



Studies on PTWs' Visual Conspicuity

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Rößger, L., Hagen, K., Krzywinski, J., Schlag, B. (TUD)

Underwood, G., Humphrey, K., Van Loon, E. (UoN)

- Experimental studies:
 - a) Exploring the role of PTWs' visual conspicuity on attention capturing and roadway decisions
 - b) Identifying effective conspicuity treatments
 - c) Investigating the impact of background conditions and traffic situations

- Overview about methods:
 - Detection and decision experiments using static and dynamic roadway scenarios on screens; (*detection time / rate / eye tracking measures*)
 - Detection / Gap acceptance experiments with driving simulations (*detection distance / gap acceptance rate / eye tracking measures*)
 - Light experiments / decision experiments under real world conditions

PTWs' Conspicuity Studies – Selected Results



Do decisions about road manoeuvres depend on the conspicuity of other vehicles?



- *More risky decisions when an inconspicuous motorcycle was presented.
(Inconspicuous motorcycles attract „it's safe to enter the road way“ decisions more frequently.)*
- *Decisions took longer when inconspicuous motorcycles were presented in the scene.*
- *Eye-tracking measures: earlier attraction of fixations for high conspicuous motorcycles.*

(Underwood, G., Humphrey, K., Van Loon, E., 2011)

■ Conspicuity treatments:

Frontal light arrangements - providing PTWs a *unique visual signature* that makes PTWs quickly identifiable by road users and clearly distinguishable from other vehicles

- Varying the light colour of the headlight
- Adding light configurations on the rider's helmet
- Manipulating the position and layout of the headlights



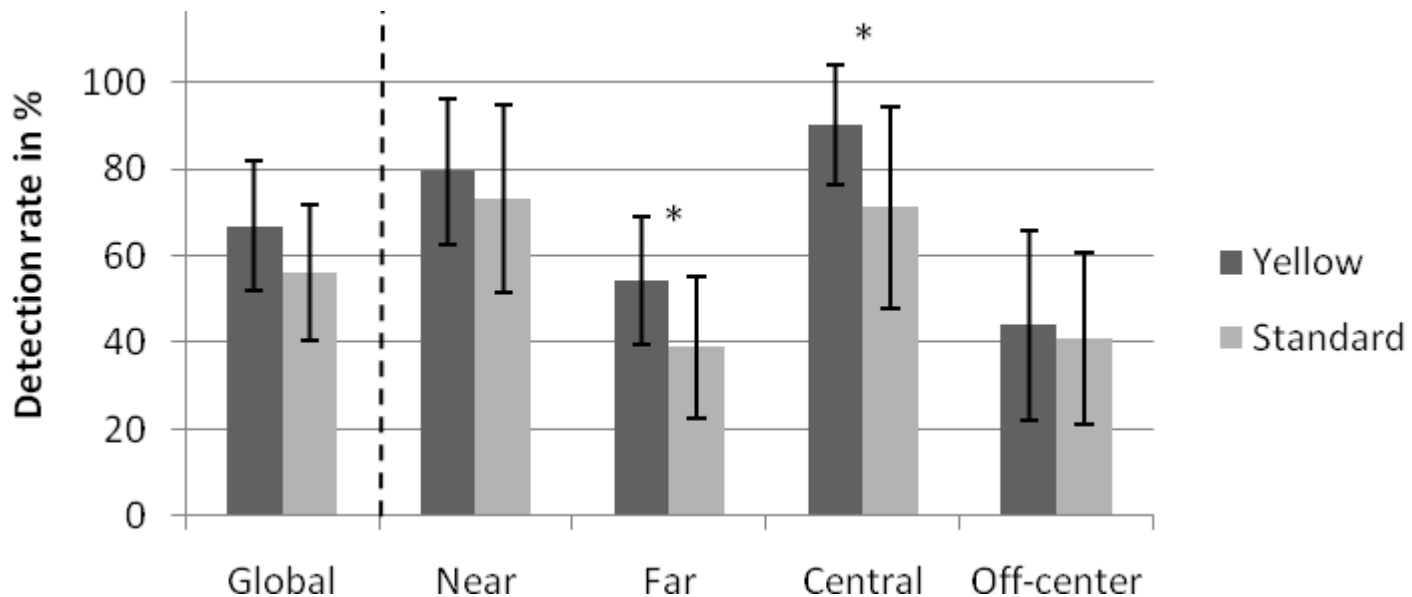
PTWs' Conspicuity Studies – Selected Results



- Yellow headlights (vs Standard headlights):

Detection of vulnerable road users (PTW rider, cyclists, pedestrians) in tachistoscopically presented photographs (exposure time: 250 ms)

“Apart from the four-wheel vehicles, which other road user did you see?”



(Cavallo, V., Pinto, M., 2011)

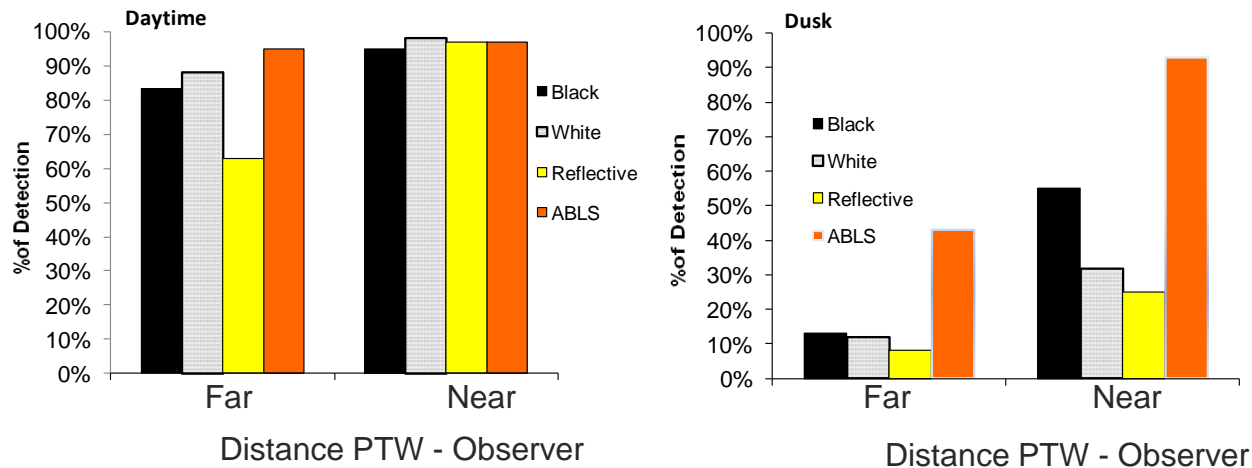
PTWs' Conspicuity Studies – Selected Results



- Light system mounted on rider's helmet (Alternating Blinking Light System - ABLS)

Detection of PTWs in video streams (exposure time: 800 ms) depicting driving scenes with multiple motor vehicles from different categories

“What kinds of motor vehicles were present in the video stream?”

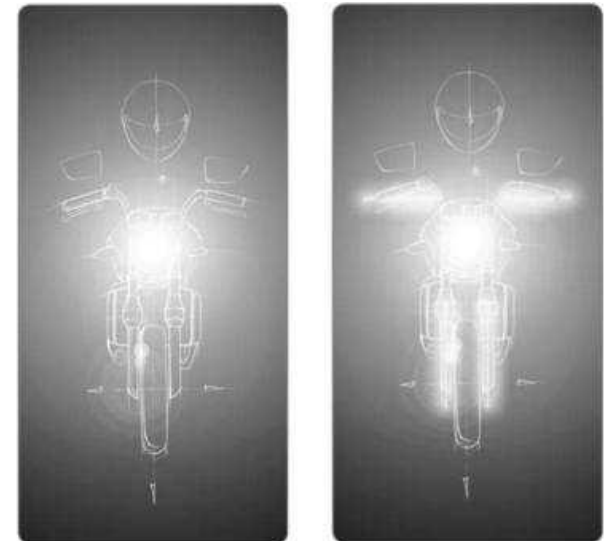


(Gershon, P., Shinar, D., 2011)

- Additional position lights creating a T-shaped frontal light configuration

Design studies:

- The real size of the motorcycle front is indicated through the position of lights at the geometrical endpoints of handlebar and fork.
- The use of a maximum horizontal and vertical distance between two light sources leads to a separate detection of lights even at long distances.
- This specific signal pattern is very similar to an abstract picture of a motorcycle front as T shaped.



(Rößger, Hagen, Krzywinski, Schlag, 2011)

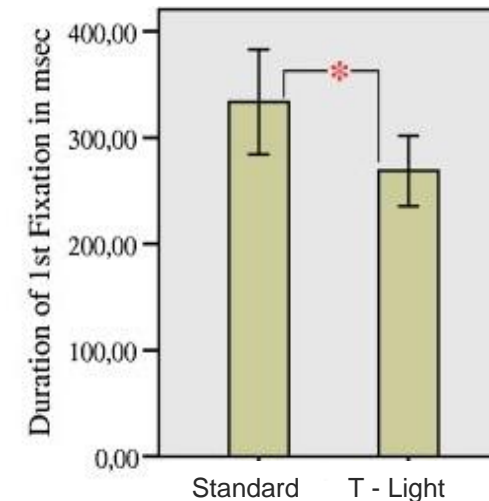
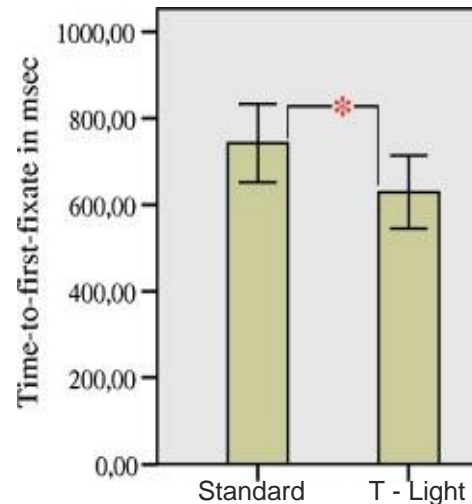
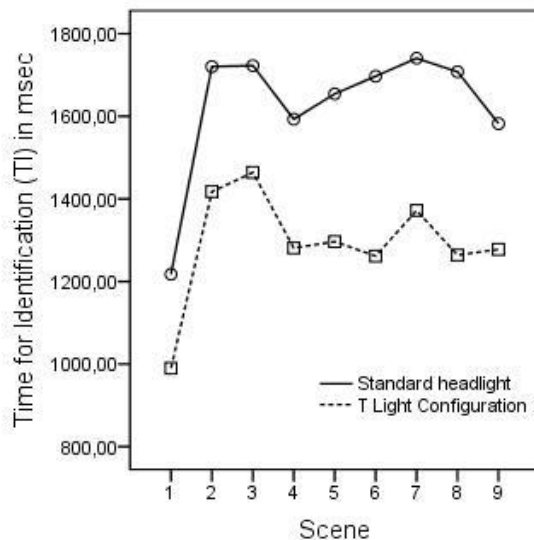
PTWs' Conspicuity Studies – Selected Results



- Additional position lights creating a T-shaped frontal light configuration

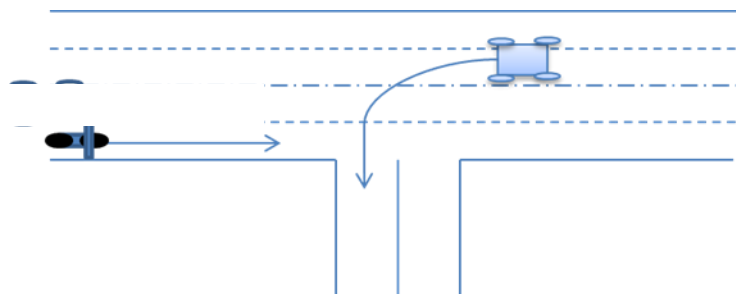
Identification of M/Cs as potential conflict partners in road way scenes:

“What vehicles do you have to pay attention to when you are planning to pull out into the main road // to cross that intersection?”



- Additional position lights creating a T-shaped frontal light configuration
 - In static scenarios:
 - *Faster identification of relevant collision partners*
 - *MC received fixations more quickly and the fixations took less time*
 - Evaluation in simulator studies:

Time gap between driver and oncoming MC at the moment drivers would give up their intention to turn in front of the MC

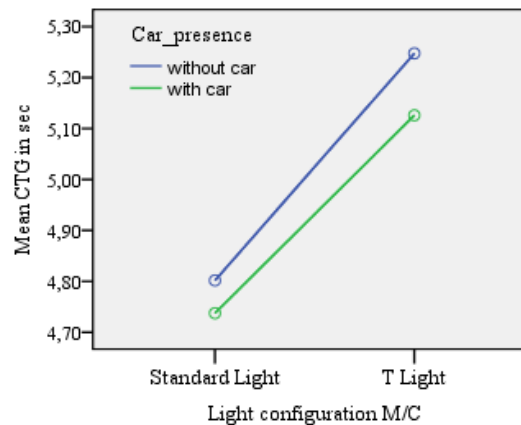


PTWs' Conspicuity Studies – Selected Results

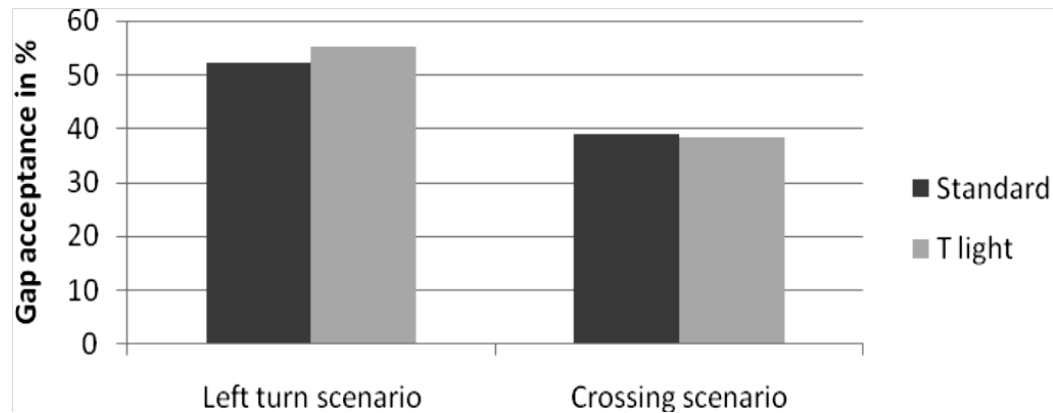


- Additional position lights creating a T-shaped frontal light configuration
- MCs front light pattern had an effect on the time gap: participants decided earlier to give up their intention to turn, corresponding with a greater time gap to the MC

		without car	with car
Motorcycle's front lighting	Standard	4.8018 msec (1.155)	4.7375 msec (1.202)
	T light	5.2476 msec (1.159)	5.1261 msec (1.137)



- Additional position lights creating a T-shaped frontal light configuration
- But: no effects could be found in simulator studies focussing on complete turning/crossing manoeuvres



- Adaptation in the turn strategy / performance

- Additional position lights creating a T-shaped frontal light configuration
 - In static scenarios:
 - *Faster identification as relevant collision partners*
 - *MC received fixations more quickly and the fixations took less time*
 - In driving simulations:
 - *Intention to turn was given up earlier for MC with alternative front light pattern than for standard MCs*
 - *No differences when considering a complete turning manoeuvre*

PTWs' Conspicuity Studies – Selected Results



- Riders' acceptance towards conspicuity treatments
Design and realisation of prototypes:



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PTWs' Conspicuity Studies – Selected Results



- Riders' acceptance towards conspicuity treatments
Presentation to and Evaluation by PTW riders
 - Presentation of prototypes at Season Openings and 4 Sessions in the lab à 10 PTW riders
 - Open discussion and Acceptance Screening;



■ Riders' acceptance towards conspicuity treatments

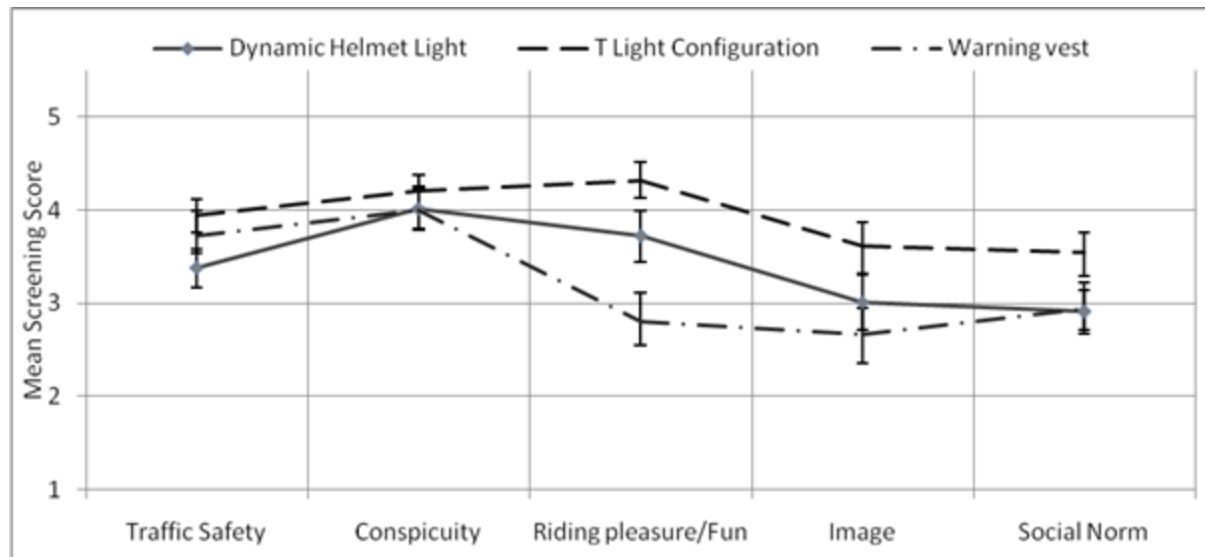
Presentation to and Evaluation by PTW riders

- Presentation of prototypes at Season Openings and 4 Sessions in the lab à 10 PTW riders
- Open discussion and Acceptance screening;
 - (Perceived) Effectiveness traffic safety: *reduces accident likelihood, would enhance my safety?*
 - Perceived Effectiveness Conspicuity: *Attracts the attention of others?*
 - Perceived impact on self-image: *MC rider part of self-identity which is also expressed outwards by specific behavioural codes, clothing codes or other external attributes. Will the treatment positively/negatively affect my image as a rider?*
 - Perceived impact on riding pleasure: *does the treatment bother me when riding?*
 - Perceived social norms: *would other approve or disapprove if I use such a treatment?*
- Acceptance score (4 item scale);
 - Willingness to use, approval of an mandatory introduction, refuse of the the treatment

PTWs' Conspicuity Studies – Selected Results



- Riders' acceptance towards conspicuity treatments
Presentation to and Evaluation by PTW riders



- Riders' acceptance towards conspicuity treatments
Evaluation by PTW riders
 - Linear regression models: ca. 60 % of the variance in acceptance scores was explained by the factors (perceived impact on image, social norms, perceived effectiveness for traffic safety/conspicuity, perceived impact on riding pleasure)

- PTWs Conspicuity has an impact on the way other road users' respond towards PTW riders
- Confirmation of results by complementary methods (e.g. in naturalistic studies)
- Risk compensation ?
- Acceptance?



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- Thank you for your attention.