Safe Work Behaviour with Brain Based Safety

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Preface

Foreword

The science of safety studies has experienced several periods in which one particular discipline or approach dominated. In the nineteenth century it was technology, with a great deal of attention given to protection from moving machine parts, the erection of safe scaffolding and the containment of hazardous chemicals. In the first four decades of the twentieth century we saw the domination of the 'accident-proneness theory', and there was plenty of attention for attitudes, personality, selection testing and training. After World War II, ergonomics was on the rise and there was attention for man-machine interactions, task analysis and task design. Since the 1980s, safety management plays the leading role.

With a fusion of these disciplines, topped with the sauce of ever-present laws and regulations, one might expect that all components for the management of health and safety at work are now present. However, there are still gaps or missing parts, both in practice and in the theoretical underpinnings of safety science. This is especially the case in the field of the psychology which lies behind the success or failure of many safety measures.

The accident-proneness theory used a one-sided view of psychology. It was searching for permanent elements, such as the competences and personality of people, which could lead to accidents. People were subsequently tested for these factors and removed from the work floor. This practice, however, ignores the results of a rich variety of more recent psychological research into the dynamics of behaviour. Over the last two decades we have learned a lot more about how the brain works, especially about how it perceives, how it makes decisions and how it prepares and executes actions. This is due to the development of imaging and measuring instruments such as the MRI, which we can use to see which parts of the brain are active during certain mental processes. We no longer have to guess based on the behaviour of people with damaged brains after a war or accident, or by directly stimulating the brain when the skull is opened for surgery.

This book responds to this expansion of knowledge and has an updated and innovative view of what this says about the safety of behaviour and our attempts to make behaviour even safer.

One of the key messages is that behaviour is driven by conscious processes to only a very limited extent. The most important part is controlled by automated chains which we can only influence easily during the creation of such. These chains are subject to instinctive motivations and patterns which stem from our evolution as homo sapiens.

None of this is visible to the person who exhibits the behaviour, so that, for example, the victim of an accident often cannot understand afterwards why he or she displayed a certain behaviour. That is why it is so important to understand which motives are active in that instinctive behaviour and how the automated chains are created. Behaviour can be changed, but not all attempts to do so are properly anchored in neuropsychology and therefore not effective. Daalmans provides an impetus within which change is possible, and focuses on risk perception, teamwork, leadership, stress and readiness.

Daalmans therefore touches on a very relevant and difficult conflict between how the brain works and how safety management has developed in recent years. This concerns the over-abundance of rules and procedures which too often are proposed by an audit-happy and litigious society as the solution for the management of risks. The following of these imposed procedures is at odds with the alertness, readiness and motivation of the employee.

The developers of the concept of '*resilience*' also identified this contradiction; this book provides a deeper justification for this based on neuropsychology. The trick is to fill a framework of imposed rules with the competences of the group, so that the employees themselves develop their routines. The group then feels ownership of these routines and makes sure that individual group members abide by the routines due to the strong mechanisms of group behaviour such as 'mirroring', which is also extensively discussed in this book.

A foreword can only point to a few of the topics discussed; the reader must then start to delve into it. The challenge is to try out the theory and the principles in practice. The book gives a helping hand by continuously using the case of an accident as a translation to reality. It also touches on short examples, primarily from the world of road traffic which is easily understood by every reader. Each chapter has a conclusion in which the consequences of each discussed aspect of behaviour for safety management is listed. Part VI of the book treats four components of safety management in detail: *safety buddies*, incident research, culture change and the management of safety processes, based on the principles explained in previous parts. But there is much more.

The *priming* given by the reading of neuropsychological insights in the first chapters, together with the simple but useful framework of topics, lays the foundation for the reader to mirror all aspects of their own practice with the principles and to learn from that. As we also learn from this book, only with the active use of new knowledge comes the mastery of it: information alone barely changes behaviour.

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5.3 Summary

A risk is often defined as the severity of a damage times the chance of that damage. In psychological terms, we can do little with the chance of occurrence. We respond in terms of 'it will happen' or 'it won't happen'. The early discovery or recognition of a risk is called risk detection. Safe behaviour stands or falls with this recognition. Risk detection triggers a natural chain of reactions which spark a higher readiness and safer behaviour. Risk detection is composed of two entirely different processes: danger sensitivity and risk understanding. Danger sensitivity is the discovery of risks in what we perceive. Risk understanding is the recognition of risks in processes.

Safe behaviour starts with a realisation of insecurity.

5.4 Opportunities for safety management

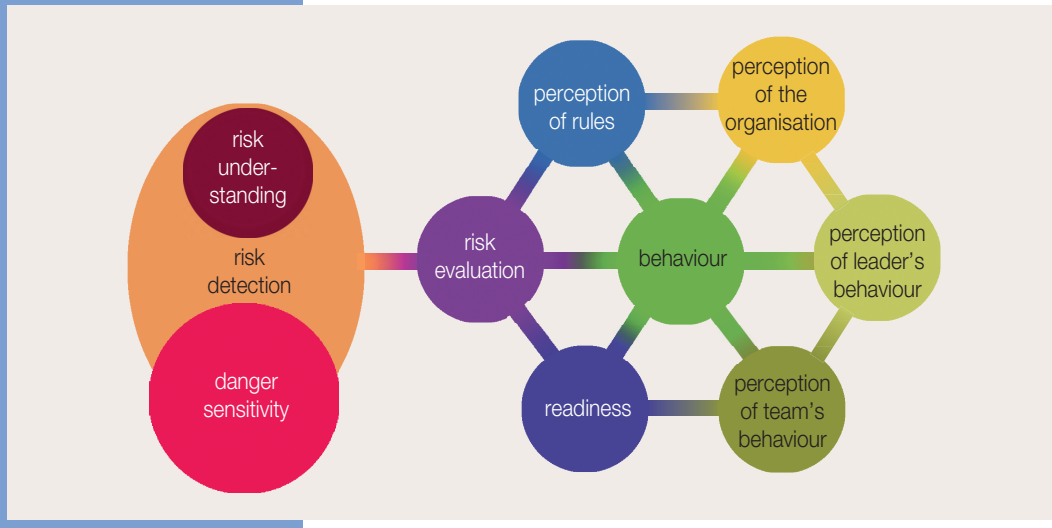
- From Brain Based Safety, the emphasis lies on the detection of risks because this creates a natural chain of safe behaviour. Although following a rule will lead to comparable behaviour in many cases, a rule is a surrogate for the perception of a risk.
- Should the reality deviate from the described procedure, people who strictly follow a rule will no longer know what to do and may even be too late to do something. When acting from an awareness of risk, the system stands ready to respond.
- The greatest gain can be had by proper risk education, which ideally primarily consists of doing and experiencing.

Notes

1 Kahneman also displays that a small chance of something positive is often experienced as 100%. We purchase a national lottery ticket for a substantial sum, even though we know the chance of winning the main prize is 0.00002%.

Chapter 6

Danger sensitivity: the perception of danger



The exploration process in the brain begins with the senses. Our senses translate what happens around us. Of all the stimuli which enter through the senses, we select those that are potentially hazardous. We pay extra attention to these hazards as a result of our survival instinct. We call this process danger sensitivity. As soon as a potential risk is observed, a chain of activities which can lead to a risk-decreasing response is activated.

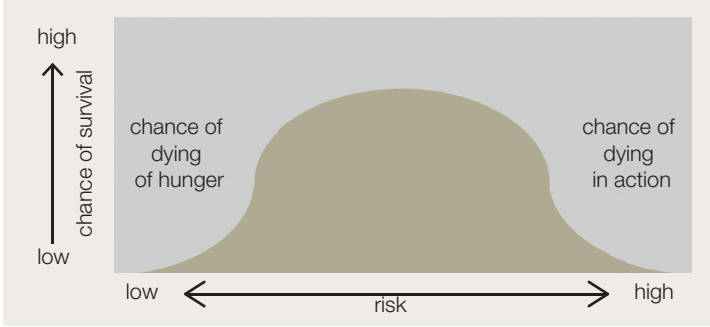
Cooler

Prior to the assignment, all three of the employees had an uneasy feeling when they discovered that they didn't have the maintenance documents with them. This feeling of uneasiness prompted a quick discussion. As a result of this discussion and the extra measures taken, the uneasy feeling faded. Mistakenly, too little attention was paid to the gut feelings. There was a slight danger sensitivity, but it did not survive the censure of the group.

humans learned to find a balance between being careful and taking risks. These ancestors lived in tribes and ate meat in addition to nuts and fruit. They were able to catch the meat themselves but they could also steal meat, either from large predatory animals that had just made a capture or from other tribes. This thievery was not performed without risk and it required the necessary tactical insight: when is the best time to strike, what will we do if the plan doesn't work, do we have any escape routes, etc.[4]

The risk spectrum

This life was risky and it demonstrates the dilemmas encountered by our ancestors. Choosing the option with the least risk – waiting until the lions have filled their stomachs and have left – meant that there might be little food left over. This could cause damage over the long run due to possible malnutrition. But choosing the option with a high risk – chasing the lion away from its meal – meant that a 'robbed' lion could easily strike. This could be an immediate threat to your life.



Chances of survival on the risk spectrum

Benefit

The optimum position on the risk spectrum is dynamic and strongly depends on the circumstances. With a plentiful supply (of food, in this case) it seems wise not to take on too many immediate risks. But if there is an acute shortage, risks must be taken to put food on the table. The degree of shortage determines where the optimum position is located on the risk spectrum. Research by Kahneman (2011) shows that the willingness to accept a risk increases when all options are negative. In many cases, an extremely high but also an extremely low risk profile has a negative effect on the survival chances of humans. The genuinely careful ancestors had less opportunity to reproduce when there was a scarcity of food. Risk tolerance has an evolutionary benefit.

Cooler

Both employees realise that starting the work activities is not completely according to the rules. After all, they don't have the maintenance documents with them and therefore cannot immediately check whether all information is correct. They do have the opportunity to walk to the car to retrieve the documents, but this will take a few minutes. Because of efficiency, a risk is taken in this situation by mutual agreement. In the technician's view, the risk is reduced by manually testing for any overpressure in the vessel.

Learning processes

Certainly if we talk about serious risks with a small chance of occurring, it may be that those who disregard the risk slowly learn that the risk doesn't actually exist. A 'learned' hubris or overconfidence – a feeling of 'nothing can touch me' – can then exist.

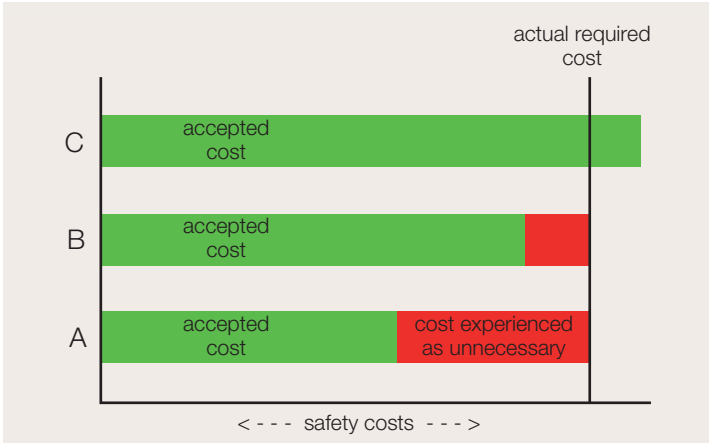
Driving a car

If you drive daily on a two-lane road and often overtake other vehicles, at a certain point you may develop the feeling that although overtaking is dangerous, it always goes well on average. Therefore, you gradually push the limit of which risk is still acceptable.

Risks and compensation

It is good to realise that taking risks is still in our nature, while the potential dangers have become much greater due to technological developments. From the perspective of safety management, we would prefer that people don't take risks and always choose the safest option. But this is not only practically impossible, it is also against our nature. The solution can only be found by tackling the problem at the source. The focus of safety management should therefore lie in the utilisation of competencies to display safe behaviour, including the recognition of risks and the integration of safety margins.

Taking risks is part of being human. This process can only be curbed from within.



Perception of safety costs in relation to accepted costs.

Major maintenance (Turn Around, or TA)

Employees of three different companies report early in the morning to the reception desk for an assignment along the lines of major maintenance at a plant. Employee A is working for this client for the first time and has another assignment elsewhere in the afternoon. Employee B has been informed by his manager that, because of safety problems during the last major maintenance, an instruction prior to starting work will be given this time. Employee C has already heard that prior to starting the job everyone will receive an extensive TA instruction, with a video and a test. The three are invited for the instruction class, which will take 25 minutes. After 10 minutes, Employee A becomes nervous. If this continues, his schedule will be completely out of control. After 20 minutes, Employee B has the idea that he knows everything and thinks the test at the end is unnecessary. Employee C had oriented himself for 30 minutes, so he is happy he can already get started after 25 minutes. Three employees with three different patterns of expectation have three different reactions to the same event.

Solution

The moral of the story: if we can influence the expectation, we also influence the actual experience of the safety costs and thus ultimately also the willingness to display safe behaviour. The costs of danger can also be included in the story – reflect on what can happen if safety is not up to par.

If we can influence the expectation, we also influence the willingness.

Automatic standards

Incidentally, we seldom cherish these expectations on a conscious level. They are stored in the automated. Kahneman (2011) introduced the concept of 'anchor' in his research of expectations. The anchor can be compared with the topmost of the green bars in the diagram – the reference point which indicates the expected investment. If it is indicated in the instructions of the assignment that the safety procedure will take about 30 minutes, the anchor is set

Anchor: reference point of our expectations.

at 30. If it is later evident that the procedure only took 25 minutes, then it exceeded expectations. For management, it is therefore a greater challenge to influence and manage the expectations of the employees regarding safety than to manage the actual costs in time and effort.

Driving a car

If you must drive daily on a fixed route with a dangerous two-lane road and you assume that you must regularly drive on this road behind slow-driving cars, you will be less tempted to look for that small opportunity to overtake. You keep sufficient distance from the car in front of you, and you wait with overtaking until you have finished that part of the route.

10.7 Summary

We don't like rules but can't really do without them, either. Psychologically, rules form a threat for risk detection. The more that things are pre-programmed, the less often we turn on our own risk sensors. The reason that rules are so popular is that external authorities require everything to be arranged on paper. Written rules indemnify management from any incidents. Along this same line, managers suffer from protocol fiction – the belief that every employee has all rules at the ready during execution. In an attempt to reduce the force of rules, people within traffic safety can take steps with the successful design of squares according to the Shared Space principle. In areas with few rules, everyone is expected that people move according to their own insights. Model behaviour and influencing the perception of reasonable safety costs (energy, time, effort) are two ways to inspire people to observe rules.

10.8 Opportunities for safety management

- Differentiation among rules helps. Rules for the protection of people and the surroundings (maximum speed, handling hazardous materials) are not up for discussion and may be enforced by any means.
- Rules which contain knowledge (protocols) can be a relevant differentiation according to the degree of knowledge. If the amount of required knowledge is within the limits of the potential knowledge at hand, a protocol is unnecessary. People can then set up their work at their sole discretion, provided risk detection is at its proper level. If the amount of required ready knowledge is extensive and too much for what may be expected to be present for available knowledge, a formalisation in a protocol might be a good idea.

Chain of behaviour patterns

When the first pattern has been initiated, the rest follows automatically. This generally occurs easily and efficiently, which makes it difficult when we want to change behaviour.

Driving a car

If we drive home via a familiar road, the archives of the automated contain the roads we will take and the knowledge of how fast we can drive on them. The automated brain hears from the sound of the motor whether we are driving in the correct gear. It even helps us to navigate a crossing and to anticipate a cyclist.

If the cyclist deviates a little from the predicted path, a potential risk arises. The instinctive then awakens and provides slight signals which stimulate the automated to pay extra attention. If the situation threatens to go awry, the automated can also involve the conscious, in case a swerving action is needed.

We only realise how powerful these patterns are when the maximum speed changes. Our automated is still set to the old speed. Even the input of the conscious can scarcely prevent the automated from continuing to select the old speed.

Interaction

One could surmise that we are no more than a robot which executes codes. Yet in completing the chain, a great deal of interaction with our surroundings can take place. But even the coordination with the surroundings proceeds at an automatic level. For example, we can walk through a busy shopping street without bumping into anyone because the automated receives subtle signals of everyone's directions and integrates these signals into the choices of patterns. After we have walked through the street, we cannot remember any face or movement – and this is also apparently not necessary.

The instinctive

The instinctive doesn't produce its own behaviour but it does direct the automated. It expresses our basic needs: survival, coexistence and reproduction. It does this by continuously stimulating the automated in certain directions. For example, the instinctive ensures that we don't do any unsafe things, that our body is fed and remains fit, that we don't alienate ourselves from our friends and family, and that we are always in the proper state of readiness to perform the required task.

Quiet direction

The instinctive perpetually guards and arranges some hundred different equilibriums of the body, including blood pressure, heartbeat and blood sugar level. If the blood contains too little sugar for an effort to be made, the burning of fat is increased. However, this can occur too slowly and not produce enough of a result. The instinctive then translates the need for sugar into feelings of hunger which we feel in our stomach region, and it also sends signals as soon as sugary food is spotted nearby. When you're hungry, you see food everywhere. The automated then receives the assignment to make a grabbing movement for food that is within reach.

Risk

Just like the desire for sugar or nicotine, the instinctive also controls our need for safety. Discovering risk is clearly a task for the instinctive.

As soon as something dangerous is discovered, an alarm goes off in the instinctive, which we can sometimes recognise in the form of fear for a certain object or action. An existing chain of automatic behaviour can be interrupted for this alarm.

Disruption of the chain of behaviour by the instinctive

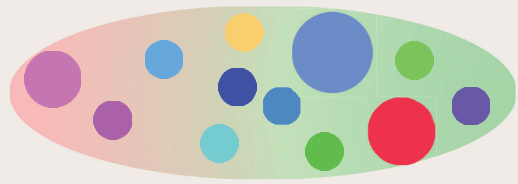
The cells of the fear system issue mandatory voting advice to the coordination centre: 'Stop immediately; dangerous!' If risk signals are weak, this will be handled between the instinctive and the automated; in this case, we aren't aware of much of this but, at most, feel some vague feelings of discomfort. If there are serious problems the conscious will be mobilised.

Driving a car

If, after reducing the maximum speed on a familiar route, the automatisms are still set to the original speed, it would help to receive a stiff fine. A fine is a waste of money and activates the pain centre. Each subsequent occasion that we drive that same route, the instinctive will send a warning signal in order to prevent that the automatisms are still set at the too-high speed. It can also help to know that there are regular speed checks on a certain route. In that case, we put ourselves in the position of others who have received a fine there and we feel their pain. This signal is sufficient for us to reduce our speed.

Playing with behaviour

The second element is behaviour. The brain is constructed in such a way that we learn new behaviour much more easily than we discard old behaviour. Consequently, it is better for us to invest energy in the strengthening of the desired behaviour. In doing so, we can make good use of the fact that a certain diversity of behaviour exists, even within a strong culture. Within the present spectrum of behaviour, one variant is more desired than another. We can use the concept of 'proactive behaviour' as an example. Focused behaviour change can occur best by strengthening the already present desired behaviour, so that behaviour in its entirety shifts in the desired direction. This requires, however, an active approach of those who want to change behaviour patterns. In this example, management intends to strengthen the already proactive behaviour which is visible. The figure displays the dimension of less desired behaviour versus more desired behaviour. In this example, reactive behaviour is less desired and proactive behaviour is more desired.



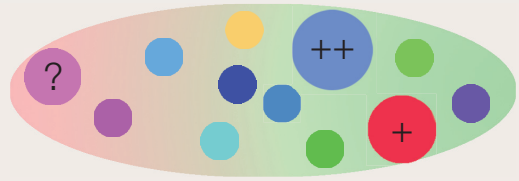
less desired behaviour - - - - more desired behaviour

Toolbox

Suppose: an organisation wants the Toolbox Meeting to be used more actively. Up until now, the meetings have always been prepared by the superiors, with the result that some employees have participated rather passively. They are barely aware that such a meeting can increase their safety, and they find it a waste of their valuable time. Management defines active participation in such a meeting as desired behaviour.

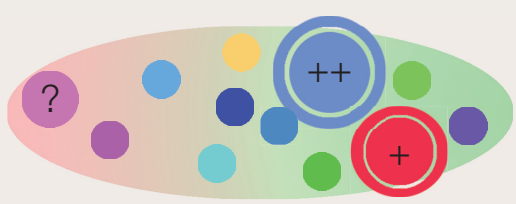
Selecting models

The next step consists of further concentrating the models based on the presence of desired behaviour. Desired models are attractive for the group (model value) as well as for management (they already display the most desired behaviour); in this example, that is the proactive behaviour. In this additional selection, the organisation will undoubtedly run up against formal leaders who owe their positions in part due to old and now less desired behaviour. An organisation which wants to change culture will have to take sides here. As long as undesirable models – in this example, those who have demonstrated a great deal of reactive behaviour – fulfil important positions, culture change will mean beating a dead horse.



Strengthening models

Culture change works if we make the desired model stronger, such as by giving them more influence, power and status. In this example, we present a number of important projects which have demonstrated considerable proactive behaviour over the past period. As a result, they are more important to others as a model for behaviour. By making it clear to everyone that those involved have received the projects because they have acted in a safe manner as well as proactively, we implicitly and explicitly put this behaviour on the agenda. If we are very unsatisfied about the current state of affairs, we can even go a step further and re-appoint all team leaders based on displayed safety behaviour and proactive behaviour.



Toolbox

Management chooses two members of each team who have shown a great deal of involvement in the past during the Toolbox Meetings and who have shown interest in safety issues in general. During the work meeting, these two members are explicitly asked if they would like to play an active role in the improvement of these meetings. This also indicates that they were chosen because they had already shown an active contribution during past meetings.

Activating

Additionally, we can elicit and strengthen behaviour in a focused manner. If we believe cooperation is important in addition to proactivity, for example, we can create interesting assignments which can only succeed if there is also cooperation across the boundaries of departments. In this way, desired models can exhibit the desired behaviour, which is then copied by others at an instinctive level.