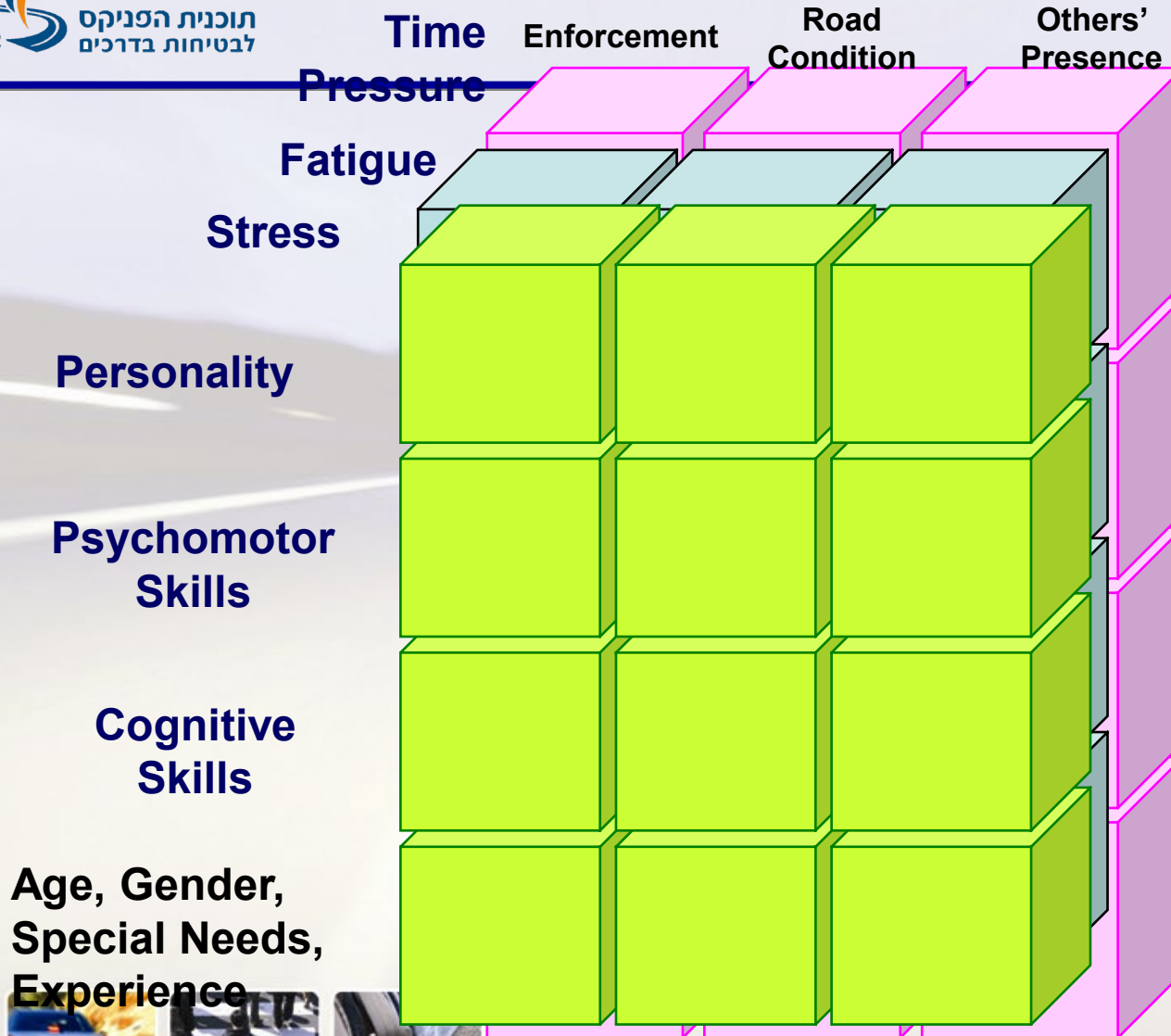# Me and My Autonomous Car

Tova Rosenbloom, Head of the Research Institute of Human Factors in Road Safety

Head, Health Management Program, Bar Ilan Univ., Israel

Safe Interaction in Traffic Following Automotive Technology Advancements

תוכנית הפניקס
לבטיחות בדרכים

אוניברסיטת בר-אילן
מסורת של מצוינות

Now put this human being in an automated car

Automation Degrees

		Automation	Driver' functions
1	Non-automation	Some systems for better driving	**All the functionsof car's operation**
2	Partially Automated	Cruise control Steering and Braking	**Car's operation especially in emergency**
3	Conditional Automation	The automation is dominant, but the driver intervenes when needed	**Dominance in emergency**
4	Highly Automated	Fully automated but only in defined areas	
5	Fully Automated	No intervention of human driver at all	

- Despite what is ideally thought, Level 3 and Level 4 of the autonomous car will still require driver attention. Level 3 & 4 car will need drivers to be able to take control of the car in any given moment. Intervention will be determined according to the autonomous car ability to cope with road conditions and challenges.

- While in autonomous mode, drivers are not required to pay <u>full</u> attention on the road, however, the human driver will have to be alert in order to take control of the car when needed.

- The handover task from the human driver to the autonomous car is not a novel concept; in shift-work domains where errors can lead to disastrous consequences, these handovers must be carefully considered, as they represent a vulnerability in a system

- This vulnerability is due to a reduction in 'situation awareness' (SA) as a result of being 'out-of-the-loop' for an extended period of time

- In turn, this can lead to an increase in errors, and consequently, an increase in accidents

- In the driving task, the reduction of SA has been found to increase risk when the driver receives control from an automated system

Situational Awareness

- Situational awareness (SA) is defined as the recognition of objects in the environment, understanding of their meaning, and the projection of their status in near future.

- We speak about three levels: perception, comprehension, and projection (Endsley, 1988).

Endsley, M.R. Situation Awareness Global Assessment Technique (SAGAT). In Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, USA, 23–27 May 1988.

The catch 22 of vehicle automation

Take away all of the driving tasks from the driver

BUT

The catch 22 of vehicle automation

Take away all of the driving tasks from the driver

BUT

Tell the driver he must be vigilant and be legally prepared to intervene as he is responsible for the vehicle

Over 1600 driving tasks!

- Basic Driving Tasks – like steering and speed control.

- Core Driving Tasks –negotiating bends and gradients.

- Specific Driving Tasks negotiating junctions and crossings.

- General Driving Tasks –being able to deal with different road conditions and reacting to other road users.

- Global Driving Tasks – are goal orientated, high level strategies such as navigation and surveillance.

Walker, G. H., Stanton, N. A. and Salmon, P. M. (2015) Human Factors in Automotive Engineering and Technology. Ashgate:

Briefly…

Problems with automation…..

- Not powerful enough (yet) to render driver redundant

- Requires driver to monitor (continuously) and intervene (occasionally)

- Attentional resources are yoked to task demand (which is substantially reduced in highly automated vehicles)

- Reduced drivers readiness and timeliness to intervene

Stanton, N. A., Young, M. S. and Walker, G H. (2007), The psychology of driving automation: a discussion with Professor Don Norman. International Journal of Vehicle Design, 45 (3), 289-306.

There maybe a design solution…..

- Only automate what you have to and when you have to

- Support the driver rather than replace driver

- 'Background' automation <u>not</u> 'foreground' automation

- Gradual and graceful degradation in system failure

Stanton, N. A., Young, M. S. and Walker, G H. (2007), The psychology of driving automation: a discussion with Professor Don Norman. International Journal of Vehicle Design, 45 (3), 289-306.

Professor Neville Stanton:

"As vehicles become fully autonomous, even the most observant human driver's attention will begin to wane. Their mind will wander … This is particularly true if they are engaging in other activities such as reading, answering emails, engaged in conversations with passengers, watching movies or surfing the internet."

- As we can see the romance with the autonomous car is not ideal but there are different solutions.

- One idea is that drivers will go through a special training how to join an autonomous car

- The design of cars will have to take into consideration the problems that arises when we use an autonomous car in order to minimize dangerous situations

Thanks!