare yourself: Coming to your meeting with ideas and knowledge about things to discuss shows that you take the coaching and your role as a coach very seriously. Read the suggested safety topic, and explore it further by looking at the links provided. Check your trips and events and see how you are doing. Decide on what you think is most important to discuss.

b) Contact your peer: Agree on the time for the session, and on what to talk about. Otherwise, this can be done in the beginning of the session. You should both suggest some topics and decide what is most important.

A3.3a During the meeting

1) Show mutual respect: Think of coaching as a collaborative relationship. You are both there to help each other.

2) Listen: A good conversation is not a monologue by one part, but an exchange of ideas, experiences and views, where each peer build upon what the other has said.

3) Ask questions. In a conversation, questions can show that you have understood what has been said, as well as pointing out when clarification is needed. Furthermore, they can influence what topics are discussed, and yield new ideas and insights. Most importantly, in a general sense, it shows that you take an interest in the topic and your peer. Use open questions as much as possible so that a discussion can be generated. Open questions begin with words such as 'how' or 'what'. For example, 'How can you learn from your mistakes?' and 'What can you do to improve your score?'.

4) Give feedback: We usually care very much about the opinion of others. It is therefore important in coaching to tell your peer what you think about his or her experiences and achievements. It is important to be positive about these things, as positive feedback is more effective in changing behaviour than negative feedback. Feedback also shows that you have listened and understood what your peer is saying.



When you have used the app for a while, it will be able to compare your current driving to your initial driving behaviour, and compare this to the company average. Hopefully, you and your coaching peer will have improved your scores, and this should be acknowledged as accomplishments.

5) Learn from each other: See the experiences of your fellow driver as opportunities for learning. Discussing both good and bad driving experiences with the aim of learning from these events is a good thing to do in the coaching sessions. We all make mistakes, but also make good decisions as drivers. Do not be judgemental about other's mistakes, but encourage others to learn from them. The app is constructed to tell you when your driving has been good as well as not so good, and it is important to discuss these occasions. What happened on the day that you scored well? What happened when you made a mistake and how did you respond? Share your own successes, mistakes, views, problems and worries with the aim of discovering how to continually improve as a driver.

A3.3b During the meeting

6) Offer advice: Telling other people what to do can be problematic, because it can often be seen as dominating the other person. Therefore, you should avoid phrasing your ideas in such a way as to give that impression. Giving a different perspective on things is often enough, or asking 'what if you try this...?' In this way, alternatives are presented for your peer to choose between, and you can discuss the likely outcomes of these.

Emphasize to your colleague the benefits of increased safety and lower levels of stress and fatigue etc. when driving but also the benefits for their family, other road users as well as the organization. In essence, everyone benefits in the long run when you are driving to the best of your ability.



It is easy to get stuck in a rut when you drive, taking the occasional risk, not planning ahead etc. In the short term the driver may think there is a benefit, such as finishing the journey more quickly. Such behaviour can easily be rationalized as 'everyone does it', especially if there is no negative feedback, or anything or anyone to compare the driver's performance with. If your peer expresses such beliefs, perhaps you should point this out, with the help of the app. Use open questions to enable your peer to recognise how bad habits can develop. In this way, you can use coaching to increase awareness of risks and identify solutions to the problem in a supportive peer-to-peer environment.

7) Support: DriveMate peer-to-peer coaching is designed to create a social situation where the driver feels that he/she has the support of other drivers in solving problems that are affecting their ability to drive safely. This can only be achieved if you trust your peer and feel able to raise issues that relate to your own problems and worries.

8) Socialize: The DriveMate coaching system emphasizes the positive effects of being friends with your colleagues, but also the wider benefits of a positive social network and family life.

An important part of building a relationship with your peer is to talk about yourself and encourage your peer to do so too. Knowing what another person likes and dislikes, does and does not do, their experiences and perhaps their future life goals is necessary if we are to say that we really know someone and want to call this person a friend. Sharing part of your own life is therefore necessary for trust and friendship to build. Also, remember that driving is part of your life, and vice versa. They are not separate, and it is therefore a good thing to share other aspects of your lives with your peer as well as your driving experience.

A4. Coaching tools

A4.1 Introduction

Within many areas of social work and medicine, behaviour changing techniques are used. In many ways, these are formalized common sense rules that are made more explicit. As you find out more about these different techniques you will probably recognize many of them as something you have done at one time or another, without consciously being aware of it. You use them for a good reason, as systematic application of these techniques is the most powerful way we know of improving behaviour.

However, using behaviour change methods does take some skill, knowledge and experience to achieve its full potential. The methods involved are therefore briefly described here, with examples. Then links are given to other sources which describe them in more detail. Again, how much you want to understand about this topic is your decision. Not everyone takes an interest in the details and good results can be achieved without knowing all the information available in the app.

The tools described here are extensively used within cognitive behaviour therapy. However, there are many other methods within that general area. If you are interested in learning more about this, you can find a general introduction in the link provided.

[Cognitive Behavioral Therapy](#)

A4.2 Goal-setting

The general goal of the DriveMate coaching is to help drivers to drive more safely. To achieve this, setting specific goals in small steps is a useful technique to change behaviour. However, goals must be realistic, meaning that they should be attainable within a reasonable time period. Improving scores by ten percent in a week may be

unrealistic, while one percent can usually be achieved, depending on the component of driving behaviour that is to be targeted. However, remember that as you improve, it gets more difficult to improve even more. Eventually you will reach your limit of optimal performance.

As a coach, you should encourage your peer to set a realistic goal, and follow up on progress in your next coaching session. You can do this by setting a goal for yourself too. In this way, a bit of competition can be added, as you are both trying to improve together. However, do not take this too seriously; the goal is not to show yourself to be a better driver than your peer, but to help him or her improve.

Example: If a driver has a bad score for braking, the goal can be to reduce this value by 2% in the next two weeks. The app can help tracking the driver's behaviour in relation to that goal.

https://www.mindtools.com/pages/article/newHTE_90.htm

<https://www.yourcoach.be/en/coaching-tools/smart-goal-setting.php>

A4.3 Self-monitoring

Behaviour is very often habitual and unconsciously guided, meaning that we do not usually think much before we act, or even think about what we have done afterwards. Also, most of our actions are not remembered at all, even if they are noticed. As a result, the consequences of our actions are often not visible to us. When driving a truck, it is difficult to know exactly how your behaviour affects other road users. It is also difficult to know how risky your behaviour actually is. However, noticing one's own behaviour is a good start to becoming consciously aware of any risks.

Self-monitoring means taking notice of one's own behaviour, and thinking about the possible consequences. Telematics-based devices (black boxes, smart phones and plug-in devices) help drivers with this because they can gather a lot of information which cannot be measured or remembered by the driver, even if it is noticed. The



DriveMate app has this kind of goal; it helps you with monitoring your own behaviour, seeing what you actually do, and putting it into the perspective of how your driving compares to others'.

However, the app is only a support tool. The important outcome of coaching is that you become aware of how you drive, and why. In the end, only you can develop an insight into the reasons why you drive in a certain way (although of course we hope you will discuss this with your peer/coach).

Self-monitoring is about acknowledging what you do, comparing it to a benchmarked standard, and concluding what needs to change. In the first instance, if you do not pay attention to your own behaviour, it will never improve.

As a coach, you should encourage your peer to self-monitor. This could take the form of thinking about what you could have done differently when you notice a mistake in your (or others') driving, or by accessing the app every time you have ended a trip and looking at the scores while you still remember what happened. Making notes after each trip can also be a good habit to develop.

<https://www.psychologytoday.com/us/blog/more-tech-support/201009/self-monitoring-made-easy>

A4.4 Social support and acceptance

Humans are usually very sociable creatures, and many things we do have a social component to them. The feeling of having others' acceptance, liking and support is a very powerful reason for the ways we act. Our interest in social media is all based upon this general principle. Therefore, if you are to change someone's behaviour (or your own), pointing out or showing the social effects of a change can be a good tool.

Examples:

Discussing traffic safety, fuel consumption and how to be a good driver (for example) is in itself a signal that you think those topics are important. Furthermore, what you say about them indicates what kind of behaviour you favour when driving. This tells your peer something about how he/she should behave to be socially accepted.

A more practical example would be if you calculated the total amount of fuel used on two different routes which could be used for the same run. Sharing the result with your peer (route A uses x% less fuel than route B) not only gives your peer useful information, but it makes a statement about what, in your opinion, is important.

A4.5 Instruction

If you or your peer have difficulty with some aspect of driving behaviour (like taking your foot off the accelerator earlier and/or avoid using the brakes a lot), the simplest strategy to change this kind of behaviour is with the old-fashioned instructional approach. Here, the instructor would point out the problem and tell/show what to do. This is what people usually do when they have knowledge about a particular topic and notice that others do not.

However, when using this approach it is important not to start lecturing, assuming that your knowledge is superior in all respects. This is a rather common fault which is often irritating for most people. Instead, you need to remember that your peer is your equal and that you both have knowledge that can be useful for the other person. The technical term 'instruction' may actually be a bit misleading. 'Sharing and discussing information and problems' would perhaps be a better description.

Example: One of the most common errors in safe driving is not to release the accelerator and reduce speed by coasting so that braking is avoided when it is safe to do so. Teaching someone this habit may require that you are in the vehicle together. Here, you may indicate to your peer the point at which you would start coasting and point out what information you are using to make this decision. Afterwards, you can



discuss how the information needed to make that decision is gathered, what might be the trigger points and how these behaviours can be trained over time.

A4.6 Feedback

In DriveMate, we make a distinction between information and feedback. Information is, for example, the values the app calculates for your driving behaviour (for example number of harsh brakings in this trip'). Feedback is the evaluation of your behaviour ('you did not have a single harsh braking on this trip - good work').

Feedback is related to social support in that it sends a signal about what you think of various things. However, feedback can be both negative and positive. Often, we have to use negative feedback ('you did not do so well here'), but the positive variant is preferable, because people respond much better to it.

As a coach, always remember that positive feedback is preferable. Try to put a positive spin on things, and concentrate on the improvements. Also, remember that things cannot always improve, there will always be setbacks from time to time. This is natural, and therefore no big deal. It is the long-term trend which is important.

Example: Your peer has had as a goal to improve their smoothness score, but since your last session, their values have deteriorated. You might then look at trip values and point out that some of them are better than usual, and looking at the worse values, you try to see whether there is some kind of apparent explanation, such as driving in congested areas. Other explanations might be sleep problems, personal worries that have been distracting etc. Asking a general question about whether your peer had encountered any problems when the bad driving occurred might yield useful information for coaching. Your discussion about the problems would help them to reflect on how these factors affect their driving. However, the important thing is to indicate that setbacks are to be expected, and that understanding why these things



have happened is good for behaviour change. This information is therefore useful to help your peers to improve their driving safety.

A4.7 Graded tasks

As described in a different section, setting a goal is a strong incentive to change behaviour. However, as pointed out, the goal must be realistic, meaning that it must be possible to achieve. Very few people can realistically have the goal to become the best in the world in something, but most people can improve. Therefore, the goal should reflect this.

Setting graded tasks is really like having several short-term, low-level goals of improvement.

When it comes to driving, there are many different behaviours, undertaken over time. It is therefore possible to address them one at a time, and in degrees, which make graded tasks a useful method to improve driver behaviour.

Examples:

The app might have indicated that you are speeding more than most other drivers. This might not be a conscious behaviour at all, but simply a failure to check the speed. If you have been alerted to this problem, you might start by identifying a certain part of the road where you tend to speed a lot (perhaps because it is an easy straight road and usually has little traffic). Then you set as your goal that you will avoid speeding in this particular location, making a mental note of this particular road. You are then reminded that there is something you need to do when you are driving on this road next time. After managing to remember to check your speed in this location and reducing your speed, you can continue to add places like this and reducing your speeding overall over time.

Alternatively, your speeding might be due to stress of some kind. In that case, the problem is different, and you need to break it down into other parts. For example, you



might talk to your manager about your work situation, pointing out that there is not enough time to drive on certain routes and that this affects your driving. Alternatively, you might start some graded tasks to start planning your journeys in more detail, adding extra time to your estimated journey time.



Appendix B: Safety topics presented in DriveMate

These topics are presented in the coaching alerts, as suggestions of topic to be discussed in coaching.

1. Introduction to driving safety topics

1.1 Using driving safety topics

1.2 General overview of driving safety topics

2. Health, well-being and driving

2.1 Health, well-being and driving: Introduction

2.2 Health, well-being and driving: Impairments and diseases

2.3 Health, well-being and driving: Medication

2.4a Health, well-being and driving: Exercise

No topic: Supervisor meeting

2.4b Health, well-being and driving: Exercise

2.5 Health, well-being and driving: Food and nutrition

2.6 Health, well-being and driving: Stress

2.7 Health, well-being and driving: Fatigue

2.8 Health, well-being and driving: Sleep

2.9 Health, well-being and driving: Mental health

No topic: Supervisor meeting

2.10 Health, well-being and driving: Social relations



3. Patterns and causes of truck crashes

3.1 Patterns and causes of truck crashes: Introduction

3.2 Patterns and causes of truck crashes: Statistics

3.3 Patterns and causes of truck crashes: Single crashes

3.4 Patterns and causes of truck crashes: Weight and size

3.5 Patterns and causes of truck crashes: Suicides

No topic: Supervisor meeting

3.6 Patterns and causes of truck crashes: Roll-over

4. Consequences of crashes

4.1 Consequences of truck crashes: Injury and fatality rates

4.2 Consequences of crashes: Psychological effects

4.3 Consequences of crashes: Costs

5. Driver behaviour

5.1 Driver behaviour: Standard ecodriving

5.2 Driver behaviour: Advanced ecodriving

5.3 Driver behaviour: Social ecodriving

No topic: Supervisor meeting

5.4 Driver behaviour: Alcohol/drugs

5.5 Driver behaviour: Anger/aggression

5.6 Driver behaviour: Distraction



B1. Introduction to driving safety topics

B1.1 Using driving safety topics

When you get an alert for a coaching (or driver development) session, you will also get a suggestion for a discussion topic which concerns traffic safety in a wider sense. The factors described are those which concern the individual driver, meaning that these are things you can to some degree control and change. Bad roads, vehicles and drivers are things which you cannot really do much about (apart from driving more carefully). Your own sleeping, health etc, on the other hand, are things which you can influence.

The information in this app which is called driving safety topics (it will appear as 'Topic') has the purpose of making drivers aware of things which influence driving safety, but may be less obvious when driving. This is accomplished in two slightly different ways; by informing you about these factors, and by being a topic for discussion in your coaching sessions. The aims are to increase your knowledge and interest in such factors.

When you get an alert with a topic, please read the text and then explore the topic further by clicking on links. This will raise your awareness of many distal factors which influence your qualities as a driver.

The pages which you will find under the topics heading also contain links to further information. There is a wealth of such knowledge available. The information about driving safety factors will be presented in a pre-set sequence, under a few different headings. Pages which you have read will be available from your profile screen. You can therefore always re-read old material.

It is important for your own and your colleagues' development as drivers that you read and think about the factors you will come across in this function of the app. Hopefully, this will lead to a more general interest on your side of looking for traffic



safety information and discussing this with your peers and your supervisor. Safety starts with awareness of your own behaviour and vulnerability, and the understanding that you can do something about it.

B1.2 General overview of driving safety topics

Transportation, especially by road, is one of the leading causes of death and injury in the world. This situation will probably deteriorate further as more people get access to vehicles, and world-wide transport increases.

Driving a truck is a serious responsibility; heavy vehicles are over-represented in road traffic crashes, especially fatal ones. This is due to both the difficulty of driving such a large vehicle and the consequences when it hits something.

In the 'Topic' section, you can read about various aspects of traffic safety, especially as it concerns you as a truck driver. Most crashes are caused by human errors, and knowing what factors exist can help you to avoid being involved in such a mishap.

Furthermore, these pages (and the MeBeSafe coaching) take what can be called a holistic approach to driving, meaning that it is not just about what you do in the truck that counts as important. As a driver, especially a professional, you bring with you aspects of your life to your driving. This means that to be a good driver, you need to have a balanced lifestyle and good health.

You will also find pages about ecodriving, common causes of truck crashes etc. This is all part of a holistic approach to safety; as many factors as possible should be described, to further your understanding of the complex pattern of circumstances which accompany all crashes.

B2. Health, well-being and driving

B2.1 Health, well-being and driving: Introduction

Being in good health is important for good driving. There are several aspects of this which have been found to be associated with crash involvement, some of which will be described here. For example, being over-weight often increases snoring during the night, which might lead to sleep apnoea (lack of air leads to partial waking up and disturbed sleep), and thus fatigue during the day. Finally, driver fatigue increases the risk of crashing by several times.

Included in the concept of health is also mental well being. This ranges from normal reactions to life stressors to what is considered abnormal.

Unfortunately, the conception of health is not an easy one and there is a lot of controversy about it, especially concerning food. In general, you should be aware that the claims of super-diets are always contested by others. For most of the other factors of health described here, however, there is a proven direct link with traffic safety. The following subpages describe these links in a very general way, and give links to other, more detailed, sources of information. Most of these come from the World Health Organisation (WHO). This is a dependable source of information, in contrast to much of what can be found on the web.

It can also be noted that most of the personal health, well being and lifestyle factors described here are not regulated by law, or by transportation company policies. Therefore, it is even more important for you to monitor them and self-regulate if needed. After all, there are many benefits for taking good care of yourself as well as for good driving.

<https://en.wikipedia.org/wiki/Health>

B2.2 Health, well-being and driving: Impairments and diseases

Several different deviations from good health have been found to be linked with crash involvement; hearing and vision impairment, cardiovascular and neurological diseases, diabetes and mental disorders. A driver with such impairments should therefore be extra careful, and take this up with his doctor and his supervisor. The important aspect of this is to be aware of the problem. It is very probable that most drivers compensate for these extra risks by avoiding certain situations and therefore can continue to drive safely. However, the risks of alcohol and illegal drugs, on the other hand, are much larger and strongly increase with the dose, and are not possible to compensate for. Similarly, excessive tiredness caused by sleep deprivation has serious implications for your ability to drive safely.

B2.3 Health, well-being and driving: Medication

Medications are prescribed to improve some aspect of health, but can also be a risk in itself. However, it is usually not possible to determine whether it is the disease or the medication which is causing the risk. Thus, crash frequency has been found to increase for driving on medication in general, although it is usually not possible to say exactly which medications are dangerous. However, drugs such as analgesics, antihistamines, benzodiazepines, antidepressants, hormones and barbiturates are among those which have been implicated as risk-inducing, as are medicines for diabetes, arthritis, cardiovascular disease, ulcers etc. Further lists and information can be found on most countries' transportation department homepage.

In general, all kinds of medications should be treated with care, especially if taken in combinations. Taking certain medications means that you are not allowed to drive. Consult with your doctor, company health officials and your supervisor if you need to take medication. Remember, in the end it is always you who have the responsibility for your driving, as can be seen on the departments' homepages; if you are influenced by drugs/medications in some way detrimental to your senses, reactions and/or



thinking, you should not drive. If you do, you can be charged with driving under the influence.

Link to further reading;

<https://www.fda.gov/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/EnsuringSafeUseofMedicine/DrivingWhenYouAreUsingMedicine/default.htm>

B2.4a Health, well-being and driving: Exercise

Keeping fit is one part of staying healthy, and although lack of fitness in itself has rarely been investigated as a crash risk, copious amounts of research have associated fitness with general health and well-being. For example, the sedentary nature of driving almost triples the risk of developing Type 2 diabetes. Therefore, to be a good driver, exercise is important. Regular exercise is good for your general health and your sleep. Also, exercise comes in so many forms, there is always something you can do, regardless of your age, health and fitness. Find something which suits you and do it. There is a wealth of information about exercise on the web, and here we just suggest a few of them, according to your level of fitness.

There are many simple exercises that you can do while you are taking a break from your driving. Walking ten times around the truck and climbing in and out of the cab a few times instead of staying inside on a break will make a difference. You can also carry with you exercise equipment, like running shoes and rubber exercise bands, and use them during your breaks. Even a leisurely walk is better than sitting still.

Links to information about exercise:

<https://www.youtube.com/watch?v=vkq0-jvz1Dc>

<https://www.bodybuilding.com/fun/wotw10.htm>

http://www.who.int/topics/physical_activity/en/

B2.4b Health, well-being and driving: Exercise

Are you getting enough exercise to stay healthy? It is difficult to give exact recommendations on what is enough, although more is usually better. Most people today are very sedentary, meaning that they do not get enough exercise. The World Health Organization recommends 150-300 minutes of moderate to vigorous physical activity per week for adults, preferably involving all major muscle groups.

We have linked to a calculator for physical activity level (in Swedish), so you can see how large your energy expenditure is. The various activities listed are not very many, but you will have to judge what kind of activity seems closest to the one you undertake. Also, the page does not save your data, so do not change page without making a note of your value.

Another calculator we have linked to is more advanced, the Peacounter, as you can calculate your food intake needs. However, its list of activities is also rather limited. Suggest remove this

<http://matkalkyl.se/rakna-ut-pal.php>

http://www.peacounter.com/con_en.php

<http://www.ivyroses.com/HumanBiology/Nutrition/Physical-Activity-Level.php>

B2.5 Health, well-being and driving: Food and nutrition

Just like exercise, healthy eating is not ordinarily considered important for traffic safety, and there is no direct evidence for this link. However, eating is part of health in general, just as exercise. For professional drivers, obesity and its associated medical problems has always been a problem, due to the lack of physical movement on the job. It is therefore even more important for professional drivers to be aware of what they are eating. While on the road, it is easy to eat fast food with doubtful



nutritional qualities. A simple method to avoid this is to always keep fruit and vegetables with you in the truck.

The World Health Organization has recommendations about diets, see link.

You might want to calculate your Body Mass Index; divide your weight in kilograms twice by your height in meters. In the links provided, you can read about what the value means.

<http://www.who.int/topics/obesity/en/>

<http://www.who.int/mediacentre/factsheets/fs394/en/>

B2.6 Health, well-being and driving: Stress

As stress is often a transient phenomenon, it is difficult to measure and relate to crash involvement. The current evidence is therefore rather weak concerning this link. However, some of the large number of crashes apparently due to distraction can be suspected to be caused by stress. Furthermore, many professional drivers, especially bus drivers, suffer from the effects of stress, which have results such as hypertension and other cardiovascular problems.

You can also take a stress test, provided in the link on this screen. This will tell you whether you are continuously stressed (this is not always something we notice ourselves).

https://www.mindtools.com/pages/article/newTCS_82.htm

Links to further reading;

http://www.who.int/occupational_health/topics/risks_psychosocial/en/

<http://www.brake.org.uk/ruralroads/15-facts-a-resources/facts/487-driver-stress>



B2.7 Health, well-being and driving: Fatigue

In general, you should not drive when you are tired. This increases the risk of crashing many times over. However, the term fatigue covers many different aspects of bodily weariness. It can be sleepiness due to the time of day, or lack of sleep the last night, or chronic tiredness from too much work, lack of quality sleep and a number of other mechanisms and combinations of those. Each of these may of course be caused by a myriad different factors. In research, these factors are seldom differentiated, but for purely statistical and methodological reasons, chronic fatigue is more well known. However, this does not mean that other types of tiredness are not risky.

Knowing whether you are dangerously tired may not be easy. Fatigue might have become such a common part of your life that you do not even think about it. Below you can therefore find a link to a test of fatigue. Such self-reports are crude measures, as it is difficult to remember how much sleep you have had (and sleep apnoea is not even something you are likely to notice yourself). Therefore, you should take the results of the test as a rough guide, but if you score highly you should discuss this with your doctor and/or supervisor. Keeping a sleep diary might also help you to see if there is a problem.

Links to further reading about fatigue and safety

<http://newsroom.aaa.com/2014/11/one-five-fatal-crashes-involve-drowsy-drivers/>

<http://www.brake.org.uk/rsw/15-facts-a-resources/facts/485-driver-tiredness>

<http://www.pacts.org.uk/2016/03/fit-to-drive/>

<http://etsc.eu/tag/fatigue/>

<http://think.direct.gov.uk/fatigue.html>



B2.8 Health, well-being and driving: Sleep

As described in the previous topic, fatigue in driving leads to a high risk of crashing. Fatigue is often caused by lack of sleep and/or bad quality of sleep. Here, you can see some links to more information about sleep; why we need to sleep, and factors that cause bad sleeping quality.

<https://sleepfoundation.org/sleep-disorders-problems-list/how-spot-sleep-apnea-early>

<https://www.bbc.com/ideas/videos/five-compelling-reasons-why-we-all-need-to-sleep-m/p06fshzv>

B2.9 Health, well-being and driving: Mental health

Bad driving has been linked to factors such as high levels of anger and aggression, ADHD, and various psychological disorders. Calm and efficient driving requires a well-balanced mind, and factors such as those mentioned disrupt this, in similar way to stress and fatigue.

Below is a link to a test for mild forms of mental distress of various types. If you have been feeling bad, with various strange sensations (bodily and/or cognitive), you can see whether there is cause for concern by completing this form. The sensations/symptoms can be things like fear, pain, fatigue, lack of interest in things, emotional swings etc without any good reason.

Please remember that mental health is not an either/or state. Just like fatigue or fitness, you can always be somewhere along a continuum, having just a few mild symptoms (which can often be difficult to distinguish from effects of stress). There are therefore good reasons to take notice of your own behaviours and feelings, and ponder whether they are unusual in some way.

B2.10 Health, well-being and driving: Social relations

In traffic safety, the relationships between people are seldom discussed. Yet, humans are very sociable, and usually work and live within a social context. When driving, we are somewhat isolated from the direct interaction with other people, as we cannot talk to the other road users, and seldom even recognize them. This can lead to our behaviour being different when we know that the people around us do not know who we are. The lack of social accountability (being held responsible for your actions by others) in traffic is a problem. Many drivers lack a sense of responsibility, and act without respect for other road users because these people are not known to them, and they are unlikely to meet again.

However, this apparent lack of social interaction and accountability is to some degree an illusion. As soon as an incident takes place, we experience the full negative impact of what we have done, because we are then forced to interact with others under rather stressful circumstances.

To be a good driver, and a good driver coach, taking the social perspective into account is one useful method for bringing this about. This means that if you forge good relationships with your colleagues and share your driving experiences with them, you will likely influence their behaviour, as well as your own.

However, social relations probably also have a more indirect, but just as important, impact upon your driving. As humans are social beings, keeping good relations to family and friends is very important to us. A lack of good relations may have an adverse impact upon your driving, because you do not feel content.

As a driver of a heavy vehicle, your own and other's safety is therefore to some degree dependent on you having a good social life.

B3. Patterns and causes of truck crashes

B3.1 Patterns and causes of truck crashes: Introduction

It is commonly accepted that at least ninety percent of road traffic crashes are to some degree caused by human error. Given such a high figure, it might be concluded that we need to look no further than the driver for the cause of crashes. However, it is also well known that different environmental factors have an influence on accident rates, like weather, light, weight/size of vehicle and road type. It can therefore be said that under certain circumstances, road users are more prone to make mistakes. These tend to be when visibility is low, the road travelled is complex, traffic density is high etc.

To help you to be vigilant at the right time, information is presented here about some common types of truck crashes, and what causes them (if known). However, when the risk of a factor is to be estimated, things get complicated. The problem is that it is usually not possible to ascertain exactly how events unfolded and what was the main cause in a crash.

Also, remember that the causes of truck crashes might be different between countries, as the driving environments may also differ. This is not only because the traffic rules differ, there are also differences in weather, roads, vehicles and driver behaviour. Much research on truck crashes comes from the U.S., and so might not be exactly applicable to where you are driving. However, some insights can be gleaned from this research. In the section about crashes, some categories of common truck crash types are presented. The aim is for you to understand the mechanism behind each different factor so you can apply this situation to your own.

However, it should be apparent that it is very difficult to categorize crashes. Different countries use somewhat different categories in their statistics, and neither do researchers agree on a common typology. It is instead the case that how crashes are

placed in various groups tends to reflect the purpose of the data gathering, as much as it shows any objective features of the crashes themselves.

Therefore, when you read about features and statistics of truck crashes, you should remember that not everything will be directly applicable to your own driving environment. However, there are often features which you can understand as relevant for what you are doing and experiencing on the road.

In the truck crash section of the safety factors information, you can read about statistics for different types of crashes, and in somewhat more detail about what causes them, how they unfold and what the consequences are. Meanwhile, the US has a special administration for heavy vehicles, where lots of information about all aspects of these can be found (please see link).

<https://www.fmcsa.dot.gov/>

B3.2 Patterns and causes of truck crashes: Statistics

When talking about statistics for road crashes, this can be done in two different ways. The most well known approach is to present data for the number of crashes, most often for a few different categories, such as fatal and injury crashes. This information can be presented as the numbers per year, per type of vehicle, as trends over time etc. However, even here, it should be apparent that raw numbers do not really tell us much, and that we cannot lump together all crashes into a single number and get some meaningful information from this. Instead, we need to categorize, dividing the numbers into different groups of happenings with similar features.

Although the commonness of a factor in the crashes themselves is only a crude estimation of the risk given the presence of the factor, the numbers do to some degree reflect what is causing crashes. The information about truck crashes has been compiled from a number of reports, which you can download and read for yourself if you want to, for example;

Craft, R. (2007). *The Large Truck Crash Causation Study. Analysis Brief*. FMCSA-RRA-07-017. Federal Motor Carrier Safety Administration.

Federal Motor Carrier Safety Administration (2013). *Large Truck Crash Overview 2011*. FMCSA-RRA-13-002.

B3.3 Patterns and causes of truck crashes: Single crashes

Single truck accidents without any other road user involved tend to happen due to fatigue or falling asleep at the wheel. The risk for this is highest in the late night-early morning hours, but some investigations also suggest there may also be a peak in the early afternoon. In total, single crashes are somewhere between five and ten percent of all crashes, but a higher percentage of those where the truck driver was judged to be at fault. They are also twice as common on rural roads as in urban areas. This probably reflects the lower cognitive load and arousal when driving in environments with low complexity. It is therefore extra important to be well rested when driving in rural areas and on highways, and to take notice of any signs of tiredness.

Jack-knifing is a kind of incident which is often the pre-cursor of a single vehicle crash, and which is peculiar to articulated vehicles. It is mainly a risk when roads are slippery. However, it is a small risk; in the US, only about one percent of truck crashes are due to initial jack-knifing. This risk will of course increase with lower temperatures and in some cases other reasons for slippery conditions, such as wet leaves on the road. Yet another cause of jack-knifing is faulty brakes on the trailer. If the tractor brakes harder than the trailer, the latter will start pushing the tractor, and sooner or later this will cause them to shift to the side.

B3.4 Patterns and causes of truck crashes: Weight and size

Although this might seem counter-intuitive, most evidence indicates that larger and heavier trucks are at less risk of crashes. Also, trucks without load are at higher risk. Actually, the highest risk of all is for tractors without any trailer (bob-tails). The



reasons for this are not known, but it can be speculated that drivers tend to compensate for the perceived difficulty of driving a certain rig by driving more carefully with increasing weight and size.

Currently, many European countries are considering increases in the allowed size and weight of trucks, and much research is going on into whether this will have an effect on safety.

B3.5 Patterns and causes of truck crashes: Suicides

Not all road crashes are accidents. Some are on the contrary deliberate. People who want to take their own lives have a large number of different possibilities, but causing a frontal crash with a truck is probably one of the safe ones (in the sense that the chances of surviving are very slim). Although this kind of problem is even worse for train drivers, the risk of being the unwilling cause of another person's death is a significant risk for truck drivers.

Today, many truckers are using dash cameras, and examples of suicidal driver behaviour are available on the web, if you want to look into this. Unfortunately, it is almost impossible for the truck driver to do anything about this, as the behaviour is not predictable.

B3.6 Patterns and causes of truck crashes: Roll-over

When a truck flips over on its side, or even its roof, this might be due to several different problems and actions of different drivers. This kind of crash is a risk especially for tankers and concrete mixers, which tend to have a high centre of gravity. We have provided some links to information about how to prevent this.

[Large Truck and Tanker Rollover Prevention - AIG www.aig.com/.../us/.../plcb-large-truck-rollover-prevention.pdf](http://www.aig.com/.../us/.../plcb-large-truck-rollover-prevention.pdf)

[Rollover Prevention: Heavy Goods Vehicles - Health and Safety ...](#)

https://www.hsa.ie/eng/.../Rollover_Prevention_Guide.pdf

B4. Consequences of truck crashes

B4.1 Consequences of truck crashes: Injury and fatality rates

It is well known that trucks have a higher rate of injury and fatal crashes than other vehicles, if counted per vehicle. This is due to the higher weight and sturdiness of those vehicles. In general, the drivers of the trucks are well protected, and it is instead other road users who are hurt. For every truck occupant killed, about six other people die.

Although truck safety would seem to be increasing in many parts of the world, it is still a cause for concern, as many different figures imply. Also, transportation is increasing everywhere, so the sheer number of heavy trucks will have an impact on the total number of crashes.

Links:

<https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts>

[Large Trucks - CrashStats - NHTSA](#)

<https://crashstats.nhtsa.dot.gov/Api/Public/Publication/812373>

B4.2 Consequences of truck crashes: Psychological effects

One much overlooked fact about being involved in a crash or a near miss (or just seeing it) is the psychological effects it might have. Post-traumatic stress syndrome (PTSD) is probably the most well known, but still rarely discussed and/or researched result of such incidents. Still, if you have been injured in a crash, the chances that you develop PTSD are more than one in ten, increasing with the severity of the accident/injury.

PTSD is a psychiatric disorder resulting from traumatic events. It is defined by re-experiencing the event, avoidance of similar situations and increased arousal. These symptoms tend to have negative effects on behaviour and well-being and might persist for some years. Please also remember that adverse psychological effect of crashes can be found not only among those in the crash itself, but also in their families and friends, as well as the emergency personnel.

B4.3 Consequences of crashes: Costs

There are many costs of truck crashes, apart from the psychological effects of those involved, as described in a previous topic. The damage to the truck and other vehicles maybe the most salient cost, but there are also those of emergency services, medical services, damage to the built and the natural environment, productivity loss for the carrier, and the extra time and petrol used by other road users due to the delays in traffic. There might also be legal costs.

If you want some figures on the costs of truck crashes, you can access several different documents.

<https://rosap.ntl.bts.gov/view/dot/32>

B5. Driver behaviour

B5.1 Driver behaviour: Standard ecodriving

It is well established that how you drive has a strong influence on fuel consumption. Differences of up to thirty percent have been reported from controlled trials. As a professional driver, you have probably heard about this, and been trained too. Here, we will therefore only summarize the main points, without going into a lot of detail. Furthermore, remember that ecodriving and safe driving share many features, although they are not quite the same. Sometimes they do not agree. For example,



emergency braking is not good for fuel but is critical for safety. In this kind of instance, safety must take precedence.

In essence, ecodriving is about planning ahead in your driving, using the momentum of the vehicle in coasting and exhaust braking. It is possible to hardly use the brakes at all, even in a city environment. However, it should be acknowledged that ecodriving takes its toll on the driver; constant vigilance and planning is tiring.

Standard ecodriving practices:

Plan ahead and release the accelerator so you can coast (engine brake) whenever there is a need to reduce speed. Whenever you use the brakes, you use up energy which you have accumulated by burning fuel. This means that you need to be really vigilant and look and plan far ahead. You can find many videos of ecodriving tips on the web.

<https://www.youtube.com/watch?v=bEqn2-obcYI>

B5.2 Driver behaviour: Advanced ecodriving

Although the general principles of ecodriving are applicable to all vehicles and environments, there are also some further refinements which you can use if you know your vehicle well.

1) At what rpm does the fuel injection shut off when you start coasting? This is different for different engines, which is why you need to know this for each vehicle you are using. The problem is that some engines need to achieve a rather high rpm (2000+ for petrol engines in some Volvo and BMW models) to cut off fuel and coast. This means that if you are coasting, and need to change gears downward, a shift from fifth to fourth will not achieve the rpm needed, and you will be engine braking but still using fuel. If you instead shift from fifth to third or even second, you will reach the needed rpm.



Unfortunately, it is often difficult to know when fuel is shut off and turned on again. In older vehicles, it was possible to feel a jolt when it was turned on, but this is usually not so in modern ones. If the information cannot be had from the maker, you have to rely on the instantaneous fuel consumption meter to know the cut-off. This, however, is a bit difficult, and will be described under the next section.

2) Making sense of the fuel consumption meter is often difficult, if we want to achieve low fuel consumption by changing our behaviour at a very detailed level. There are two problems involved; the difficulty for humans to integrate information over time, and the construction of fuel consumption meters. If you are driving at a an RPM of about 2500 in a car, and start coasting, the fuel consumption meter will show a declining value for several seconds before it reaches zero. This is not actually a true reading, because the fuel injection shut off as soon as you released the accelerator. The reason for the lag in the meter is that makers use what is called a moving average, i.e. the meter is showing the average fuel consumption during the last ten seconds or so. The values shown may therefore be difficult to relate to your own behaviour.

3) How to accelerate is something which is still contested in ecodriving teaching. Some say it should be gradual, not using the full power of the engine. However, there are also those who contend that full power should be used. The reason for this can be found in an engine map, which plots load (amount of energy used) versus rpm. For most engines, there is a sweet spot where load is fairly high, but rpm is in the middle range. The problem is that in lower gears, it is difficult to achieve high load unless you use full throttle, or is driving on an incline. At higher gears, you automatically get higher load. This is the reason why it is important to drive in the highest gear possible.

4) Driving at an even speed is actually not the most efficient way of ecodriving. A flat motorway uses more fuel than a road with many turns and hills, if you negotiate it in a certain way. This counter-intuitive statement is explained by the same fact as the



heavy acceleration behaviour; engines are over-sized and under-loaded. Therefore, changing between heavy load (accelerating or going uphill) and coasting uses less fuel than an even speed (and engine load).

B5.3 Driver behaviour: Social ecodriving

The social part of driving in an economical manner might actually be the most difficult hurdle to overcome. The main tool, reducing speed slowly by coasting, often has as a result that you have a tailgating queue behind you when you reach the junction, traffic light or roundabout which has prompted you to decelerate. This might be rather uncomfortable, knowing that drivers behind you are probably annoyed with you (as tailgating people probably are).

There is no easy solution to this social dilemma, and you simply have to make a choice about what you consider most important. Most of us easily yield to social pressure and try to conform to the people around us. This, however, is not a good behaviour in traffic, as most drivers do not use adequate caution or foresight. It is also worth considering that everyone of us has the possibility to change the traffic culture. As more and more drivers change their behaviour, perhaps by observing your fuel efficient driving, slowing down by coasting as you approach a junction eventually becomes the norm.

B5.4 Driver behaviour: Alcohol/drugs

The risks of driving under the influence of mind-altering substances is probably the most well-researched and consistent sub-field of traffic safety. There simply is no safe amount of drugs which can be used in driving, and the risk increases strongly with the dose taken.

Although this is difficult to estimate with certainty, it would seem probable that at medium and high doses the crash risk is way higher than for any other known traffic safety factor.



In trucking, a few percent of crashes are deemed to be due to alcohol and other drugs. This is about a tenth of the corresponding value for other types of vehicles.

Truckers thus have a good safety record when it comes to drugs, but a zero tolerance is preferable. Never drive while intoxicated or hung over, and keep an eye on your colleagues too. Remember that cannabis/marijuana has effects which might last for days, and that there are many new drugs which have totally unknown effects.

B5.5 Driver behaviour: Anger/aggression

Feeling angry when driving is usually a symptom of a wider syndrome of anger. Truck drivers are probably less likely to be prone to anger and aggression (at least if they are employed by someone) because angry drivers are unlikely to want to drive for a living and employers are not likely to employ them for the longer term. However, it can be beneficial to remember that this state of mind is at odds with safe driving. If you or someone you know seems to react with anger and even aggression in situations which are common to us all (like someone cutting in in front of you after a risky over-taking), you might want to give this some thought and do something about it.

Links:

<https://www.safedrivingforlife.info/blog/how-beat-driver-stress>

<https://www.rosipa.com/road-safety/advice/drivers/better-driving/road-rage/>

B5.6 Driver behaviour: Distraction

Taking your eyes (or just your mind) off the road for a few seconds is dangerous in the fast-paced traffic of today. Unfortunately, in the last few decades, we have also been provided with a number of electronic gadgets which cause distraction if you use them while driving. The cell phone is probably the main cause of concern, and handheld phones have been banned in many countries. However, many other devices



have the same potential for disturbing your concentration, although not for such extended periods of time.

Distraction is probably an important factor in truck crashes, although it is often difficult to ascertain the exact chain of events. In a recent report from the US, the category (failure of) Recognition (by truck driver) was given as a critical reason for twenty-eight percent of crashes. This includes different reasons for failing to see the risk for what it was, but distraction inside the cab is probably the most important one. This can include several different forms of distraction including eating and drinking whilst driving, but using a phone is probably the most common problem.

<https://ai.fmcsa.dot.gov/lccs/>

Appendix C: Driving competencies survey

The driving competencies survey measures drivers' level of knowledge about safety topics. The drivers are presented a small number of facts per specific topic (e.g. 5 facts about speeding, distracted driving, etc.) and asked to rate them on how surprised they are about these facts. If a driver is not surprised about a certain fact it is because s/he is already aware about this safety driving aspect and therefore, there is no benefit in discussing this topic within the next coaching session. If, on the other hand, the driver indicates for a majority of facts him/her being surprised, the feedback is given to discuss this topic at the next coaching session as the driver could benefit from this discussion. A collection of safety driving facts for the central topics of speeding and unsafe driving behaviour, distraction and fatigue was compiled and, if needed, reformulated in order to make them accessible for a wider audience (see table below).

Speeding & unsafe driving behaviour

Original fact	Formulated App fact	source	country
"Speeding increases the risk of a crash by 13 times"	"recent research shows that speeding increases the risk of a crash by 13 times."	Dingus et al., 2016	USA
"Speed is one of the main factors in fatal road accidents"	"According to accident statistics, speed is one of the main factors in fatal road accidents."	Department of Transport UK (https://www.think.gov.uk/campaign/road-whisperer/#speed)	UK



"light speeding is more frequent than severe speeding, and that the night and rush hours are most popular for speeding."	a) "light speeding is more frequent than severe speeding."	UDRIVE Data, Dotzauer et al., 2017	Europe
"light speeding is more frequent than severe speeding, and that the night and rush hours are most popular for speeding."	b) "night and rush hours are most popular for speeding."	UDRIVE Data, Dotzauer et al., 2017	Europe
"Travelling 65km/hr in a 60km zone would only save 46 seconds over a 10km stretch of road if travel is not affected by other cars and traffic"	*	Transport Accident Commission (http://www.tac.vic.gov.au/about-the-tac/media-room/blogs/articles/the-facts-on-speeding)	AUS
"Following too closely increases the risk of a crash by 13.5 times"	"A US study showed that following too closely increases the risk of a crash by 13.5 times."	Dingus et al., 2016	USA

Driver Distraction

Original fact	Formulated App fact	source	country
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„secondary tasks or activities, particularly resulting from the use of handheld electronic devices, are of detriment to driver safety - dialling on a cell phone, for example, increases the risk of a crash by 12 times"	"A US study showed that, for example, dialling on a cell phone increases the risk of a crash by 12 times."	Dingus et al., 2016	USA
"inattention was present in approximately two-thirds of crashes"	"A recent US study showed that driver inattention was present in about two-thirds of crashes."	Dunn et al., 2014	USA
"texting, which had the highest odds ratio of 23.2, also had the longest duration of eyes off forward roadway (4.6 s over a 6-s interval). This equates to a driver traveling the length of a football field, at 55 m/h, without looking at the roadway. Other high visual attention tasks included those that involved the driver interacting with technology: calculator (4.4 s), dispatching device (4.1 s), and cell phone dialling (3.8 s)"	"While texting, for example, the driver does not look at the road for about 4.6s. This equates to a driver traveling the length of a football field, at 55 m/h, without looking at the roadway."	Olson, 2009	USA
"Recognition: The driver was inattentive, was distracted by something inside or outside the vehicle, or failed to observe	"A US study, which reviewed causes for truck crashes, showed that driver distraction	FMCSA (2007)	USA

the situation adequately for some other reason". - assigned as critical reason within 28% of crashes	was assigned as critical reason within 28% of crashes."	https://www.fmcsa.dot.gov/safety/research-and-analysis/large-truck-crash-causation-study-analysis-brief	
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Fatigue

Original fact	Formulated App fact	source	country
"After 17–19 hours without sleep, corresponding to 2230 and 0100, performance on some tests was equivalent or worse than that at a BAC of 0.05%."	"Research shows that after 17-19 hours without sleep, performance (e.g. reaction time) corresponds to driving under the influence of alcohol."	Williamson & Feyer (2000)	USA
"It is now widely accepted that fatigue is a major contributory factor particularly in the early hours of the morning and on long distance journeys on major roads or motorways"	*	http://www.pacts.org.uk/2016/03/fit-to-drive/	UK
"Research suggests that almost 20% of accidents on major roads are sleep-related"	*	International Transport Forum (2016)	



"Sleep-related accidents are more likely than others to result in a fatality or serious injury"	*	International Transport Forum (2016)	
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Appendix D: Coaching presentation

Text for the powerpoint 'Coaching training presentation'. To be used by companies when they introduce drivers to the MeBeSafe coaching system.

Text after a number is the titles of the slides in the ppt.

Italized texts are summaries of the main message, not to be entered into the powerpoint itself.

Underscored texts are the texts within slides of the ppt.

Non-formatted text without a proceeding number is the text to be read and entered as sound files in the ppt.

1. Coaching for better driving and work environment

Present myself and MeBeSafe

Welcome to the MeBeSafe coaching training for truck drivers. MeBeSafe is an EU funded traffic safety research project. My name is Anders Wählberg, from Cranfield University in the United Kingdom. I have designed the truck driver coaching part of the project.

In this presentation, I will introduce you to coaching and how to do it. Along with the DriveMate app, we have designed the coaching to help you to develop as a driver. Whilst our goal is increased traffic safety, we also expect other positive effects of our system such as greater job satisfaction.

If you have questions concerning coaching, you can contact me by e-mail or telephone. My contact details will be shown on the last slide of this presentation.



The information concerning coaching techniques contained in this presentation is also available in the DriveMate app. It will be presented to you in the weeks before coaching starts, and then stored in your coaching area. Therefore, you can always read up about how to do coaching and how to undertake the sessions with your truck driver colleague.

Please remember that you are taking part in a research and development project. This means that the app may change somewhat over time. Your feedback on the app and coaching system matters to us, and will have an influence on the development of DriveMate.

2. Overview of presentation

Here you can see what this presentation covers. First I will talk about what our system looks like in general and briefly what the DriveMate app does. A detailed description of the app functions will be provided separately.

Then I will describe how you should work with coaching, while using the app, and what will happen when you start DriveMate. Furthermore, some words about what we expect future versions of the app to look like. Finally, we go into the main topic of this presentation; coaching and how to do it.

3. The MeBeSafe coaching system

Empowering the driver

There are several principles of the MeBeSafe coaching and app system which are different from other systems available on the market at the moment.



First of all, our goal is to empower the driver. This means that you are in control of the system. The system is not used for surveillance. It has been developed to be a support for you in your work, not be a big brother looking over your shoulder. Your individual data is not shared with the company or anyone else - you own it. You can delete trips, even your whole account if you want to. If you do, all your data is also automatically deleted from the server, although you have to send a request for deletion from the research database with your id number to me, using the common e-mail address on your phone. Not even myself or the research team will know who you are, as the data is anonymised. The system is there to support you, not to police you. The data collected will be used to investigate any changes in driving performance as a result of being coached.

4. The MeBeSafe coaching system

Peer-to-peer coaching

Another distinguishing feature of the MeBeSafe system is that we do not use supervisors or professionals as coaches. Instead, you will be matched with another driver into a coaching pair. That means you and your fellow truck drivers will coach each other to support your safety at work. We believe that you as drivers have a wealth of knowledge about driving and traffic safety which you can share with your work mates. Most of you will already be sharing your experiences with other drivers to some degree, when you have the time. As part of the project, we would like this sharing of best practise and supportive contact with your work mates to be regarded as an important part of your work as a truck driver.

5. The MeBeSafe coaching system

App-based

There are many telematics systems where you get information about your driving from the in-vehicle monitoring system. Many of these systems also use this driving information as the basis for coaching delivered by supervisors. In MeBeSafe, however, we have chosen a technical solution which is simpler and easier to apply, and developed an app for Android phones. It does not connect to the CAN-bus of the vehicle, but uses only the internal sensors and communication devices of the phone. Whilst the information gathered is more primitive than that of a system based in the CAN-bus, it is accurate enough for coaching purposes. The important feature is that you can follow your performance over time.

6. The MeBeSafe coaching system

Objective, exact and simple information

Much coaching currently in place uses very subjective information as the basis of the discussion. Telematics systems, on the other hand, often uses extremely complicated information. We have tried to avoid both these pitfalls by supplying you with information about your driving behaviour using only three variables of a simple type - driving smoothness, strong acceleration and harsh braking events. We believe these three capture most of the relevant information related to driver safety. The most important thing is how these three measures of driving behaviour change over time.



7. The MeBeSafe coaching system

Regular meetings, continuous support

In contrast to systems which use professional coaches, the MeBeSafe intervention is expected to continue indefinitely, although with fewer sessions over time. As a driver, you are never fully trained. Instead, safety is a continuous process which you always need to be up to date about.

8. The MeBeSafe coaching system

Based in CBT

The coaching techniques which I will describe to you in this presentation are taken from cognitive behavioural therapy. These techniques are rather easy to understand and use, and have also been shown to be very effective. You do not need extensive training to apply these principles.

9. The MeBeSafe coaching system

A social network approach

I would like to emphasise the social dimension of the MeBeSafe system. We want drivers to socialise in a supportive way with each other and make use of their knowledge about driving, vehicles and roads. This can be achieved if you have a good working relationship with your fellow driver, as well as the time to sit down and talk.



10. Coaching content of the DriveMate app

Coaching alert

I will now briefly describe the content of our app. The app does three main things; it measures your behaviour, it calculates behaviour summaries, and it supports your coaching. Here, I will shortly describe the parts related to coaching. We will also return to these later.

First, you get a coaching alert. This indicates that you should contact your peer.

11. Contents of the DriveMate app

Information about your driving/Feedback

Then you go to a screen which shows how you have been driving since the last session. This is something you can discuss in your coaching session, although this is not necessary.

12. Contents of the DriveMate app

Information about driving and safety topics

Also, on the same screen, you have suggested topics which you can discuss in your coaching session. These topics also have texts associated with them, so you can read up before you meet your peer.

13. The DriveMate app in coaching

Here is a summary of how we intend the DriveMate app to be used in your driver development work.

a) The app measures your driving behaviour and summarizes this for you

The DriveMate app will measure your speed using GPS and calculate your behaviour in three different ways. These are your overall smoothness of driving, and the number of strong acceleration and harsh braking events. These are presented as percentages, where 100 is the best.

b) The app will tell you when to coach, and what you can talk about

When it is time for a coaching session, the app will give you an alert, and present various topics which you can discuss in your session.

c) The app is designed to support you in your driving, but all use is voluntary

The app can tell you how you drive and help you improve, but it is your choice whether you use it. In the end, remember that this is for your own benefit, and that increased safety is good for everyone.

d) The app will suggest safety topics for reading, this information is then added to your profile

Safety topics are themes like driver fatigue. Useful knowledge about these topics is briefly summarized in the text in the app. If you want to know more, there are links to detailed information.

e) Coaching is an opportunity to give and receive help, discussing things which are important in your job

Our intention is for you to make systematic use of the collective knowledge of professional truckers, so you can improve as drivers.



14. Procedure

a) Start the phone and app etc

So, what will happen is this: After installing and starting the app, you see the recording screen. You just put the phone in the cradle and start the trip.

b) Record a trip whenever you drive

It is important that you use the app as much as possible, or your data will become incomplete and possibly misleading when it comes to understanding any changes to your driving.

c) Read the onboarding sessions

The onboarding sessions is information about coaching, which is similar to what will be described later in this presentation. The onboarding will be presented before the actual coaching sessions, from the first time you start the app. It is important that you read this information, so you learn the specific coaching techniques which we want you to use. You can also look at this presentation again, if you prefer to listen to me instead.

d) Pair up with a peer

In coaching, you are supposed to work in pairs, although small groups can also be formed. Either way, you need to pair up with at least one other person. This should be someone that is easy for you to meet up with. It may be the person you share a truck with, or a truck driver who lives close by. Who to choose is something you should discuss with your supervisor.

e) Start doing coaching sessions when the app indicates

The app will show an alert when it is time for a coaching session. You then contact your peer and decide upon a time for a meeting. Also, you should read the material



on safety provided, check your driving data for your journeys to date, and think about what you want to discuss in coaching.

15. Future development of the app

Currently, the calculations applied to the raw data measured by the phone are very simple, and so are the procedures within the app. In the future, we hope to be able to refine several of these things.

a) Traffic complexity

Your driving behaviour is very different in different environments, and this should be taken into account when we calculate your overall scores. If we succeed in doing this, your driving in the countryside will be comparable to your driving in cities. Although good driving on a country road is very different from good driving in the city, they should add equally to a final good score, which is our goal.

b) Improve algorithms

The algorithms installed in version 1 of the app are not custom-made for truck drivers, and will therefore be updated in due course.

c) Positive feedback

Standard feedback for drivers is based upon detecting errors, usually harsh braking events. We plan to develop measurements of instances of very good driving as well. We believe that encouraging good behaviour is better than pointing out bad behaviour.

d) Video

With video installed, we can gather data of different types than by using only the phone and road databases. The most visible change for you would be to the event recording function, where a video would accompany anything you record.



16. Coaching - what is it?

The second part of this presentation will cover coaching. I will describe what it is, how to do it, and how you should act when in a session with your peer.

a. A one-to-one relationship

Definition; one-to-one relationship for improvement, by regularly discussing topics which are important for work, behaviour, thinking and personal development.

Coaching is a working relationship, usually between two people, where the aim is to improve performance. It usually concerns work or sports, but may also be about other things. The coach acts as a discussion partner, and the coaching session is an opportunity to discuss topic which are important for your performance. In this case, the coaching relates to your driving performance.

b. Similar to teaching, mentoring, therapy etc

Underscore the social relation.

Coaching has many similarities to other educational relationships, but differs in that it more strongly emphasises the social relation and equality between the participants.

17. Coaching - what is it?

Not about specific knowledge

Furthermore, coaching is usually not about any specific knowledge or facts, but about how you think about things, and in the end how you choose to act. You may of course discuss facts, and rehearse certain behaviours, but the main aim is that you should



become aware of important factors and mechanisms which influence your situation and behaviour.

18. Coaching - what is it?

A personal relationship

To achieve these goals, coaching need the social dimension of the relationship between people. The coach should be more than a teacher, more like a friend, and of course like a good work mate; someone you can discuss your problems and ideas with.

Coaching will allow you to discuss work- and life-related problems and opportunities with someone who is familiar with your work environment. Without such continuous discussion, we tend to stagnate, in work and as people.

19. Why do we need coaching?

Truck driving is lonely and difficult work

Truck drivers have a work situation which is different from that of, for example, factory workers. You spend most of the time alone in your truck, and a large part of the support and interaction which is natural to humans is therefore absent. Also, truck drivers have the responsibility of negotiating traffic safely with a vehicle which is difficult to handle and also rather valuable, while also trying to deliver goods on time.

20. Why do we need coaching?

Drivers need to share problems

Coaching can help truck drivers to solve problems and handle the difficulties of their jobs.

21. Why do we need coaching?

People are sociable

Coaching takes advantage of the fact that most people like to talk to someone from time to time, sharing ideas, experiences and views.

22. Why do we need coaching?

Our own behaviour is not visible to us

Also, we all think we are good drivers. However, not everyone can be all of the time. The belief that we are good drivers is perpetuated because we cannot usually compare ourselves to others when driving. Coaching, especially in combination with information, gives us feedback on how our behaviour compares to that of others. This enhances our understanding of what we can and should do to improve our safety.

23. Why do we need coaching?

Safe driving is a continuous and never-ending process

There is really no such thing as a safe driver. We all make mistakes at one time or another. We can therefore not become complacent and believe we are safe just



because we have not been involved in any mishaps for a long time. To be safe, you need to continuously strive to improve and update yourself on how to improve.

24. Having a coaching session; preparations

We now turn to how you should prepare for your coaching.

Matching with a peer

Drivers will be matched according to what is convenient for the company and drivers

As said before, your coaching will be undertaken in pairs, where you are both coach and coachee. These pairs will be formed by you in collaboration with your supervisor.

25. Having a coaching session; preparations

Alert from the app with topics

The app will tell you when it is time to coach, and suggest topics and information

When you get the coaching alert, please take a few moments to study the suggested topics, and think about what you would like to discuss in your session.

26. Having a coaching session; preparations

Agree on time and place/medium

Then contact your peer, and agree on time and place for the meeting as well as what to talk about. This makes it easier to be efficient when you meet in order to have a useful coaching discussion.



Pick a quiet place where you can talk without being interrupted or overheard. If it is not possible to meet in person, use Skype or similar

27. Having a coaching session; preparations

Agree on topics

The app will suggest three different topics for discussion. First, a safety topic which you can read about. Second, your trip performance, and third, any events which have been bookmarked for coaching. You can choose any, all or none of these. Again, the app is suggesting things, it does not order you to do anything.

28. Having a coaching session; preparations

Read up

After agreeing on what to talk about, you can then prepare yourself by reading and thinking about the topics chosen.

29. Having a coaching session; good practice

Show respect - you are equals

As stated before, coaching is a social relationship for mutual development and benefit. Especially when you are working with a peer, it is important to respect the other person's qualities, knowledge and views. You should see the other person as a resource for yourself in your development, and act accordingly.



30. Having a coaching session; good practice

Listen/talk

Take equal turns talking and listening. Coaching is supposed to be an exchange, not a monologue.

31. Having a coaching session; good practice

Positive feedback

It is important not to put a negative spin on things, but to encourage good behaviour. Giving feedback is also a way of showing that you have understood what has been said during the coaching.

32. Having a coaching session; good practice

Ask questions

Questions show that you care, and are also a way of furthering the conversation.

33. Having a coaching session; good practice

Share experiences

Professional drivers have a wealth of knowledge about driving which can be used for increasing traffic safety. Telling each other about what has happened on the road, and how you handled it, is therefore a good practice.



I have now covered the basics of the app and how you are supposed to do coaching. We can now take a break, and in ten minutes, I will continue, and talk about behaviour change techniques which you can apply in your coaching.

<<< Break 10 min >>>

35. Behaviour change techniques

Thank you

We now turn to the main part of the MeBeSafe coaching system; how to change behaviour, and improve performance.

The following methods for behaviour change have been developed within cognitive behavioural therapy. They are simple but effective.

Self-monitoring

Becoming aware of your own behaviour is an important start for improvement. Most people have beliefs about themselves which are not shared by other people. By self-monitoring, you will achieve a more realistic view of your own driving, and be able to identify things you need to improve. Self-monitoring is achieved by taking notice of what you do in various ways, for example by writing down the number of times you have done something in a day, like having a cup of coffee. Do you know how many cups you have per day?

Closely associated with self-monitoring is self-reflection, which means thinking and talking about your own behaviours and emotions. To self-reflect is therefore to try



to understand why you do things, and what this might mean in terms of consequences.

36. Behaviour change techniques

Goal-setting

When you want to change your own or another person's behaviour to achieve something, for example increasing the amount of exercise taken, setting an explicit goal is a useful technique. This is especially so if you share this with someone else. This could take the form of an agreement between two people that they should both have this goal.

37. Behaviour change techniques

Graded tasks

If you set a goal for yourself or someone else, it is important that this is not unrealistically high, or very long-term. People respond better to short-term, achievable goals. If you want to run a marathon, it is a good technique to break this down into separate goals, like running 500 meters five times a week for the first month. After having achieved this, you can raise the bar somewhat. Applied to driving, you might want to reduce the number of harsh braking events by 5% in one month and then by another 5% as the next goal.

38. Behaviour change techniques

Instruction

Instruction is simply old-fashioned teaching, telling or showing someone about how something works. This technique depends upon the coach actually having this kind of experience and knowledge, and being able to transfer it.

Instruction is best used for specific knowledge, like for example certain routines at a delivery site. It might also be a warning about and description of a particular hazard which you have encountered.

It is important to restrict the use of instruction and not to start lecturing. Coaching is usually about helping your peer to understand, not just telling them how things are from your perspective.

39. Behaviour change techniques

Feedback

Feedback is information about behaviour which is used to influence how people behave by presenting it to them. The DriveMate app gathers information about your driving and presents this to you. However, it only becomes feedback if it is used by you and your peer to change your driving behaviour. Your scores should therefore be used as a basis for a discussion about driving habits and behaviours which might have an influence on safety.

Please remember that positive feedback is always better than negative feedback. Try to encourage the good behaviours by praising them. Mistakes and bad behaviours are better handled by suggesting alternatives rather than focus on the negatives. You should never criticise your peer's behaviour. It is better, for example, to ask whether



a certain behaviour might be risky. Such questions can lead to fruitful discussion about what traffic safety is, instead of a quarrel about not being a good driver.

40. Behaviour change techniques

Social support

One of the problems we encounter in traffic safety is the lack of social regulation and support. Basically, we are to a large degree left to our own devices. This means that we can develop faulty beliefs and make risky decisions on the road. However, social relations have a powerful influence on our behaviour and by using a peer-to-peer coaching approach we believe these behaviours can be altered.

In driving, there might for example be instances when you feel a need to speed up, because someone is tailgating you and cannot overtake. Discussing such events with your peer and agreeing that you should not let yourself be pressured into speeding is a way to elicit social support. This means that you have confirmation from your peer that speeding as a response to this situation is not a socially approved behaviour within the trucking industry.

41. Examples of coaching; self-monitoring and self-reflecting

To give you an idea of what these behavioural techniques might look like in practice, here are some examples of questions you might ask, issues to raise and suggestions to make.

For example, You can make sure that your peer looks at his data, more or less thoroughly, or ask about hazards he has encountered and what he thinks about these. The important part is to acknowledge your own behaviour in various situations, and



your reasons for this. If you just blame other road users for being idiots, you are not taking responsibility for safety by trying to handle them, even if they are idiots.

42. Examples of coaching; goal-setting

You can help your peer setting a goal by asking about this. Remember that the goal must be realistic and not too long-term.

43. Examples of coaching; graded tasks

To achieve goals, you can break them down into specific tasks. If the overall goal is to reduce the number of harsh brakes, one way to do this might be to think about specific places where you often need to brake, and plan how to handle this.

44. Examples of coaching; instruction

Instruction might be the most common way of sharing knowledge and experience between truck drivers. Remember that this is most useful for very specific problems.

45. Examples of coaching; feedback

Several of the concepts I have been talking about overlap at least a bit in many situations. Feedback, for example, often take on a flavour of social support, as we often refer back to what we think and how we would handle a similar situation ourselves, when giving feedback.



46. Summing up

We have now come to the end of this presentation. These are the main points.

a) The MeBeSafe coaching system is a development tool - not surveillance

Our system is designed to help you to develop as a driver, while respecting your privacy.

b) The app supports you in your coaching

You are the main agent of change and development, but the app is there to support you with information that you need.

c) You are both coach and coachee

You have dual roles in this scheme, both equally important.

d) Use the information in the app and the techniques described

If you learn to use the methods described to you in this presentation, you will be able to help your peer to develop as a driver.

e) Drive safely

In the end, we all want to come home safely after a day's work. Good luck with this task.