

GPS data tracks from smartphone applications – a useful support for bicycle infrastructure planning?

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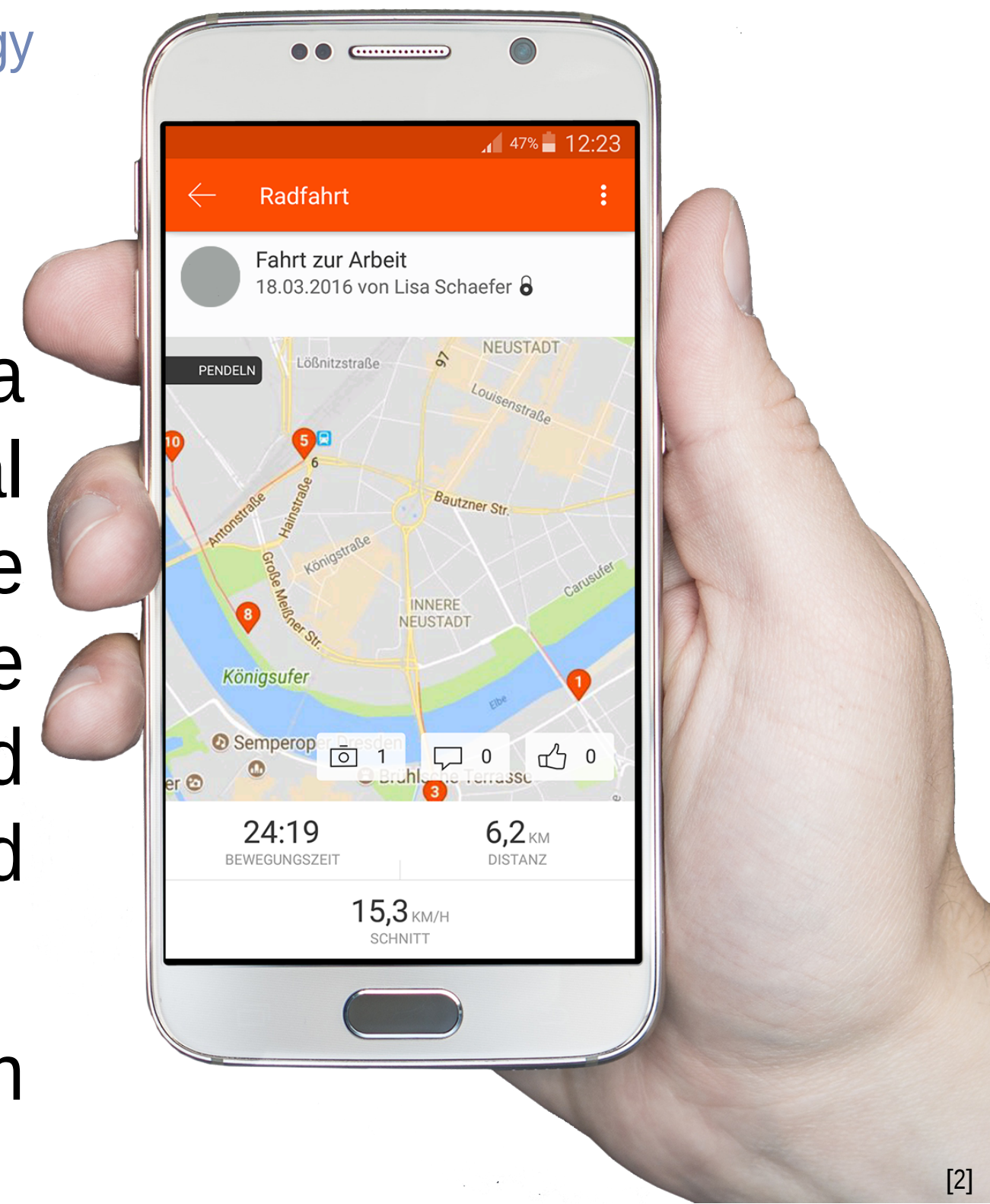
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Why is Big Data relevant for cycling?

Infrastructure planning is highly reliant on real world data. Smartphone-based GPS data can support a systematic and feasible evaluation of the infrastructure needs of bicycle traffic. It combines advantages of real world data and citizen science concepts where the public can participate actively in the collection of data. The collected data can draw a broad picture about the movements and habits of the users. In means of bicycle usage, among others, sport-focused smartphone applications offer their users to record cycling routes and submit the GPS tracks to servers of the application operators in order to monitor their training progress and compare results with peers.

To understand boundary conditions of user generated GPS data (**Study 1**) as well as the practical contribution for the bicycle planning and transportation research (**Study 2**), two online surveys were conducted.



Study 1 – App-users as data source

Sample: Users of the smartphone application *Strava*¹, contacted through various in-app forums ($N=182$; 171 male; $\bar{x}$ 34.15 years; $SD = 7.94$).

Results:

1. **Everyday routes longer than 5 km** are tracked by most of the users in order to generate statistics about their cycling-performance.

„Are there reasons for **not** activating the application on everyday routes?“

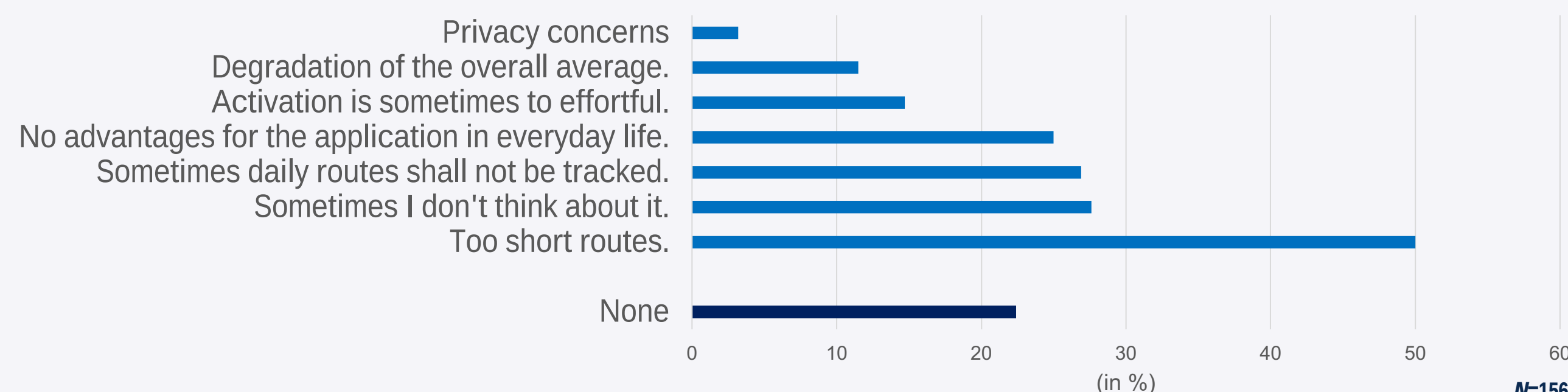


Figure 1. Asking Strava users ($N=156$), who claimed to generally activate tracking on everyday routes: Are there reasons for not activating the app on everyday routes?

2. Self-reported **behavioural changes** when the tracking is activated:

↑ **motivation** ↑ **velocity**

distances and route selection: no or minor changes.

Conclusion: The GPS data generated by the Strava-users can be used for a realistic impression about road users, particularly for route selection monitoring. For further evaluation, factors like higher overall speed have to be controlled.

Study 2 – Does the data help the planners?

Sample: An online questionnaire was distributed to bicycle planning divisions in city governments in Germany ($N=61$).

Results:

1. 77% of small/medium-sized municipalities have never worked with GPS data, even though half of them have access. (**Figure 2**)
2. Three main **purposes for the use** of GPS data
 - network-planning ($n=38$)
 - monitoring and evaluation ($n=33$)
 - infrastructure planning ($n=32$)

3. Main **reasons for the disuse** of GPS data
 - missing personnel capacities
 - technical facilities

Reasons like *missing capacities*, concerns about *data privacy* and *costs* are more often reported among GPS data unexperienced participants.

4. Most important **tools** for bicycle planners

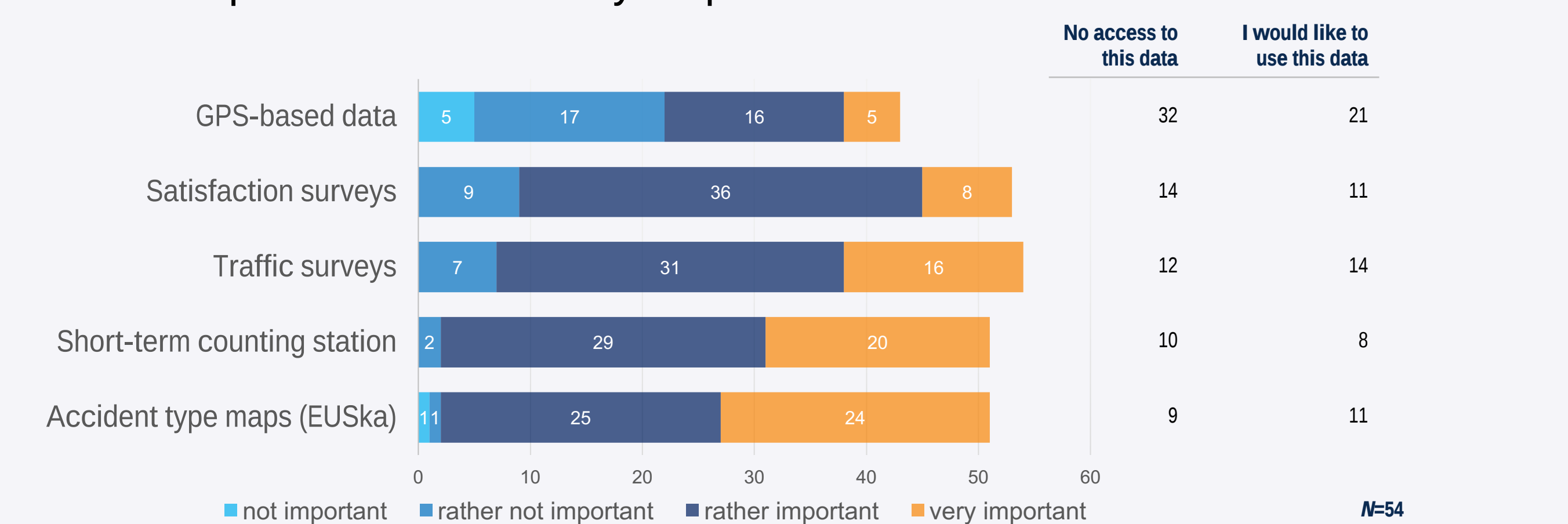


Figure 2. Asking bicycle planners ($N=54$): How important are the following data sources for your work and can/would you access them?

Conclusion: However, 40% of the respondents showed interest in GPS data sources and have realistic application suggestions. Data indicates that currently the potential of GPS data is not fully utilised due to uncertainties in the data handling.

Summary and recommendations

The bicycle infrastructure planners see various application purposes for GPS data. Due to uncertainty issues in handling the data, most municipalities do not include GPS data in their planning toolbox, yet. It should be noted, that even though the main purpose of the evaluated application is sports tracking, the users report no major route changes. Further research is required regarding the differences in cycling behavior of different user groups to avoid in long-term social exclusion in bicycle planning.

Based on the two surveys and a scientific cross-matching a full manual for GPS data-based planning will be published in autumn 2017.

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Explanatory note:

[1] Strava Inc. was the only company offering the GPS data sets in an adequate format for further evaluations when the project was conducted. There is no commercial collaboration between the company and the project.
[2] Edited screenshot from Strava Inc. smartphone application.

For further information about the project please visit our website:
<https://tu-dresden.de/bu/verkehr/ivs/voeko/forschung/forschungsprojekte/nrvp>

