

## Self regulation in traffic and psycho-physical education

### Coaching in Young Driver Education. A developmental and comprehensive view on growing awareness, impulse control, connectivity and responsibilities.

Lauk Woltring, *Learning in Traffic, Landsmeer, The Netherlands*

**Keywords:** development, impulsivity, gender, decision heuristics, risk perception, awareness, responsibility, brain, education, instruction, coaching

Published on [www.laukwoltring.nl/traffic\\_education.htm](http://www.laukwoltring.nl/traffic_education.htm) No copyrights. Please mention name, title and source.

*This discussion paper is about developing behavior of youngsters in growing complex situations, about learning and risk taking behavior, including what might go on in the minds of drivers, and maintaining awareness plus upgrading hazard perception also after the test. It's about very dynamic, layered and multivariate processes, many factors do contribute. The text discusses contributions from psychology, neurobiology, socialization, social work, and education. It's in a way a more organic text, bringing together my own (and others) experience, knowledge and views in this field and parallel fields. At the end I plea for new ways of driver education like coaching, new ways of testing and I do some research proposals. More background: [www.laukwoltring.nl](http://www.laukwoltring.nl)*

**Motto:** *A safe driver is a constant learning driver. If we would really learn from every incident, accident or narrow miss, traffic would have been much safer than it is now.*

#### CONTENTS

1. Introduction
2. The situation in the Netherlands and other (western) developed countries
3. Developments in Dutch driver education
4. Current problems in Dutch driver education
5. New projects in driver education
6. Learning: a developmental approach
7. From tricycle and bicycle to moped and car
8. Awareness
9. Brain development
10. Decision heuristics
  - a. The immediate danger 'heuristic'
  - b. The affect heuristic
11. Understanding risky behaviors
12. Youth, adolescence, autonomy and developing responsibilities
13. The fear factor
14. The role of guided learning. Instruction or coaching?
15. An example in the making: the EU Hermes project
16. A few words on testing, monitoring and self assessment
17. The future: Keep on learning and how to facilitate it?
18. Resources

#### 1 Introduction

Human beings are made for survival, that's what evolution did with us, but in the last stage of our evolution we have developed systems like for example traffic systems, cars, where our basic survival skills and observation modes are no longer geared for. So we have to extend our awareness and skills, partially in using instruments. Traffic safety in most countries has gone up, but there are still lots of deaths and severely wounded in traffic, as well as economic damages and a lot of stress is produced. The *balance between hi tech and the human organism* is not reached, and will be a continuing question.

A random message from the battlefield traffic:

*Braunschweig – 19/7/2009. In a multiple collision on the A2 in the north of Germany 66 people got injured on Sunday evening of which 10 are in serious danger. After a first accident on the A2 to Hannover a pile up started in which 259 cars – often driving fast - were involved over a length of 30 kilometers. Some drivers said that they were blinded by a low sun. Short before the accident there had been a heavy shower. Many drivers had lost control over their steering wheel. About 340 firemen and other helpers were brought into action to help the wounded. .*

What happened? Bad luck? ‘It’s all in the game?’ Many drivers were speeding; obviously they did not slow down when they could not see properly due to a low sun, when they saw the rain, when the shower started or when they saw that the road was wet. They did not keep enough distance to be able to stay out of the pile up. They must have speeded as a collective. Possibly some maintained their speed while others were inclined to slow down, but decided to follow.

Many questions arise. All drivers do *know* that they have less control on a wet surface and that distance is crucial to have more reaction time in hazardous conditions (low sun, wet surface). Was their hazard perception muffled? Driving a fast car under insecure conditions must have produced some fear, possibly also a gratification. What happened to that fear? Or did they just enjoy the feeling of driving fast and conquering all dangers with their automated steel cage on wheels? Self image may have played a role. Compensation for a lack of power elsewhere?

What was their reaction on the low sun? Did they only *see* that the road was wet or did they actually *feel* that the road gave less grip?

Which of their own sensory systems were involved apart from the instruments? Was their awareness adequate enough or did those instruments substitute their sensory systems completely? How did they *sense* the last signals before disaster? Or did they only feel them once they lost the grip? Was their mental activity just too low, driving on ‘their own automated mode’?

How about their feeling of responsibility for their own safety, others and the environment? Did they trust on the car manufacturers, on the in built anti skid devices, on the reaction of other road users, road conditions, advertising, on good luck?

How does this behavior relate to their driver education? Did they forget what they had learned there, was it wiped out through their later experiences? What had they learned from previous experiences of their own or news messages about accidents alike? From a neighbor, uncle or cousin who had been in such a collision? Something must have prevented them from learning , or must have got priority above their existing knowledge or their feelings of anxiety. What? How does that work?

Another message.

In Dutch focus groups youngsters did estimate the chance to get involved in a serious accident (dead or heavily injured) in the years ahead as 1-5%. (In reality this chance is about 0,03% in two years). At the same time they did not change their behavior, or, put in other words, they were not able to implement this estimation in their own risky behavior. In all kinds of statistics youngsters, especially young men, show high in risky behavior, be it alcohol, drugs, unprotected sex or traffic behavior. Why? Is it a general picture or just a small group counting for the high numbers?

There is a famous U-curve in many traffic accident statistics (high chance from 16/18 years old, lowering till 23-28, then quite stable and low till about 60/70, and then climbing again). So driver education concentrates on young drivers, but this U-curve neglects the evidence that some drivers (often male) adopt dangerous driving styles for the rest of their lives. That is less visible in the statistics. These adults have gained the ‘skills’ and heavy expensive cars with all built in ‘safeties’ to export the risk to other more vulnerable participants in traffic: moped drivers, bikers, bicyclists, pedestrians, or those who cannot afford these expensive vehicles. These adults are not more safe, they just do not get killed or injured anymore on that scale themselves, others do.....<sup>1</sup> They will not show up in those statistics that are about seriously wounded and road deaths, and not about car damage or slightly wounded. They give bad models, examples to young drivers.

**Basic question in this text is:** how can we influence risky behavior, taking the long view: education starting before adolescence, on schools, in moped driver training, in driver training, through tests, in novice driver education, and *engraining a learning style after the learner period*

---

<sup>1</sup> Berends, SWOV 2009 shows the effect of the vehicle mass in two personal vehicle collisions: high mass, lower risk on (serious) personal injury; more injuries and casualties in the other car with less mass.

that keeps awareness alive all the time, enables them to resist bad examples, peer pressure, negative advertisement models and keep on developing good hazard perception?

**More focused:** can we train young people to be able to resist negative peer pressure and not to engage in too high risk behavior? Can we train them to use all the sensory signals they get, and coach them into sound decision making, problem solving and social skills in traffic and also into developing a learning style that helps them to stay out of danger when they get older?

## 2 The situation in the Netherlands and other (western) developed countries

Compared to other western countries the Netherlands score high on traffic safety. Large pile ups like cited above are not very likely, as we do not have the German ‘Autobahn culture’ (fast driving over long distances with hardly any speed limits) but there is still much to do. The pattern however is comparable with other countries: speeding, not enough distance, fatigue, alcohol, too much risk taking by youngsters, aggressive media messages and adults who give bad examples. There are many complaints about asocial and even anti-social driving.

About sex and gender: like everywhere young men peak in unsafe behavior. Since the OECD report Young Drivers (2005), which was very clear about the gender of risk in youth, and since recent WHO-reports we cannot just speak about youth on the road. When we see media, texts, policies, programs, or interventions we should ask ourselves “*Is this about boys or girls*”, and – not generalizing - “*Which boys*”? On average boys and girls do not grow up and mature in the same way, they do not meet the same expectancies, they do not behave the same, nor do they learn in the same way<sup>2</sup> and they do not take the same risks. They may not react on the same signals and interventions<sup>3</sup>. Facts & figures in many countries show that nearly all groups of traffic participants became safer, except for boys (may be just a bit, or not, and even became riskier...). In the Netherlands we have seen great progress in the last decades, but not (or very slowly) in boys’ figures. Young female drivers are 2 times more at risk to die or get seriously wounded than experienced drivers - they have to learn and so they make mistakes - but young men 4, sometimes even 5 or 6 times more than average.

Research has been done on the effect of some technical innovations, measures, limits, rules & changing environments. Little research however has been done about what’s actually going on *in the mind* of (young) drivers just before an incident or real accident, immediate after and on the long term. We do know a lot about generalized causes of accidents (speed, fatigue, alcohol, sight lines, hazard perception, etc.). Measures are taken on road construction, signs, lines on the road, traffic rules; there is more sophisticated enforcement and there are more cars with inbuilt safety systems. The number of fatalities and serious casualties lowered strongly, but it seems harder now to get it more down. “*We have picked the low fruits, the higher fruit is harder to get by*” as the Dutch Minister of traffic said in 2008. How to go on? Better cars, more infrastructure, even harsher enforcement? They may even have even a reverse effect<sup>4</sup>. Or do we have a better look at the behavioral side? How to influence it with long lasting effects through education that links up and fits in our in born survival instincts and responsibility for the group we’re part of? Probably the most important question here is whether nowadays driver education programs prepare for the driving test, or do address and set the basis for the *continuing* awareness, responsibility, *self regulation* of the learners and connection with other participants in traffic. Do we trust on the validity of the driver license, on the effect of campaigns and enforcement and the ascribed responsibility of drivers?

If (1) the education and testing would cover all the aspects of driving (see GDE-matrix, Hattaka e.o.) and (2) if novice drivers would *continue to learn* along these lines, there is no problem. But: education and testing, how sophisticated it may be, does not and cannot cover all aspects of safe driving. The tendency to give well-controlled instruction and to develop simulators, cars and roads

---

<sup>2</sup> Gurian 2001 (and later, also other authors) See [http://www.laukwoltring.nl/recommended\\_literature.htm](http://www.laukwoltring.nl/recommended_literature.htm)

<sup>3</sup> A fine example of this can be found in Albarracín (2005 & 2006) about HIV prevention campaigns. In traffic safety campaigns and driver education one can learn a lot about risk taking and prevention in other fields (see also Woltring (1994,2005, 2007-1) and Romer (2007 & 2009). Of course traffic is not the same as sex, alcohol, drugs, but there are strong underlying principles in risky behavior by adolescents in all fields.

<sup>4</sup> Nowadays car ads show dangerous driving made possible by in built safety devices (e.g. automated lane control on a bendy road through forests etc.).

‘with inbuilt safety’ may be the dream of policy makers, and also engineers and investors in cars and road building branches, but it might lead us away from awareness, self regulation, our own responsibilities and social behavior. Modern cars take over much of the sensory systems and control we used to exercise ourselves. Where is the balance? How do people react on, and compensate for this loss of sensory stimuli and of control?

### 3 Developments in Dutch driver education, a personal view<sup>5</sup>

Until the mid nineties Dutch driver education was - like in most countries - quite traditional: based on instruction, little sight on what was going on, little reflection, little research done.

In 1993 German research (Schulze, 1993) showed low educated young male novice drivers working in the metal and building branch as a high risk group. For the development of a suitable program a Dutch contribution was asked from the field of ‘working with boys’. These young workers – at 18 still 1 day in a branch related school – were accessible in groups for a one hour dilemma game eliciting them to assess risky behavior and expressing in groups how to react if their friends would behave risky (Schulze & Woltring 1994). In most schools there was no measurable effect. In later research the remarkable success in some schools however appeared to be related to the prescribed, but in most schools not adhered, principles of a non moralistic approach: in those schools self finding solutions did stimulate self control (Hoppe, Tekaas, 1997). Later in 2001 a comparable and more elaborated program was launched also in Germany with some success (Hoppe, Tekaas, Woltring, 2005). Regrettably there was no long term effect research and the infrastructure for implementation was weak.

This program – addressing young men - drew some attention in the Netherlands and in 1997 an education tool was developed for Dutch moped education, again young men 16 – 17, a high risk group. A short road movie was shown, evolving from fun to disaster. In a second run the videotape stopped at crucial moments (stills) in which the audience were presented open questions, dilemma’s, etc. letting them tell and discuss what was going on and how the participants could have changed the outcome if they would act differently (and how?). Here a completely new element was added: ‘*psycho-physical education*’.

*From 1997 there is a successful program on self defense and social skills, Rock and Water, in which an integrated physical, psychological and social approach on self regulation gave good results on reflection, resisting peer group influence and the therefore needed impulse control. It was applied in schools, youth centers, social work and youth detention centers in the Netherlands, but even more so in Australia and elsewhere (Ykema 2002; Ykema, Hartman & Imms 2006). Exercises addressing physical safety and the therefore needed breath regulation, right tension of muscles and physical positioning, were good prerequisites for reflection and sound non-violent actions, better problem solution, adding to better school participation, lowering anti social behaviors and more.*

Drawing from this approach we introduced in this new moped driver video tool (with teacher manual ) not only questions to the pupils like “*What do you think goes on in the driver’s mind*”, but also about *his body and sensory system*: “*Where is his breath? High in the chest (being a fight, flight and fight response) or low in the belly (relaxing, allowing more blood to flow to higher brain functions)? Which muscles are tight and which are relaxed? What does he hear, feel, see? Can he steer well in this position, where is his focus?*” These questions were meant to *activate and reflect* on the input of all senses in order to get better self feedback and reflection on risky behavior. It was only evaluated in focus groups but seemed rather a success.

There was no infrastructure to maintain and implement it on a larger scale (Woltring 1997).

In 2004 it was repeated (new video with new make mopeds, clothes, music, style etc.) again proven rather successful (self report by pupils and educators). This is still being used, but again there is no infrastructure and long term effect evaluation, due to reorganizations, lack of interest or priority, no available financial resources, and so on (Woltring 2004).

In the meantime (2000) experiments were going on in Dutch novice driver education, addressing the fact that novice drivers had lots of accidents just after receiving their license, again foremost

---

<sup>5</sup> Part 3 of this text is a more personal history of those developments the writer of this text was involved in. There are more histories. I was strongly involved in the introduction of educational and communication psychology in driver education, especially gender aspects, but of course I was not the only one (LW).

young men like in other western countries. A lot was learned from EU-projects (see page 16) In 2003 the Dutch contribution to the EU NovEv-project (*Evaluation of 2nd phase training pilot projects*) consisted of a drivers day, with (1) a small group in a car with mutual feedback (guided by a coach with open questions, stressing their own responsibility) and (2) on-track demonstration of skid danger (no skid control!). In a classroom meeting (3) non-judgmental discussions were organized using a video tool along the principles above. The day was preceded and followed by an e-mail exchange and web based self assessment. Evaluation research came with positive results. It also showed how difficult it was for 'former instructors' to pose open questions, be non-judgmental, and to coach instead of steer or instruct (NOVEV, 2004). The drivers did have their license but – contrary to the program's rules – they were often yet treated as pupils (with resulting reactance instead of real learning).

Dutch primary driver education at that time (early 2000) was partially modernized as a number of driving schools adopted the program 'RIS' (in English: DTS Driver Training Stepwise) in which instruction was planned in a more sophisticated way<sup>6</sup>: following a perceived more or less standard learning behavior of learner drivers, it offered different steps in ongoing grades of difficulty: modules, scripts and other elements and for the instructors very detailed instructions. One of the results was that DTS candidates showed higher quality in driving performance *at the exam* than candidates with traditional driver training. Later this difference faded away. Whether drivers with this experimental training were in fact safer drivers and caused less accidents, remained to be seen (Vissers, 2001). Nevertheless, in the end report of SUPREME (2006) it was mentioned as one of Europe's best practices.

From the point of *instruction* DTS was certainly a step forward, but in the course of further implementation some problems arose: it asked for quite high level instructors, it offered only one format and it presupposed one learning style. Many instructors evaluated it as a too complex and rigid format. They found it hard to combine with their own individual style, working more natural according to their own insights and interaction. Young male clients were often said to give problems in the communication (e.g. reported stubbornness, priggish and cheeky, 'not wanting to listen', reactance, etc.). Technical and tactical goals (GDE<sup>7</sup> level 1 & 2) were central in this program, a chapter on addressing motives and emotions dangled in the rear. Higher level goals on strategic choices and life goals (GDE level 3 & 4) as well as self evaluation skills were aimed for, but not yet very successful.

As a next step a special module was advised for problematic boys (or better: for instructors that found it hard to relate to some boys and learn them how to drive). What then began as developing a special module for these boys, turned out in a more thorough changing of the whole program, putting motives, emotions, *self* regulation, *self* monitoring and *self* assessment more central. This process is not yet finished but goes on and moves from very detailed instruction towards coaching. Along this process, guided by developing insight from research, focus groups, evaluation made by instructors and examiners, new insights arose from cognitive neurosciences. This made it more understandable what we were looking at. Dutch participants in the development of RIS were also active in or learned from various European projects.

Insights from Scandinavian countries, e.g. the developing GDE-matrix (Hattaka e.a. 2002)– introduced in BASIC (2003) - were quite influential in the further development of this Dutch program, be it less influential or not at all in other Dutch driving schools.

At this moment (2009) the Dutch test program (for driving license) is being altered, adding hazard perception and independent driving (route choice). Focus there is shifting slowly from left down under GDE to more aspects of the whole matrix, as far as this is possible in a 35-45 minutes test, like in some other European countries (Scandinavia, Luxemburg, Germany and Austria). Hazard perception and independent driving 'trickles down' into driving schools, but they operate still via instruction. Coaching practice in the driving schools - as advocated in MERIT (2005) and brought to implementation via HERMES (2007-2010) - is still very poor. A new development is (from 2010) the introduction of guided driving (youngsters can get their driver license at 17 and are only

---

<sup>6</sup> Comparable with the Danish system (Carstensen 2002). In Denmark this program was obligatory, in the Netherlands it was an option on the free market.

<sup>7</sup> The GDE matrix (Goals for Driver Education) a taxonomy of driving competences - is regarded as an important stepping stone. It is now being used in many countries for developing curricula for driver training at both pre- and post-license stages. The matrix stresses the overriding significance of the higher levels of driver behavior with regard to accidents, and the need for drivers to possess not only knowledge and skills, but also risk awareness and self-evaluation skills at multiple levels (Hattaka e.o. 2002, Roelofs & Vissers, a.o. 2009).

permitted to drive under guidance of adult experienced drivers till 18, also allowing them to gather as much as driving experience as possible.

#### **4 Current problems in Dutch driver education**

Driving instructors are low paid and the average level of professional education is low (with exceptions). Many find it hard to change into coaches, if they are inclined to do so at all. The promising developments in DTS stopped for a greater part because in 2005 the Ministry decided that the involved test agency (CBR) was no longer allowed to participate in the development of driver education which was completely left to market competition. The ministry says that it cannot compel driving schools to use this program as education is supposed to be free<sup>8</sup>. The prevalent belief is that the test (exam) directs the marketwise competing driving schools towards higher quality (through better exam results and client assessment of the offers on the market), but the test largely addresses only the left under corner of GDE-matrix. Young people however (or their parents) look at the price per lesson and cannot judge long term effects. Fierce competition among driver schools leads to getting their pupils as fast as possible through the test in the lowest number of cheap priced driving lessons; everything that does not serve this goal may be skipped or left out. It is often no more than just training for the (limited) test.

#### **5 New projects in driver education**

In realizing safe driver habits for the drivers themselves, others and the environment, also after the test, and in developing continuous learning, a number of projects in education are now in development (in pilots and regional projects).

1. A pilot in a few schools on an integral physical, psychological and social skills education (11-17 year olds), rooted in the mentioned Rock & Water program, and concretized in traffic, behavior in public transport and some other fields in which impulse control, self regulation for the growing young adolescent, safe behavior and social skills play an important role. (This builds on previous elementary school projects where is more attention paid to children's safety in traffic)<sup>9</sup>.
2. Moped education (16 +) in which self assessment, hazard perception and risk awareness are trained (nowadays a test and minimum educational program are mandatory).
3. Secondary education: the Young Drivers Experience project in 3 provinces of the Netherlands in which coaching principles, already implemented in the Dutch NovEv-contribution are more elaborated (ROVG)<sup>10</sup>.
4. Training instructors – already motivated through the Young Driver project mentioned above - to become coaches now also in the primary driver training (along the principles of the EU-Hermes project, see later in this text and in chapter on Hermes)
5. Traffic safety campaigns aiming at youth and projects addressing novice drivers are being evaluated (e.g. Brijs, Ruiter & Brijs 2008).

When Hermes produces its final products, including manuals etc. there will be efforts to implement these coaching principles on a larger scale. A discussion will be necessary whether this is possible under the current test conditions (in a coaching education tests will still be necessary, but will play another role, more on that in §16).

*In order to develop these steps further, in this text attention is now paid to some fundamentals about the development of behavior and learning, impulse control and about traffic education...*

---

<sup>8</sup> This goes back to a long history of pacification of Dutch internal struggle between religions in which freedom of schools was essential. In Dutch driver education this amalgamated with a tendency from about 2000 to transfer several former state responsibilities to the free market (the Dutch ministry of transport goes much further in this than the ministry of education, that has in fact a heavy influence on schools...)

<sup>9</sup> An experiment of the ROVG (Regional platform for traffic security in the Dutch Province Gelderland). (ROVG has a long standing history in experimenting and contributed strongly to DTS and the Dutch NovEv part.)

<sup>10</sup> An ongoing Dutch pilot on novice drivers (Kern, Roelofs, Vissers, Wildervanck, & Woltring) aims not only at goals related to driving safely and self evaluation, hazard perception, but also at communication skills with in-car training of three youngsters accompanied by a coach, stimulating them to ask each other questions that are productive, instead of provoking bluff, reactance, shame etc.

## 6 Learning: a developmental psycho-physical approach.

While growing the human organism is from birth on constantly reacting to internal<sup>11</sup> and external<sup>12</sup> stimuli. *In reacting on* and balancing between those stimuli, new connections are made in the brain and body system, first slowly, hesitant, later faster and more encompassing. So *it develops itself* into a more capable and mature organism. This is largely a self paced process, partially dependent of the stimuli coming from the environment like education and guidance. Cue driven learning is the most basic learning process. The body and brain are strongly interwoven, in fact every cell in our body that is involved reacts on any stimulus first by interpreting: *is this good or bad for me?* The first and most basic *emotions* are sorrow (in danger) – the reaction is: *act or avoid!* Compare the *fight, flight and fright reactions, residing low and deep in the brain* - or joy - the reaction is: *maintain or approach!* These emotions are expressed with physical actions; for example in danger via the adrenaline system, via a light nausea in the belly, instinctively holding one's breath, tension in the muscles, raising blood pressure... These actions one can (1) *feel* and if there is enough time (2) *reflect on (think)*. For survival we are specialized in danger-oriented emotions and reactions<sup>13</sup>. Feelings of joy too can be described as registrations of rewards in the 'brainbody'<sup>14</sup>. They can come from the absence of stress (= safety or relaxation after endurance), satisfaction (drink, food, touch), or rewards of novel experiences, especially in adolescence, but also before and after. Some rewards are direct, others more delayed, indirect, effect of planned actions or wise decisions.

Learning does not only take place in the brains... Our bones learn from load and grow stronger. Our hormonal system balances, our muscles get stronger and develop the right tension (not too high, not too low), neuronal systems and muscles learn to automate complex coordinated movements like when a tennis player hits a ball exactly in the right place, right direction and with the right effect with split second 'decisions', or a golf player is 'in flow' and plays 'effortless' with great success.

In the maturation process of the human brain those brain parts in the neocortex develop first that coordinate the spatial and visual information and spatial-physical responses, soon also the sound (language) processing parts. The frontal lobes are specialized in so called higher mental or executive functions as anticipation, self reflection, conscious assessment, inhibition of impulses that may lead to unwished situations. They take longer for full maturation. Their development starts already at an early age, for example they response to direct rewards or a bit delayed rewards, and can be trained very young, if appropriate - not too much, not too little - and this maturation goes on a long time till in early adulthood.

The development of skills begins with those skills we need for immediate movements, paying attention and actions, listening and speaking, followed later by reflection, anticipation, empathy, inhibition, perspective taking and accurate corresponding decision making.

Some skills – especially *balanced decision making* involving the choice between direct or later rewards - require more experience and possibly also corresponding maturation of the slower developing prefrontal cortex ('think before you act'), but this maturation again is also a matter of experience and getting rewards for good balancing between direct or later advantage.

---

<sup>11</sup> Like hunger, thirst, curiosity, wishes, (sexual) desire, memories, associations, plans, anticipations, conscious decisions.

<sup>12</sup> In the beginning just touches, movements, visual impressions, sounds, smells, vibrations, later in development also words, sentences, expectations, feedback on actions from others, etc. Education, training, instruction, law enforcement, coaching can be classified as more complex stimuli from outside.

<sup>13</sup> This whole process is very fundamentally described in Damasio (2003). See also: Immordino-Yang & Damasio, (2007)

<sup>14</sup> I introduce the word 'brainbody' as an integral concept. We experience and sort of 'think' in all our cells, like the liver does not wait for 'commands from upstairs'. It's just not only in the head. Traffic is not just a technical but also a physical thing and we use all our sensors there. So it is good to address not only the brain, heads or minds but also to include more 'bodily' experiences, and we can address them in traffic education, activate learners to pay attention to their whole system. In school education there tends to be a split between cognitive and physical training. In this text it may lead too far to elaborate, but there is a distinct relation between the spatial-motoric development (a.o. in the cerebellum) and the cognitive development, especially the coordination of, and supervision over complex cognitive processes. (The cerebellum operates here as a kind of co-processor). The previously mentioned Rock and Water program operates amongst other things on this principle.

## 7 From tricycle and bicycle to moped and car

Before young people learn to drive cars, this learning process is preceded by many former experiences of moving in public space (walking, tricycle, scooter, bicycle, moped) in which the speed, complexity, risks, required observations, span of control and anticipation are increasing.

The access to new means of transport is limited by age for reasons of accumulated experiences and maturation. Some have less previous experience, some have a strong impulsive trait, and some have less developed the capacity to handle themselves including their own energy and emotions in traffic, notably in combination with the extra energy of engines.

Most of these previous experiences are a bit guided (first steps, first movements on a bicycle) or (in the case of moped driving) only very basic and at the beginning. Statistics show peaks in accidents at the start of using every new mode<sup>15</sup>. The step from bicycle (or moped) to driving cars however is a big step. In most countries there is some kind of professional instruction or guided learning process to reduce this peak.

The tricycle, bicycle, moped, bike and later the car are extensions of our body and brain. They enable us to move faster and longer with less efforts and more payload.

***Bicycle riding** is a very good way for learning basic functions of fast body movement in restricted spaces: equilibration, balancing, knowing what gravity does in a bend, the importance of good brakes, sharing space with others, communication with signals, illumination, hazard perception with a more direct bodily feeling, anticipation etc. Most bicycle accidents with (young) children involved are light accidents in residential areas, public parks. Grazes etc. are impressive, do cause sharp pain without being really dangerous, so they do give a very strong bodily experience of danger. Some youngsters however go directly from being pedestrian to the dangerous mopeds. There they can add 50 cc to their own not yet stabilized and 'unproportioned' energy. These mopeds have a far higher risk 'built in' and the accidents are much more severe... Learning to drive a moped, let alone a car, without these previous experiences on a bicycle can be harder and more hazardous, because these primarily body / mind experiences in traffic with low risk levels are hardly there, and not integrated in the danger detection ability on an emotional and cognitive level. Actually good traffic education starts very early.*

Human organism and feedback systems in physical actions are originally geared to the immediate surrounding environment and need for traffic some adjustment or adaptation and more anticipation. Complex danger reactions can be automated, and anticipation can be learned (either by warnings or own experience) to avoid situations in which one cannot maintain ones safety by immediate actions anymore. A bruise or a common graze is one of mother nature's finest inventions for children and youngsters: there seems to be a lot of blood, it's dramatic, it hurts, and... it's not that dangerous! Falling from a tricycle or bicycle can be a blessing in disguise. It makes for a lot of learning. In cars however (and before that on mopeds) it is different: accidents are far more dramatic, have much more impact.

On mopeds and in cars tiny movements with arms or feet have much more effect. Our feet do not operate directly like in walking or on the bicycle, but are mediated by accelerator, gears, motor and brakes. Direction is intermitted by our hands via the steering wheel, etc.

Our observations & sensory systems have to change as well. We need eye movements (and by experience maturing connections in the visual cortex) in order to see patterns in fast changing fuzzy environments and adapt for hazard perception. In driving, nearby orientation is altered into wider and longer distance orientation with shorter reaction times. It asks for a mix of direct decisions and more anticipating decisions to avoid situations one cannot handle safely.

We use dashboard instruments as extensions of our receptors: eyes, organ of balance, skin or ears, so we need fine tuning on new instruments that intermediate between the environment and our own observation organs, and give us feedback in this new and rather fast movements, for example the speedometer.

Finally, not only our direct survival emotions for safe traffic are at stake. Also other emotions, possibly stemming from outside traffic, like irritation, anger, self-expression, too high self confidence can interact with our decisions in a car and they can be triggered and stimulated by the effects of traffic or the car in itself as well (sounds, arousal by quick effects, fast escalation, etc.).

---

<sup>15</sup> In NL: a peak at 11/12: bicycle accidents when children go to another school, further away from home, driving in groups, meeting fast traffic, complex crossings. A new and very sharp peak at 16 when the moped is legally accessible (50 cc is added to the still unbalanced energy and emotions of youngsters), and there is a high and longer lasting peak at 18 when they begin to drive cars. In all these peaks boys rate much higher than girls.

Moreover survival emotions can be deafened by constant noise, fatigue, inattention, automated reflexes, underestimation of hazards, and more.

If the step from bicycle/moped– that we have learned to handle without much guidance - to cars is such a big one, the basic question for all traffic education is

1. how the needed learning processes do take place
2. how good interventions can enhance and enrich this learning process in all its elements, *without* resulting in dysfunctional side-effects like partial learning, resistance, denial, fear, reduced learning and dependency that would not lower or even enhance too risky behaviors (e.g. reactance or misplaced over-confidence)
3. how to *stimulate and 'engrain' to go on* with learning while driving after the test, because learning to drive takes more than just a number of lessons, a period of accompanied driving or driving under restrictions.

## 8 Awareness

As we saw the 'brainbody' is aware of itself and its presence in an environment through all kinds of internal and external signals: not only through the eyes and ears but also the body gives physical feedback, e.g. feeling gravity in a bend or while braking, or feeling a changing road surface. The 'brainbody' often reacts quicker than we can consciously follow, 'it wants to survive'. It gives warnings of fear or anxiety via the adrenaline system, a light nausea in the belly, instinctively holding one's breath, tension in the muscles, raising blood pressure. The body never lies. In learning to drive we can learn to be aware of, trust on, expand our awareness and act on these signals and make safe driving a routine that gives its own rewards like the actual feeling of safety, responsibility, easy flow, being in control without harming others.

The latter however asks for empathy, one element of awareness that emerges during development from early years on, especially stronger from 9-11 years old. It is for a large part dependent on experience, examples and education: it should be honored, stimulated and *it can be trained*. Youngsters are very curious about what goes on in the mind of others, but this should be actively addressed, e.g. in the car during driving lessons. ("*Do you think that the other driver sees you?*", "*What do you think might go on in his mind when you do ....*") If these questions are put in a inquisitive way, nonjudgmental, youngsters can react surprisingly open (personal experience LW). How to develop and maintain awareness and hazard perception? Can it be trained *and maintained* by video feedback, simulators? If so, there is research needed about *lasting* transfer to daily traffic. One can think about new task for driving schools. It is already done in campaigns (results still to be researched, see e.g. HERMES-project, see §15), one can think of continued education like novice driver education, update courses for adults instead of punishments after breaking traffic rules or safe driving modules offered by companies to their employees.

## 9 Brain development

The body-brain system, responding on stimuli and coordinating actions, does develop very strongly in the first 10-12 years and it continues in maturing till 22-25 years old<sup>16</sup>: the brain develops from deep inside (where the basic functions and emotions reside) to the cortex and from the back to the front, the prefrontal cortex with the executive functions (Gogtay, Giedd, 2004, Giedd 2004). While growing up, emerging connections are stimulated by outside and inner stimuli, the kind of which changes over the years. Children learn to move, interpret things, listen, speak, obey rules and internalize values and rules. In early adolescence they get more skilled cognitively, reach for autonomy, make their own assessments and rules, look at and learn from each other, their hormonal systems change, they take risks, learn from that and gradually become wiser (more insight, hindsight, overview) and gain self control over their sometimes very strong emotions. It's a dynamic and not always very coherent process. According the present state of brain research, there are periods of 'synaptic explosions' (like from 0-2 and from 8-11/12) in periods after which those neural connections that are not used will fade away (called 'Neural Darwinism' or synaptic pruning) and other connections will strengthen, get faster and much more efficient through the process of myelination, resulting in an increased white matter to grey matter ratio. Correlation however between morphological maturation (cortical thinning reflective of synaptic

---

<sup>16</sup> And after that it continues, but for the basic processes the first 22-25 years are of great importance

pruning) of and skill maturation, although instructive, reveal only associations and cannot elucidate causality. Neuroscience still cannot prove whether morphological maturation enables the acquisition of skills or if skills acquisition drives morphological change (Lu & Sowell 2009, o.c.in Romer 2009-2).

## 10 Decision heuristics

We do not actually think with each step or action, we would get mad and overburdened, and traffic develops too fast for that. During this maturation process we develop decision heuristics and attitudes: complex units of propensities how to react on internal and external stimuli; the heuristics can guide behavior without the need for extensive cognitive control. (Romer 2009-2). We develop the ability to act in complex situations; first carefully, slow, increasingly more at ease and in the end more or less automated, unless ‘something’ tells us “*Ho, stop, this is different, think... and act differently...*”. This ‘something’ is intuition, also fed by experiences, sometimes modeled by norms, values, the culture around us.

We learn from our own experiences including where necessary offered information (a special kind of experience) from trusted others<sup>17</sup>. A certain degree of development of the brain and its connections with all other bodily functions is needed to do so. Learning in traffic requires constant tuning and learning from experience, a process that started long before, when riding a bicycle already stimulated the cortex, but is now more complicated.

One cannot ‘not learn’. Every processed stimulus (internal or external) leads to learning, that is the strengthening of existing or development of new connections in the brain. Missing important stimuli will not be processed. The needed results may be acquired later, but possibly need more effort then. So the important questions for driver education – are: Which stimuli do we get, Which heuristics do we learn? and: How receptive is the mind for influences contra these heuristics?

### 10a The immediate danger ‘heuristic’

During actual driving in traffic, well considered and fully conscious decisions simply take too much time; we fall back on basic decision heuristics. In situations where immediate actions are needed, most of our actions are based on subconscious or nearly conscious decisions, intuitive, split-second. The bodybrain acts very swift, hardly governed by conscious cognitive processes. See for instance a jerk at the wheel. A bit later we identify what’s going on in our organism: we *feel*, that is: we begin to notice what is going on in our body-brain system often *after* we have already responded. Note well, especially in fast developing situations *feelings* come after *emotions*. We may have acted before we realized that action was necessary, and *feel* the fear, anxiety or anger after, followed by more consciously controlled cognitive and behavioral responses. Indeed, we often *reflect* on what was going on triggered by emotions and feelings. The (later) reflection process opens the possibility of feedback loops at a more conscious level. If we do not cut ourselves off for them, we will learn from our experiences, negative effects of our behavior, store risky situations, and our proven effective responses on them. Here is a task for the driver trainer in his capacity as a coach in asking after these feelings and processes because they give important cues and can stimulate higher awareness from the beginning. Further in our development we can actively steer our responses to quickly developing situations like for example in traffic where driving skills are acquired through a mix of automated and adaptive responses and more thoughtful and reflective reactions.

Once we have automated and internalized basic responses and reactions in traffic, we slam on the brakes and declutch simultaneously before we consciously realized that we had to. A coordinated action by body and brain: “our hands and feet did know what to do”. This process is not only driven by external cues (e.g., a traffic light turning red), but at the same time also by internal processes that are governed by autonomous memory and associative dynamics. The rewards in this ‘heuristic’ – if we may call it that way – are survival, safety, relaxation: “*Wow, that was close...*” There are other situations in which there is no direct danger oriented decision involved and there is more time to choose between behavioral options; hazard perception and anticipation do play here an important role. There is a choice between direct and delayed rewards.

---

<sup>17</sup> As to the education of young drivers: As little as possible, as much as needed. Information from outside sources to be used in complex integrated body-brain actions has always to be integrated in one’s own ‘system’, this transfer from ‘abstract’ into one’s own concrete functioning is not without problems, as we will see later. This is of great importance for driver education.

### 10b The affect heuristic

If there is no immediate danger or risk actively felt, or when there is more time available, a second decision heuristic may be effective. This *affect* heuristic is a robust and simple decision rule that relies on the dominant affective reaction to a response option as the criterion for evaluating its reward potential. More direct rewards can be just fun, being in control, self expression<sup>18</sup>, good feeling, or — safety, feeling responsible, cool, saving fuel, act social (the ones we aim at in driver education). Indirect or anticipated rewards can be arrival in time despite your late departure by driving fast, or driving safe and a bit slower knowing that you will arrive a bit later but relaxed. There is a reverse relation between risk and reward; the more favorable the affect related to an option, the less risk is associated with it by the decision maker.

The heuristic makes decision making simpler than a careful (reflected) consideration of both risks and rewards would require (Romer 2009-2). Many authors argue that in decision making (e.g. in traffic) the same processes underlie adolescent and adult decision making, namely the use of affect as the basis for evaluating behavioral alternatives<sup>19</sup>. In driver education it is important to look at accumulated knowledge from gathered experience, trying to develop *with the learner* a positive affect heuristic on safe driving behavior.

## 11 Understanding risky behaviors

In understanding risky behaviors cognitive neuropsychologists refer to a mix of reflexive impulsive behavior and reflective thinking<sup>20</sup>. Younger drivers are said to be more reflexive, or impulsive, they do more operate on ‘a gist’, have less experience adding to their insight, may need more time to make fully aware and informed decisions (built up after reflected reactions). Another important element is that they often show risky behavior as an effect of the rewards in their brain for novelty behavior<sup>21</sup>. The ‘kicks & clicks’ of coping with dangerous situations may produce endorphins that lead to a kind of rush.

These can be very strong from early puberty till late adolescence, and in males later, stronger and longer lasting than in females. There are also important affect rewards from their peers: the brain centers that process affect develop earlier than the executive functions that reside in the Pfc, the prefrontal cortex. High sensation seekers may also need *some* risky behavior to get their safety systems (self control) developing and operational<sup>22</sup>. Overcoming fear, daring, is for some of them a challenge. New experiences give a reward: literally: signals from deep in the brain, the basal ganglia, give a good feeling.

An important discussion is going on between developmental neuropsychologists whether this impulsivity (a. o. sensation seeking) overrules the still immature prefrontal cortex that would not be able to control the impulses cognitively (so by reflected thinking).

If impulse control is a question of brain development, morphology, pruning of unused neurons or synapses and becoming more effective of the used connections, the device is: restrict their options and wait until they grow up and mature (Steinberg<sup>23</sup>). Another position is taken by Romer, arguing that it is mainly a matter of learning and processing experiences, enhanced by adolescent sensation seeking, rooted deep in the brain, mediated by peer groups and quite independent of maturation of the Pfc<sup>24</sup>. If so, the device is: give them enough experiences, limited by rules and guided by adults and their good examples<sup>25</sup>.

Romer argues that there are two kinds of sensation seeking behavior: One type refers to a small group (often boys *LW*) already starting very early at 2-3 year old: a specific developmental path

---

<sup>18</sup> “*If others could see me now..*”: an internalized look at ourselves through the eyes of others, a common trait in youth developing their identity in exchange with each other.

<sup>19</sup> Very basic: Slovic, Finucane, Peters, & MacGregor 2002 (Cited in Romer 2009-2)

<sup>20</sup> Steinberg (2005), Reyna & Farley (2004), Strack & Deutsch(2004), Lieberman,(2007), Romer (2007-2)

<sup>21</sup> Romer & Duckworth 2007; Leyenhorst, Crone a.o. 2009. The National Annenberg Survey of Youth (US), 2002-03, shows much higher rates for sensation seeking in boys than girls, not only higher (and a bit later peak, at 19 instead of 16) but when lowering after 19 still at a much higher level at 22.

<sup>22</sup> From experience: Woltring (2007-1); from research: Romer, Duckworth, Snitzman & Park (2009-1)

<sup>23</sup> Approximately the position taken by Steinberg (2005 and later) followed by e.g. Reyna & Farley.

<sup>24</sup> Romer (2009-2)

<sup>25</sup> See also Woltring (2007-2) about Vygotsky, and Woltring (2008).

leading on a trajectory of high impulsive behavior (consisting of 3 potentially independent forms: 1. Acting without thinking, 2. Impatience and 3. Early sensation or novelty seeking). This developmental path is – when not actively addressed - quite steady and predicts problematic behavior in adolescence (these youngsters are largely responsible for the high numbers of risky behaviors in adolescence).

Another one starts in adolescence and is quite normal, not leading to extreme risks. In an encompassing argument he doubts evidence to support a relation between natural maturation in brain structure (like Pfc) during adolescence and impulsive behavior. High risk behavior in the mentioned small group is often preceded by high impulsivity, that is probably mostly epigenetic (effect of early child interactions with caregivers), is caused by impaired impulse control long before the adolescent period, shortage or even absence of early training of highly impulsive youth, the neglect of these adolescents, giving them too much freedom that they have not been trained to handle. Romer gives many other research results maintaining that these factors are far more important than the maturation of the essential brain parts.

Back to the adults on the motorway. Following Steinberg and those who follow his line, adults' brains should have been matured, and their matured Pfc would be more capable of anticipation and of inhibition of awarding stimuli from their deeper brain. They would have a more stabilized danger perception, automated danger reactions and risk avoidance. If this is true, did then the adults on the A-2 (page 2) not mature enough? Or were there other factors? They were well informed, but they did not apply their knowledge, experience, insight. Was the wrong behavior automated? Did 'the boy inside' not mature enough? Or have they learned long time ago not to 'listen' to their sensory system that gave early warnings that they did not comply with.

## **12 Youth, adolescence, autonomy and developing responsibilities**

In traffic young drivers do *not only* have the task to learn how to self-regulate their own impulses, energy and goals, and connect to others (pro social behavior), feeling 'part of it all', but also have to deal with the potential and the extra energy of the vehicle (moped, bike, car) that kind of multiplies their own energy. Furthermore there is the actual and implied presence and actions of other participants and the ever changing road and road environment. Traffic asks for specific social interactions as well, governed by traffic rules, laws and personal estimations. Again, it takes time and experience to tune in on these tasks, but it is fitting again in the logical paths of youth become adult, they do (and like) to experiment with it.

Especially in boys the GO-system is stronger than the STOP-system<sup>26</sup>. Traffic education is about these processes too: it intervenes in and intensifies maturation not only of the Pfc, but a more general process in which the bodybrain accumulates processed experiences. Girls mature on average a bit faster than boys while in boys the development of swift and immediate reactions is mostly sooner than their reflection and anticipatory skills. This is (LW) possibly also related to the adrenaline-testosterone relation. Boys do have much more testosterone than girls do, and they react under stress – when the adrenaline alerts and prepares the body for action – more quick and direct because testosterone is not only a sex hormone, but also contributes to a high action potential.

It is believed that this all contributes to the higher accident rate in young male drivers, also strongly influenced by imagery of masculinity and bad examples of adult male role models. They are in a developmental phase in which they define themselves by comparison with adult people and mutual contest. Whether we like it or not: notably boys do learn more by trial and error. They develop their self-image and their image in the eyes of others particularly through development and exhibition of those skills that they can *show*: for example fast special acting is what they are specially good at, while they are behind in dual or multi-task processing that characterize safe traffic behavior. They overestimate their skills and underestimate the risks involved (Fuller 2007). Possibly this relates to the high impulse group that Romer points at (2009-2). It makes them good learners from their own experience but also more risk prone than girls. Their quest for self-esteem leads to less imitation of instructors and more reach for autonomy. They may obey the instructors just for the purpose of getting their (expensive) license as soon as possible, but once they have their license they go their own way and much more risky learning processes can take over.

---

<sup>26</sup> Romer & Hennessy, *A Biosocial-Affect Model of Adolescent Sensation Seeking: The Role of Affect Evaluation and Peer-Group Influence in Adolescent Drug Use* (2007); Romer & Duckworth *Adolescent Risk Taking: Implications for Public Policy* (2007)

### 13 The fear factor

Is there a sound 'fear induced decision heuristic'? Probably there is, people may drive safer if they are afraid of an accident, but a lot of questions arise. In the communication with youth (but also adults) about the dangers associated with traffic and their behavior in it, one can often see that the fear factor is used, for example in campaigning. Research on traffic safety campaigns aiming at adolescents shows that warnings for danger are not very effective. Fear is for many youngsters, especially the high risk group, a bad advisor. The fear factor does not work for them. Positive affect associated with risky behavior, often mediated by peer groups, and lack of personal skills are predictors of their risky behavior. Information about possible danger only works if the danger is presented quite sober, matter-of-factly, when it evokes personal emotions (this is serious, my personal change of getting involved is high: this is about *me*) and even then only if combined with the idea of self efficacy: "*Something can be done about it, and I can do something about it*", "*I can resist peer group pressure*", "*I can personally win by not doing something risky*". If these factors are not strong enough, denial is a usual response<sup>27</sup>.

It is quite easy to scare and impress youngsters in a day on traffic safety, and they actually are impressed and promise themselves solemnly to change their behavior. But after a while they are not able to keep up their promises. This very fact is diminishing their self esteem ("*What kind of person am I not to keep my promises*") and they cope by declaring that it does not relate to them, that *they* are able to drive safe, etc. and the effect can even be reverse: they can build a shield against campaigns and safety messages. Especially if their self image and self acceptance is low they may fall back on bluff and bravado (LW 1994, 1997, 2004, 2007-1). In a Swedish research<sup>28</sup> using depth interviews some notably dangerous driving boys who did realize what might happen, choose to close their eyes: "*If I would really have killed someone else in traffic I could not bear it, and might kill myself as well*" being their ultimate coping answer.

It is clear that driver education can address fear, but only if done properly, measured, working on personal efficacy and skills, self image, self esteem (not acted-as-if) and transferring the idea "*You are worthwhile, it would be a bad thing, I'd really regret it, if you would die or get handicapped*".

### 14 The role of guided learning. Instruction or coaching?

Driving teachers are in a very comfortable position: driving lessons offer great possibilities for 1:1 communication, provided that it does not take away the responsibilities of the learners, but just elicit these, by questioning and steering on the growing awareness of the pupils' 'bodybrain' in a growing complex environment, so they can learn to trust and develop their basic reactions. In driving lessons the situation is alternately quiet and intense, calm and busy, stressed and relaxed. Routine and sudden changes. There are no transfer problems from books or classrooms into reality, they can stop the car and discuss what happened, and make plans for the next steps. It seems wise to help and guide learner drivers to master their basic skills in driving (steer, brake, switch gears, keep the engine running) in an early stage, as much as possible guided by their own inquisitive attitudes and inborn need to survive.

The basic rule in coaching is that *not the teacher* but the *learners* set their goals, minutely, per lesson, in each lesson, act on it and assess the result by themselves. The coach is there to limit dangers and guide the process by open questions, also steering on the growing and more precise awareness (body signals and mind processes) also enabling the learner to keep and develop his responsibility and gradually formulate goals of a higher complexity, but from lesson one growing insight is based on feeling, literally: registering emotions, all kind of signals and metaphorically: feeling for the car and traffic (see HERMES, strongly influenced by MERIT and the work of John Whitmore<sup>29</sup> 2006). The more the learners have mastered these skills by themselves, instead of copied the heuristics of someone else, like the instructor, the more they learn to trust their own experiences and learning capacity *and may go on* like that after the test for the driving license. Reflexive reactions can be reflected, learned and (semi-)automated with sufficient time and

---

<sup>27</sup> Kok, Ruiter & Feenstra, 2008; Brijs, Ruiter & Brijs 2009.

<sup>28</sup> Falk & Montgomery 2007

<sup>29</sup> Whitmore developed his book and practice on coaching in organizations from his former experiences in all kinds of sports like driving, golf, sailing, skiing and builds in that also on his cooperation with Gallwey and his books/trainings on 'the inner game of sports'

experience. It can be questioned whether instruction stimulates enough autonomous learning after. Autonomous continuation of the learning process in the next 3 years and 50.000 kms is nuclear in reaching safer traffic.

Affect is an important issue in learning to drive. It plays a role not only in the communication but also – and that is the quintessence here – in the developing decision heuristics. A good driver trainer or coach knows about adolescence and has a good feeling for communication with adolescents. He or she respects their tasks and dilemma's and guides them through these where traffic is concerned. This may even have important effects outside traffic as well.

We can train and memorize actions, but we have seen that in this process emotions and feelings play an important role (Immordino Yang & Damasio, 2007). These are often preceded by earlier engrained emotions in the case of danger, possibly outside traffic, possibly in early years. In stress situations, these may have a bearing on acting and reflection.

If the relation coachee-coach develops well, a good coach can help the learners to handle these emotions and feelings, gradually, where possible self paced. He is not a therapist, but assists the learner to build up his capacities in an important field, works on self acceptance first (“You are you, and that is good, from here we can go on learning; what do *you* need?”) and builds on his positive qualities. He may open up real self esteem (instead of ‘acted-as-if-self-confidence’) in other fields too. These emotions and feelings are taken serious as elements of traffic behavior that can be addressed in the process of learning to keep distance, diminish speed, or stop and think: “What is going on and what can you do...? What do you need for that?”

Stress in the interaction with the driving trainer, and the anticipated or real behavior of the examiner at the final test, has an effect on the way the learner learns to handle his or her emotions. This stress may for example be followed by obedience. Just obeying orders or instructions can be more of a stress reduction mechanism (surviving this lesson or exam) rather than actually lead to real learning, integrated in somebody's accumulated competencies. Some youngsters may obey during basic driving lessons (“*Very expensive, so I do not discuss*”) until the exam and go their own way after. They may have obeyed in view of the test and keep on learning by themselves, but what do they learn? From who? Under which influences? Which decision heuristics have developed? Are they the ones that show up 20 years later in a pile up on the A 20?

In many road accident research we see that emotional factors (including ignoring them) did contribute very strong to ‘unsafety’. If learners do not take their own emotions, feelings and anxieties serious from the very beginning and skip it on direction of an instructor (“*Get over it, don't be scared, I am here..*”), or hide them, they may miss out on a fundamental task in developing their driver skills.

For example: if in lesson one or two the engine cuts off after wrong operation of the clutch or brake, this may give a feeling of fright<sup>30</sup>. This is affect adequate. It is a very important moment full of learning possibilities. The coachee realizes that one cannot just transfer the power of the engine to the wheels. A lot of energy is involved here, so you have to be careful. Does the instructor say how you can avoid this (“*Do this and that, and take care of my car...*”)? Or does the coach re-assure you, it's all right to be frightened, logical, you're not the only one, you are a learner, so you're allowed to make mistakes, we can learn from them. He can ask what's going on, “*What did you do? When did you sense what? What do you think you can do about it? Try it again. Better so? Why? What did you do the second time, can you do this operation better or is this all right for you?*” (It's quality will improve later by doing).

This may take a lot of time at the beginning, but may lead to quicker and more basic learning after a few lessons. The learner may resist coaching: “*Say me what to do, you're the one who is paid for learning me to drive!*”, a luxury position for the learner and possibly for the instructor is well (he can show his skills...). So it is not easy at the beginning, but again the basic question to guided learning in driver education is whether it supports or reinforces the natural maturation process and reflection on ‘*the self in complex situations*’ or whether it initiates other processes, sometimes counterproductive like mere copying and dependence, taking away important moments of self paced learning, or even provoke temporary obedience and/or reactance.

---

<sup>30</sup> Often associated with preceding emotions in parent child or teacher-learner relations. “*I am clumsy*”, “*I will never learn this*”, “*I hope they will like me and that they do not see that I am frightened*”, or just the opposite, showing dependency: “*Help, I cannot, help me*” addressing the hero/savior in the educator, staying independent.

Acquiring the basic pure technical skills (GDE-level 1) is for many youngsters, especially many boys, quite easy. Acquiring tactical skills in traffic is a bit harder, but they can do. Strategic and the 'higher order' skills like anticipation, self assessment, traffic assessment, inhibition, planning and more are harder to meet in instruction-wise guided learning. One can question if these can be addressed via texts, warnings or instruction with all the 'noise and rumble' in the communication, translation problems and transfer to their own integrated, responsible and autonomous decision making. The immature/inexperienced learner needs for the time being a more experienced coach or trainer, for example for setting limits ("*I do understand what you want, but did you realize what can happen if...*"), but too much structuring of the acquirement of skills from the outside may provoke the quest for excitement ("*These lessons are boring, wait till I have got my license..*") and may not lead to sufficient self monitoring all elements of the interaction of the brain body with the complex environment. Basic experiences and reactions may be overruled or even prevented by instruction. Self observance, mastering skills, developing questions, and structuring of knowledge is in fact much more effective, it reflects the functioning of the brain. Experiences and what one learns from them are better engrained by coaching. See Bailey (2009) who cites some basic reports on this about coaching and self monitoring.

*How* learners get as far as that may vary in many people. Some may learn better by imitation first and later self adjustment, supported by instruction and modeling. The question is how they will reach independence and go on learning after the test? Do they skip important steps during driver education<sup>31</sup>? Others favor trial and error and are dependent of feedback on their actions, basically direct feedback in action, but also feedback from relevant others. Law enforcers may complete the feedback after the test, although law enforcement has some other counterproductive aspects as well, like evading that kind of feedback more than doing what the enforcers want you to do. Some go from concrete action and experience into more abstract knowledge. Others want to have the full picture before they go into detail, although it is questionable if this works as well in concrete swift action like in traffic. It may work for those who are fearful and so it gives them some insight and corresponding relaxation. But again: every learner has to integrate all learning from sources outside their own system and self processed experiences into their own complex autonomous behavior.

The question is legitimate whether instruction can attain this result. Autonomous handling of the car and handling oneself in the car and in traffic cannot be reached just by listening to cognitive knowledge as written in books, showed on video, spoken by or showed by an instructor – "*Do this, don't do that, take these steps in order to...*". Translating this into one's own complex and swift responses to traffic situations is difficult. It is a very complex process: in the integration of new responses is the personality of the learner involved. Rational safe behavior is easily overruled or crossed by emotions, especially stress. "*They should know that...*" is the projection of adult people on less developed and balanced youngsters, and as such a rather weak answer to trespassing behavior in situations where the cognitive rules are overwhelmed by strong emotions. The good question is: "*Do they know that....? And can they operate on that knowledge?*" Not organic but artificial developed feedback systems like detailed instruction and/or simulators can intensify learning, but should keep pace with the natural more organic development of the bodybrain and also pay attention to the learning styles, the socialization, imagery in the media, adult examples and personality building of youngsters, especially their initially somewhat vague and weak feeling of self, self acceptance, self esteem (real, not acted-as-if) and self-confidence. Artificial control systems (like in enforcement) are necessary to set the limits and give feedback, but may also lead to reactance, evasion or externally controlled behavior instead of the wished for autonomous safe driving.

## 15 An example in the making<sup>32</sup>: the EU Hermes project

There have been several EU programs related to driver education and aiming at less accidents: GADGET (1999): *Guidance, Education & Technology for car drivers*; DAN (2000): *Post-licensing measures for novice drivers*;

<sup>31</sup> An old Dutch research in the mid-nineties showed that nearly 900.000 licensed drivers (at that time some 9-10 % of the licensed drivers) did not use their car, because they thought driving to be too dangerous. For some of them that may have been adequate (too old, in a way handicapped, etc.) but many may not have learnt to act appropriately in traffic, while others went their risky way accepting or exporting risk to others.

<sup>32</sup> In this text there is no space for elaborating on other modes and manners of education. See also Woltring 2007-1. a bit out dated on pfc-maturation and decision heuristics, but for the remainder still useful.

ADVANCED (2002): Post-license training (for novice drivers); ANDREA (2003): *Best practice in driver rehabilitation*; BASIC (2003): *New models in driver training*; NOVEV (2004): *Evaluation of 2nd phase training pilot projects*; TEST (2005): *European standards for driver testing*; MERIT (2005): *European standards for driving instructors* (in which coaching was already advised) and SUPREME (2006) *Summary and Publications of Best Practices in EU-memberstates*. The logical and practice oriented follow-up on these EU-projects is the HERMES program (2007-2010): *High impact approach for Enhancing Road safety through More Effective communication Skills for driving instructors*.

HERMES tries to work out *how* to put these best methods into practice and how to contribute to continuing learning after the license test. In 2010 a training package will be published for driving teachers on '*best communication skills especially coaching*' in the car, in classroom discussions, and on the track. A team of experienced driving teachers, psychologists, educational and coaching experts from 9 member states has been brought together for this purpose. In 2010 this package is available throughout Europe in all major EU-languages, ready to be adapted to the various cultures and opportunities that the member states' laws and traffic education structures do offer.

In Hermes driving is seen as a 'self-paced task': it is the driver who makes the choices. Drivers must choose *if* they drive, *when* they drive, *how* they drive and *with whom*. But to be able to pace themselves well, drivers must have a realistic perception of their skills and must avoid being influenced by other factors (such as motives that work against safety, peer pressure, stress, life style) and learn how deal with these factors.

The use of coaching methods in driver training is seen to be a key way to achieve these goals. A very specific way of coaching is designed to develop the *awareness* and *responsibility* of the person being coached. These 2 components are seen as vital in encouraging safe driving and maintaining to learn from own experiences. It is specific and not just opting for the 'buzz-word' coaching that nowadays can mean anything. The challenge of coaching is seen as to lead the student out of the role of a passive consumer and into the role of an active producer. It should activate and while doing so motivate the learner to make the right decisions in traffic. It builds on the physical, emotional and intellectual experiences of the coachee. Hermes draws on existing experience of coaching (in sports and elsewhere) and other active learning methods in driver training and on expert advice in the greater coaching world. It aims to deliver a highly practical training package which new and experienced driving teachers can follow, including:

- What is coaching - the principles of coaching
- Why coaching - aims and rationale of coaching in driver training
- When - and when not - to coach: practical application in driver training
- How to coach - methods to be used by the driving teachers
- Scenarios for coaching: training exercises

The course documentation will include the training-of-trainers, audiovisual support, user manuals and practical coaching scenarios for learner and novice driver training. The complete package is now being tested and evaluated in a pilot project and will be adapted as a result.

Coaching is seen as a method which activates the learner driver and makes him more aware of himself, the car, and the interaction between himself and others in a (social) traffic environment. It accepts the learner driver as being responsible for himself, his own learning (including his future learning) and his behavior in traffic and which help him maintain this sense of responsibility in complex situations).

The teacher/coach and learner form a partnership in which the coach, through observation, questioning and feedback, encourages the learner to be himself, identify goals, reflect on his experience and develop strategies to meet his driving goals in the future<sup>33</sup>.

To make the right choices in traffic, a novice driver requires:

- Self-awareness, e.g. how one's mood or emotions can affect one's driving.
- Awareness of external factors, such as the actions of other road users
- A sense of responsibility and of the consequences of his behavior and the confidence to act accordingly
- Self-confidence, or perhaps more appropriately 'self-acceptance' in the case of novice drivers, accepting themselves as the ones they are, capable of learning to prevent bravado or any feeling of inadequacy leading to risky driving behavior

---

<sup>33</sup> If necessary, this process should sets limits to the learner's goals and behavior, but these limits should be fully accepted by the learner.

Principles of coaching in this manner are:

1. The coaching relationship is an equal relationship: the trainer is no longer 'the expert' in the hierarchical sense.
2. Coaching puts the learner in an active role.
3. Coaching encourages the learner to identify his/her goals and to meet these goals.
4. Coaching raises the awareness, responsibility and self-acceptance of the learner
5. Coaching raises awareness not only through rational thought but also through the learner's senses and emotions. It raises awareness of the learners' values, goals, motives and attitudes as well as his sensations and emotions, knowledge, skills and habits.
6. Coaching addresses the learner's internal obstacles to change
7. Coaching builds on the prior knowledge and experience of the learner
8. The coach is convinced of his role and of the benefits of coaching
9. A coach communicates in an authentic, neutral and non-judgmental manner
10. The basic skills a coach uses are effective and precise questioning, listening and reflecting back
11. Coaching and instruction do not mix: if instruction cannot be avoided, alternate with coaching rather than mixing them.
12. Coaching shall be experienced by the coachee as much as possible as a voluntary process: the learner shall not be forced to participate in the coaching method.
13. Coaching is not just about asking questions: it is about using a method which is appropriate for the circumstances, ensuring that the learner is put in the active role wherever possible.

Many of these principles are interlinked and mutually dependent. It leads too far to elaborate more on this. Info about Hermes and coaching on: <http://www.alles-fuehrerschein.at/HERMES/>

## 16 A few words on testing, monitoring and self assessment

If we want to break with the culture of 'test training', but to make the test an integral part of the continuity in learning to drive, a next step will be to look at the tests in various countries.

Introduction of hazard perception in the theory test (in the class room) like introduced recently in the Netherlands, and evaluation of independent driving (route choice) during the test (idem) is no doubt a improvement. A lot of effort is done to heighten driver performance assessment during driver education by the instructor and to heighten the validity of the formal test (e.g. Roelofs, Visser 2009), also expanding the test to more levels of the GDE-matrix.

Discussion however is needed about the influence of external assessment (first of the instructor, later by the examiner) on the gradually acquiring of self assessment by the learner.

In this text the position is taken that too much emphasis on external assessment makes the learner dependent, does not enough elicit his self assessment. Instructors and examiners are very often strongly 'fault-oriented' and they influence each other in this (e.g.: "*If you do this during your test drive, you will fail the exam!*"). They are often used to give many corrections and negative feedback on learners, go contra their (gradually developing) self assessment, in this way negatively affecting their feeling of trust in their own learning capacity. This may result in a not matured self assessment that has a large bearing on their further development of an own driving style after having received his formal driving license.

Of course *monitoring* by the coach is very important during the coaching process (as being advocated in Hermes), it enables the coach to question the shown skills, decisions taken by the learner in his leaning process and to set limits where necessary if the learner is too daring and to challenge if the learner is too hesitant.

In a good coaching process every lesson is a constant 'game' of doing and self assessment. Every act is tested, so the the learner should be able to assess whether he is far enough to be a candidate for the formal test, and the coach can question this.

In this line of thoughts this formal test should be nothing more (or less) than a 'back up test' – if the learner does not pass the test, something went wrong before - and a public safe guard as not to allow drivers with a bad self assessment to enter traffic and a check on coaches who miss out in this process (being too easy to their clients).

The test itself can then also be changed in not only assessing driving behavior (sufficient or wrong) but also assessing the candidates' learning behavior; for example in minor faults (not direct leading to a negative ordeal) questioning the candidate whether he is able to see what went wrong and how he came to his wrong decisions, what he had seen or not, taken into account or not, etc.

## 17 The future: Keep on learning and how to facilitate it?

Drawing on the text above and the positions taken in it, something can be said about how to go on:

- Further development (and research) of testing is needed in order to develop ways that support lifelong learning (see chapter 16 in this text).
- Professional education schemes and programs can be further developed. Coaching is rather new in driving schools, it will take a lot of pilots, experiments, learning from fault applications and so on. In all these pilots principles of Self Directed Learning can be applied, next to formal evaluation research. A lot can be learned from good psycho-physical education in some sports and especially in some social skills programs with a physical dimension in it as well.
- Supporting lay teachers in coaching. If – as in many member states all ready practiced – there will be more emphasis on accompanied driving, it is logical to support parents or other experienced drivers in doing so. As a side effect it may also influence their driving behaviors.
- In Europe there is more possible in introducing graduated driving licensing, like the good examples in the US, see OECD (2005), Sanders & Vissers (2006) on Supreme.
- Novice driver programs do tend sometimes as an update on instruction (“*Do you remember what you’ve learned during your primary education?*”). These programs can be (re-) formulated in addressing the learning qualities of novice drivers.
- A lot of research can be done to support the practice of continuing learning. Just a few examples:
  - Prologue: a EU project, lead by SWOV, the Dutch Institute for Road Safety Research, researches whether a large scale European Naturalistic Driving study is useful and feasible. A lot can be learned from there.
  - Research after accidents have happened: what can be learnt from in-depth interviews with the involved persons: interventions based on imagining the emotional aftermath of being the perpetrator of a serious accident should be developed and tested.
  - Research can be done about longer lasting effects of coaching versus instruction
- Campaigns on safe driving can be reframed, being less based on fear, and more on positive self assessment and learning.
- Enforcement can be reframed. More focus can be placed on behavior changing, in which punishments are only one factor. A logical step after trespassing safety rules can be some training, controlled self assessment on simulators, group sessions etc. This is already practiced in some countries, but may be checked upon transfer into reality, facilitating continuous learning and self assessment.
- Simulators can be used to maintain and/or further develop hazard perception and keeping awareness. Further research has to be done where yes, and where not.
- Policies could be developed in which the development of cars is stimulated that do not take away the responsibility, but give more feedback on one’s driving behavior. This can be done simultaneously with promoting fuel saving cars. These do give already a lot of direct feedback on fuel consumption, also leading to more calm driving, offering opportunities for safe driving.

**Acknowledgements** This text is entirely my responsibility, but I thank many people for giving sources and comments on parts of it, especially Jan Vissers and Rob Ruiter (the Netherlands), and Dan Romer (US)

### References:

- ADVANCED):** *Recommendations for post-licence driver & rider training*, (2002 CIECA)
- Albarracín, D., Gilette, J.C., Earl, A., Glasman, L.R., Durantini, M.R.,** A Test of major Assumptions About Behaviour Change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic in *Psychological Bulletin 2005 Vol. 131 No. 6, 856-897*
- Albarracín, D., Durantini, M.R., Earl, A.,** ‘Empirical and Theoretical Conclusions of an Analysis of Outcomes of HIV-Prevention Interventions’, in: *Current Directions in Psychol. Science*, 2006 15(2), 73-78.
- ANDREA :** *Recommendations for driver rehabilitation courses*, (2003, KfV)
- Bayley, T.** *Self awareness and self-monitoring – Important Components of Best Educational Practice for Novice drivers* Journal of the Australasian College of Road safety – february 2009
- Berends, E.M.** Invloed van automassa op letselrisico bij botsingen tussen 2 personenauto’s (Influence of vehicle mass on injury/death rates in collision of two passengercars. SWOV, Leidschendam 2009 (English abstract: [www.swov.nl](http://www.swov.nl), publications, search word ‘mass’ Reportnr., R-2009-5)

**Brijs, K.\*, R. Ruiter\*\* & T. Brijs\***, Naar een *evidence-based* en doelgroep-specifieke verkeerseducatie: Enkele recente inzichten met betrekking tot risicogedrag bij jonge adolescenten (\*University of Hasselt (B) and \*\*University of Maastricht (NL) (presentation on Symposium Maastricht 2008; (translation of title: Towards an *evidence-based* & target Group specific traffic education. Some recent insights with regard to risk behaviour of young adolescents. English version is in the making)

**Carstensen, G.**, The effect on accident risk of a change in driver education in Denmark in *Accident analysis & prevention*, 34 (2002) 111-121

**Dahl, R.E.**, 'Adolescent Brain Development: a period of vulnerabilities and opportunities' in: *Annals New York Academy of Sciences* 1021: 1-22 (2004)

**Damasio, Antonio**, *Looking for Spinoza. Joy, sorrow and the feeling brain* (William Heinemann, London 2003).

**Falk, Brigitta & Henry Montgomery** *Developing traffic safety interventions from conceptions of risks and accidents*. Transportation Research Part F 10 (2007) 414-427

**Fuller, Ray**, *Driver training and assessment: implications of the task-difficulty homeostasis model* (Dublin, 2007)<sup>3rd</sup> Int. Conference on Driver Behavior and training.

**Giedd, J.N.**, 'Structural Magnetic Resonance Imaging of the Adolescent Brain' in: *Annals New York Academy of Sciences* 1021: 77-85 (2004)

**Gogtay, N., Giedd, J.N.** (e.o.) 'Dynamic mapping of human cortical development during childhood through early adulthood' in *PNAS* may 2004 vol 101, No 21 8174-8179

**Gurian, M.** *Boys and girls learn differently* (San Francisco 2001)

**Hatakka, M., Keskinen, E., Glad, A., Gregersen, N. & Hernetkoski, K.** 'From Control of the vehicle to personal self-control; broadening the perspective to driver education' Transportation Research part F 5(3) pp. 201-215 (2002)

**HERMES** <http://www.alles-fuehrerschein.at/HERMES/> (2007-2010)

**Johnson, D. M.** *Introduction to and review of simulator sickness research*. (Research Report 1832).

**Hoppe, R., Tekaat, A.**, *Personale Kommunikation in Berufsbildenden Schulen* BAST Heft M74 Bergisch Gladbach jan. 2005) {(An evaluation study of) *Personal Communication in vocational training colleges on traffic security* (See Schulze, Woltring, 1994)}

**Hoppe, R., Tekaat, A., Woltring, L.**, *Förderung der Verkehrssicherheit durch differenzierte Ansprache junger Fahrerinnen and Fahrer*. BAST Heft M165 Bergisch Gladbach jan. 2005) (*Promoting road safety by adopting a differentiated approach to addressing young male and female drivers*)

**Immordino-Yang, M.H., & Damasio, A.R.** We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain and Education*, 1(1), 3-10. (2007).

**Rucker, AL:** U.S. Army Research Institute for the Behavioral and Social Sciences.

**Kok, G., J. Feenstra & R. Ruiter**, Bevordering van veilig verkeersgedrag van adolescenten. (Promotion of safe traffic behavior of adolescents). University of Maastricht, Faculty of Psychology. Presentation on Symposium on Traffic safety, November 2008

**Van Leijenhorst, L., Zanolie, K., Van Meel, C. S., Westenberg, P. M., Rombouts, S. A. R. B., & Crone, E. A.** What motivates the adolescent? Brain regions mediating reward sensitivity across adolescence. *Cerebral Cortex*. See also: <http://www.brainanddevelopmentlab.nl/index.php/publications> 2009

**Klimstra, T., Hale III, W.W., Raaijmakers, Q. A.W., Branje, S.J.T., Meeus, W.H.J.** 'Maturation of Personality in Adolescence' in *Journal of Personality & Social psychology*, 2009, Vol. 96, No.4 898-912

**Lieberman, M.D.**, 'Social Cognitive Neuroscience: A Review of Core Processes' in: *Annual Review of Psychology* 2007.58: 259-289

**Lu, L. H. & Sowell, E.R.** Morphological development of the brain: what has imaging told us? In: Rumsey, J.m. & Ernst, M. (Eds) *Neuroimaging in developmental clinical neuroscience* (pp.5-21) New York, Cambridge University Press, 2009

**MERIT** Minimum European Requirements for driving Instructor Training, (Institut Gute Fahrt) ([www.alles-fuehrerschein.at/publikationen](http://www.alles-fuehrerschein.at/publikationen) & [www.cieca.be](http://www.cieca.be) 2005

**Mollenhauer, M. A.** *Simulator adaptation syndrome literature review*. Royal Oak, MI: Realtime Technologies. 2004

**NOVEV** Evaluation of post-licence novice driver training, (CIECA 2004)

**Poolton, J.M. & Zachry, T.R.**, 'So You Want To Learn Implicitly? Coaching and Learning Through Implicit Motor Learning Techniques' in: *Int. Journal of Sports Science & Coaching* Vol. 2 No. 1 2007

**Roelofs, E., Vissers, J., Onna, M. van, Nägele, R.** *Validity of an on-road driver performance assessment within an initial driver training context* Paper presented at Driver Assessment conference in the US 2009

**Romer, D. & Hennessy M.**, (2007-1), 'A Biosocial-Affect Model of Adolescent Sensation Seeking: The Role of Affect Evaluation and Peer-Group Influence in Adolescent Drug Use'; in: *Prevention Science* 2007 8 89-101

**Romer, D. & Duckworth A. L.**, (2007-2) *Adolescent Risk Taking: Implications for Public Policy* Presentation for American Psychological Society 2007

**Romer, D., Duckworth, A. L., Sznitman, S., & Park S.**, (2009-1), Can Adolescents Learn Self-Control? Delay of Gratification in the Development of Control over Risk Taking (july 2009, Annenberg School of Public Policy, University of Pennsylvania

**Romer, D.**, (2009-2), 'Adolescent Risk Taking, Impulsivity, and Brain Development: Implications for Prevention' in: *Prevention Psychology*, autumn 2009

**Sanders, N. & Vissers, J.** *End report of SUPREME, Summary and Publications of Best Practices in EU-member states* (KFV, CIECA, DHV) 2006

**Schulze, H.** *Lebensstilanalysen – ein Beitrag zur Sicherheit junger Kraftfahrer/innen in Ost und West* BAST, 2003 (Life style analyses; a contribution to safety of male and female drivers in East and West)

**Schulze, H., Woltring L. (e.o.)** *Entwicklung eines Programms der Personalen Kommunikation für Berufsbildende Schulen* DVR Bornheim, 1994 (*Development of a personal communication program for vocational training colleges*)

**Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G.** 'The affect heuristic'. In T. Gilovich, D. Griffin & D. Kahneman (Eds.), *Intuitive judgment: Heuristics and biases*(). New York: Cambridge University Press 2002

**Steinberg, L.**, 'Risk taking in Adolescence. What changes and Why?' in: *Annals New York Academy of Sciences* 1021: 51-58 (2004)

**Steinberg, L.**, 'Cognitive and affective development in adolescence' in: *Trends in Cognitive Sciences* Vol 9 No.2 February 2005

**Steinberg, L.**, 'Risk Taking in Adolescence. New perspectives From Brain and Behavioral Science' in: *Current Directions in Psychological Science*, 2007 16(2), 55-59.

**Steinberg, L., & Monahan, K.C.**, 'Age differences in Resistance to Peer Influence' in: *Developmental Psychology* 2007 Vol.43, No. 6, 1531-1543

**Strack, F. & Deutsch, R.**, 'Reflective and impulsive Determinants of Social Behavior' in *Personality and Social Psychology Review*, 2004, Vol.8, No.3 220-247

**SUPREME**, Summary and Publications of Best Practices in EU-memberstates (CIECA) (2006)

**Reyna, V. F.**, 'How People Make Decisions That Involve Risk. A Dual-Processes Approach' in *Current Directions in Psychological Science*, Volume 13 60-66 (2004)

**Reyna, V. F. & Farley, F.**, 'Risk and Rationality in Adolescent Decision Making: Implications for Theory, Practice, and Public Policy' in: *Psychological Science in the Public Interest* Vol. 17 No. 1, 1-44 (2006)

**Visser, J.**, 'Driver training stepwise: towards a new structure for the training of novice drivers in The Netherlands' in: *Zweite Internationale Konferenz "Junge Fahrer und Fahrerinnen : Referate der Zweiten Internationalen Konferenz "Junge Fahrer und Fahrerinnen" in Wolfsburg am 29.-30. Oktober 2001, Berichte der Bundesanstalt für Strassenwesen `Mensch und Sicherheit', Heft M 143, p. 88-94*

**Whitmore, J.** *Coaching for Performance*, NB Publishing, London 2006

**Woltring, L.** (1994) *Geschlechtsspezifische Aspekte des Risikoverhaltens junger Männer: "Verbindung von Natur und Erziehung"* (Male Genderspecific Aspects of Risk-behaviour: Nature and Nurture) in: *Bast Heft M52 Junge Fahrer und Fahrerinnen*, Referate der ersten Internationalen Konferenz "Junge Fahrer und Fahrerinnen" in Köln, Dezember 1994 (BundesAnstalt für Strassenverkehr, Bergisch Gladbach 1994)

**Woltring, L.**, (1997) *Verkeersagressie* (translated title *Aggression in Traffic*). Teachers manual for the ANWB (Dutch Automobile Association)moped video *Cool!?* (ANWB, Den Haag 1997)

**Woltring, L.**, (1999) *Verantwoorde zelfsturing van energie* (translated title *Sensible self-management of energy*) in: Achterhuis, Dupuis e.a. *Verkeersethiek. Negen opstellen over normen en waarden in het verkeer*, ANWB, Den Haag 1999). (*Traffic Ethics. Nine essays on the standards and values of behaviour in traffic*)

**Woltring, L.**, (2004) *Alles onder controle. Docenthandleiding bij (video-)lespakket over risico's op de bromfiets* (translated title: *Everything under control. Teacher's handbook accompanying video and teaching materials about the risks involved in driving a moped* of: (*Regionaal Overleg Verkeersveiligheid Noord-Holland*, Regional Platform for Traffic Safety, Noord-Holland) (Haarlem 2004).

**Woltring L.** (2005) *Addressing Risk Taking Behaviour of Young Males in Traffic. Some notes on the Novice Driver Education Trial (for Australian Traffic and Security Bureau, July 2005)*

**Woltring, L.** 'Boys in traffic: learning and risk-taking, specific developmental tasks and education' (in: Hartman. D., *Educating Boys. The Good News*, Newcastle (Australia.) 2006

**Woltring, L.** (2007-1): *Addressing the risk-taking behavior of young males in traffic*  
[www.laukwoltring.nl/traffic\\_education.htm](http://www.laukwoltring.nl/traffic_education.htm)

**Woltring, L.** (2007-2) *The only safe driver is a learning driver* Paper/handout for 3rd Int. Conference on Driving behavior and training (Dublin Nov. 2007) [www.laukwoltring.nl/traffic\\_education.htm](http://www.laukwoltring.nl/traffic_education.htm)

**Woltring, L.** (2008): *More Backgrounds: Boys in Balance – Development, Opportunities and High-risk Behaviour.* <http://www.laukwoltring.nl/backgrounds.htm>

**Ykema, F.** *The Rock and Water perspective. Theorybook and Rock and Water, Skills for physical-social teaching with boys.* Gadaku Institute St Maartensdijk, The Netherlands (see [www.rockandwaterprogram.com](http://www.rockandwaterprogram.com))

**Ykema, F., Hartman, D. & Imms, W.** *Bringing it together. Rock and Water, Skills for Physical-social Training. 22 cases studies in different settings* University of Newcastle, Australia 2006