



HUMAN-MACHINE-  
INTERACTION

## WP 3 – Focusing on the Driver Key Findings and Results

### NON-DRIVING RELATED TASKS (NDRT)

According to our experiments, the following attributes of NDRTs **can increase the take-over time** compared to not pursuing NDRTs:

- Holding an object (e.g. a mobile device) in one/both hands
- Manual interaction (one/both hands) with mobile electronic devices
- Unusually strong rotations (>90°) of the torso
- Increased effort or multiple steps needed to fully disengage from a NDRT

The following attributes of NDRTs show **no consistent effects**:

- Visual or visual-motoric tasks (e.g. watching video, reading, texting) without occupation of one/both hands
- Cognitively demanding NDRTs affecting the cognitive transition
- Generally, **strong interindividual differences were found** concerning how NDRTs influence the driver state

### HUMAN-MACHINE INTERFACE

For planned requests to intervene (Rtl), **multi-stage HMI-concepts** have been shown effects of accelerating the disengagement from NDRTs and by this on take-over time.

A preview of planned requests to intervene along the route (based on safety server information) helps **drivers to self-regulate their engagement** in NDRTs.

A „**NDRT lockout**“ simultaneously with the request to intervene can speed up the driver response to the request.

A „lockout“ was implemented as a system-initiated interruption of the NDRT performed on the vehicle-integrated infotainment system or on connected portable devices with an additional presentation of the Rtl on the respective screen.

### RECOMMENDATIONS

**Natural behavior, self regulation and motivational aspects** of NDRTs must be considered in the experimental design.

A safety assessment of NDRTs with respect to their effects on take-over performance can only be carried out taking into account the details/parameters/aspects of the test scenario (e.g. the available time budget).

The **request to intervene (Rtl)** should be designed to be **multi-modal** and needs to unequivocally convey the necessity for taking over vehicle control.



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