



Environmental Tracking for Healthy Travel Behaviour

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Background

Urban areas are hotspots of human activity. Small wearable sensors advanced environmental monitoring of urban stressors such as noise, air pollution or heat (Helbig et al., 2021). These environmental stressors have an impact on health and are to a high degree context specific and distributed in space and time (Hänninen et al. 2014). While stationary measurements can give an impression of e.g. general air quality, wearable sensors can provide feedback on individual exposure throughout the day.

Behaviour Change in Response to Exposure Feedback

Can individualized exposure feedback raise awareness and motivate protection behavior such as choosing less polluted routes and travel times?

Protection Motivation Theory:

Both threat appraisal (severity, vulnerability, fear) and coping appraisal (outcome efficacy, self-efficacy, low cost) contribute to protection motivation (Rogers 1975; Maddux and Rogers 1983).

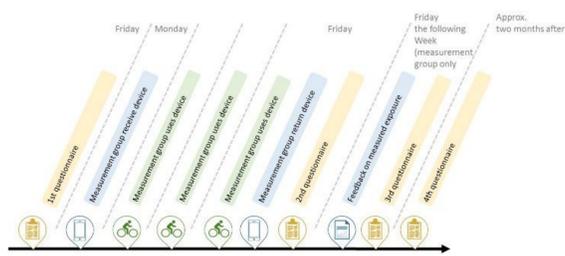
Hypotheses

- The measurement group will report higher levels of threat after carrying the measuring device than participants in the control group.
- Higher threat and coping appraisal will predict protection intentions.

Method

This field experiment ($N = 206$) tested an intervention to promote healthy routing choices for cyclists and pedestrians. Randomized controlled trial with a measurement group using environmental trackers and a control group without. Four measurement points with questionnaires:

- Before carrying the device (both groups)
- After carrying the device (both groups, after one week)
- After receiving feedback on measured exposure (measurement group only)
- Follow-up (both groups)

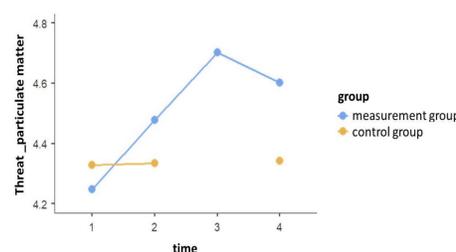


Timeline for the measurement group

Results

Effects on Threat Appraisal regarding particulate matter (PM)

- no main effect of exp. group $F(1,234) = 1.60, p = .207$.
- significant main effect of the time point of measurement, indicating an overall increase of threat over time $F(3,400) = 5.20, p = .002$.
- marginally significant interaction of exp. group and time point $F(2,405) = 2.56, p = .078$.



- significant three-way interaction of group, time and outcome efficacy, $F(6,484) = 2.89, p = .009$. Simple slopes show, that the intervention had an effect on threat perception only for those with high levels of perceived outcome efficacy. → motivated perception of threat?

Effects on Coping Appraisal regarding PM

- There was no significant effect of the group, time point or interaction effect on self-efficacy or outcome efficacy

Effects on Protection Intentions

Protection Motivation Theory (tested at T1, $n = 186$):

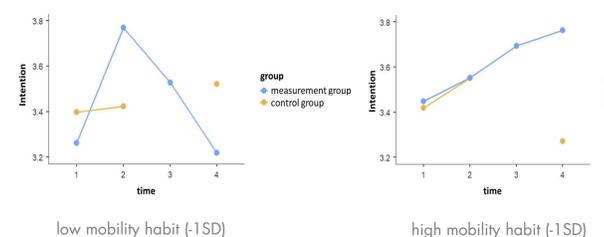
- sign. effect of threat appraisal (PM): $b = .15, t(182) = 2.60, p = .01$
- sign. effect of self efficacy (PM): $b = .25, t(182) = 5.14, p < .001$
- no effect of outcome efficacy (PM): $b = -0.01, t(182) = -0.12, p = .905$
- Increased protection intentions when threat and self efficacy are higher. No interaction of the predictors.

Effects of the Intervention:

- no main effect of the group $F(1,292) = 0.216, p = .643$.
- marginally significant main effect of time, indicating an overall increase in behavioural intentions $F(3,358) = 2.468, p = .062$.
- no significant interaction of group and time $F(2,361) = 1.954, p = .342$.

Effects on Protection Intentions are moderated by Habit

There was a marginally significant three-way interaction of exp. group, time point, and habit $F(6,389) = 1.95, p = .071$. → For the measurement group, there was no significant changes, if habit was high (+1SD). When habit was low (-1SD), there was a significant increase in intentions from T1 to T2. A significant drop between T2 and T4, indicates that the motivating effect of wearing the device in people with low habit was not sustainable.



Discussion

- Making exposure to environmental stressors salient through carrying a measurement device can increase threat appraisal.
- Only persons with a high coping appraisal allow a higher threat perception. This motivated threat perception might be due to non-protective coping, as high threat and low coping perceptions can lead to non-protective coping such as denial (Rippeto & Rogers, 1987).
- Carrying the measurement device can increase protection motivation differently for persons with different levels of habit of their travel behaviour: Persons with low transport habits are more willing to change their routes, though this is not a sustainable change.

References

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Cyclist wearing the measurement device (Foto: Bodo Tiedemann)