



# Cyclists and sounds

## The impact of the use of electronic devices on cycling safety

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# Cycling safety

- Road safety of cyclists shows a less favourable development than that of car occupants:
  - number of fatalities among cyclists has not decreased since 2004 in the Netherlands<sup>3</sup>
  - number of seriously injured cyclists is showing an increasing trend over the period 2000–2009 (in the Netherlands, the UK and Germany)<sup>4</sup>

<sup>3</sup> Reurings et al. (2012)    <sup>4</sup> Pastor (2012)

# Auditory information in traffic

- Little is known about the role of auditory information in safe management of road hazards



[www.nynas.com/en/Media/News/Quieter-roads/](http://www.nynas.com/en/Media/News/Quieter-roads/)



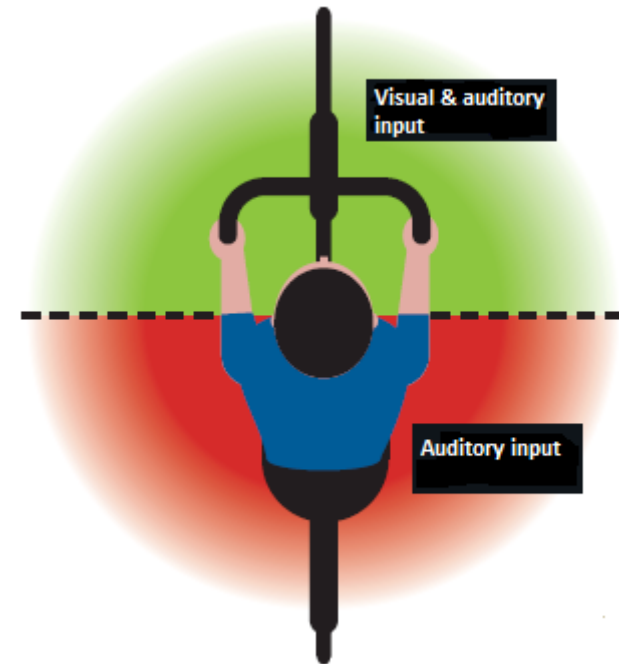
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# Cyclists and auditory information

- Auditory information – especially important for gathering information about other road users from areas outside one's visual field of view
  - detection and localisation in space



*Illustration by Noah Adler*

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# Recent trends

- Portable electronic devices:
  - 39% of cyclists at least occasionally listen to music and 55% engage in a phone call<sup>1</sup>
- Quiet electric cars
  - Target: 1 million in 2025 in the Netherlands<sup>2</sup>



[www.spiveylaw.com](http://www.spiveylaw.com)

<sup>1</sup> Goldenbeld et al. (2012) <sup>2</sup> IEA (2012)

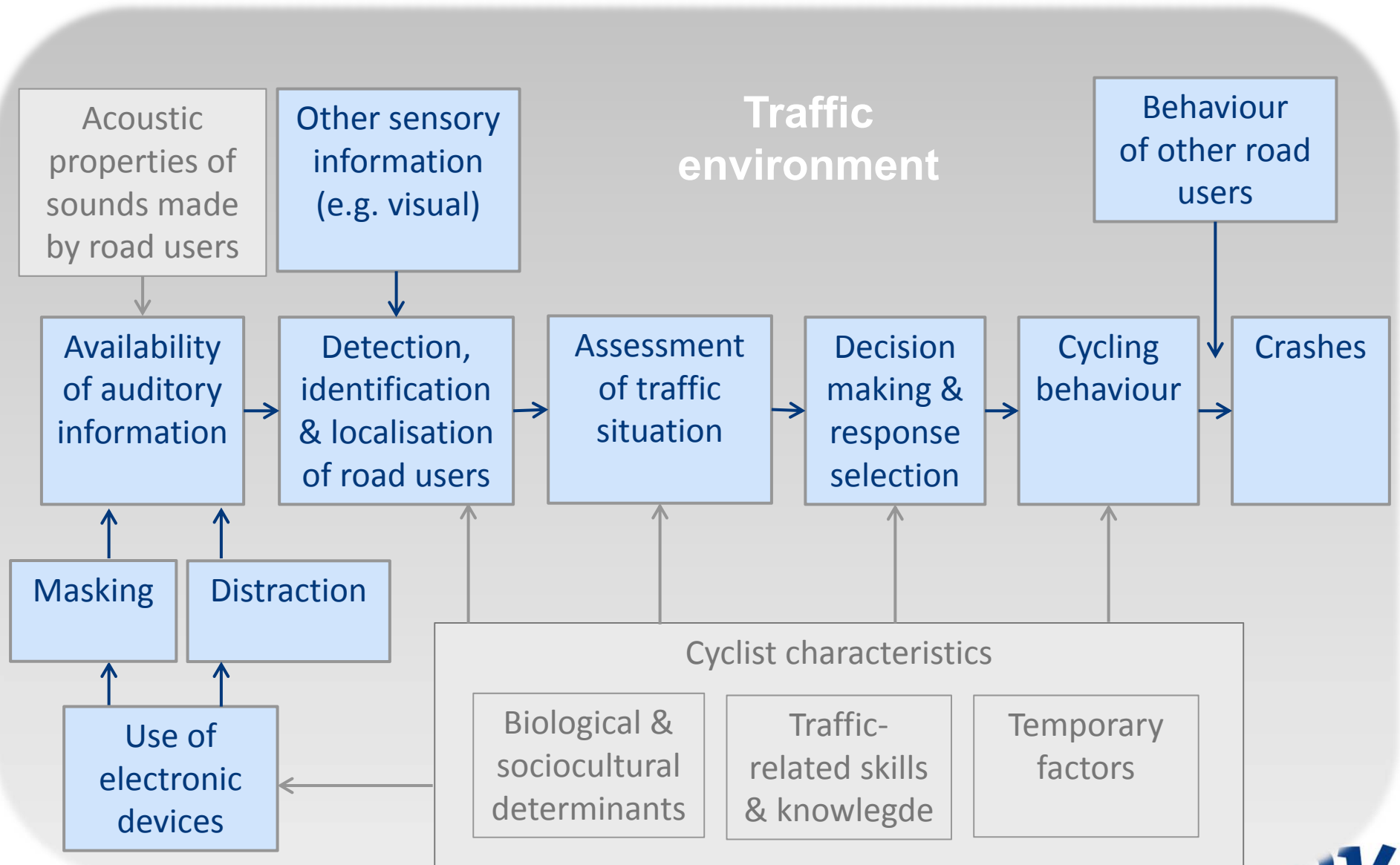


Figure 1. Conceptual model: auditory information and cycling safety.







# Method

- Literature study: 7 studies
  - Available literature concerns mainly the Dutch setting
- Sources used
  - Literature into crash data (official & self-reported)
  - Literature into cycling behaviour & cyclists' risk perception





# Summary of effects

		
missed bicycle bell	↑*	↑
missed horn honking	↑**	—
cycle speed	—	↓
response time	—	↑
detected visual objects	—	—/↓
subjective risk rating	↑	↑
conflicts	—	—
disobedience of traffic rules	↑	—
unsafe behaviour	↑	↑
crash risk (self-reported)	↑	

↑ Increase ↓ decrease — no effect

\* listening to music with one ear bud had no effect

\*\* effect found for high volume, high tempo music & 'normal' music using in-earbuds





# Results: crashes

- Official crash records provide no information about the use of electronic devices
- Device use increases the crash risk for teen cyclists (factor 1.6) and young adults (factor 1.8) but not for middle-aged and older adult cyclists<sup>1</sup>
  - self-reported data
  - only (very) light injury crashes



<sup>1</sup> Goldenbeld et al. (2012)



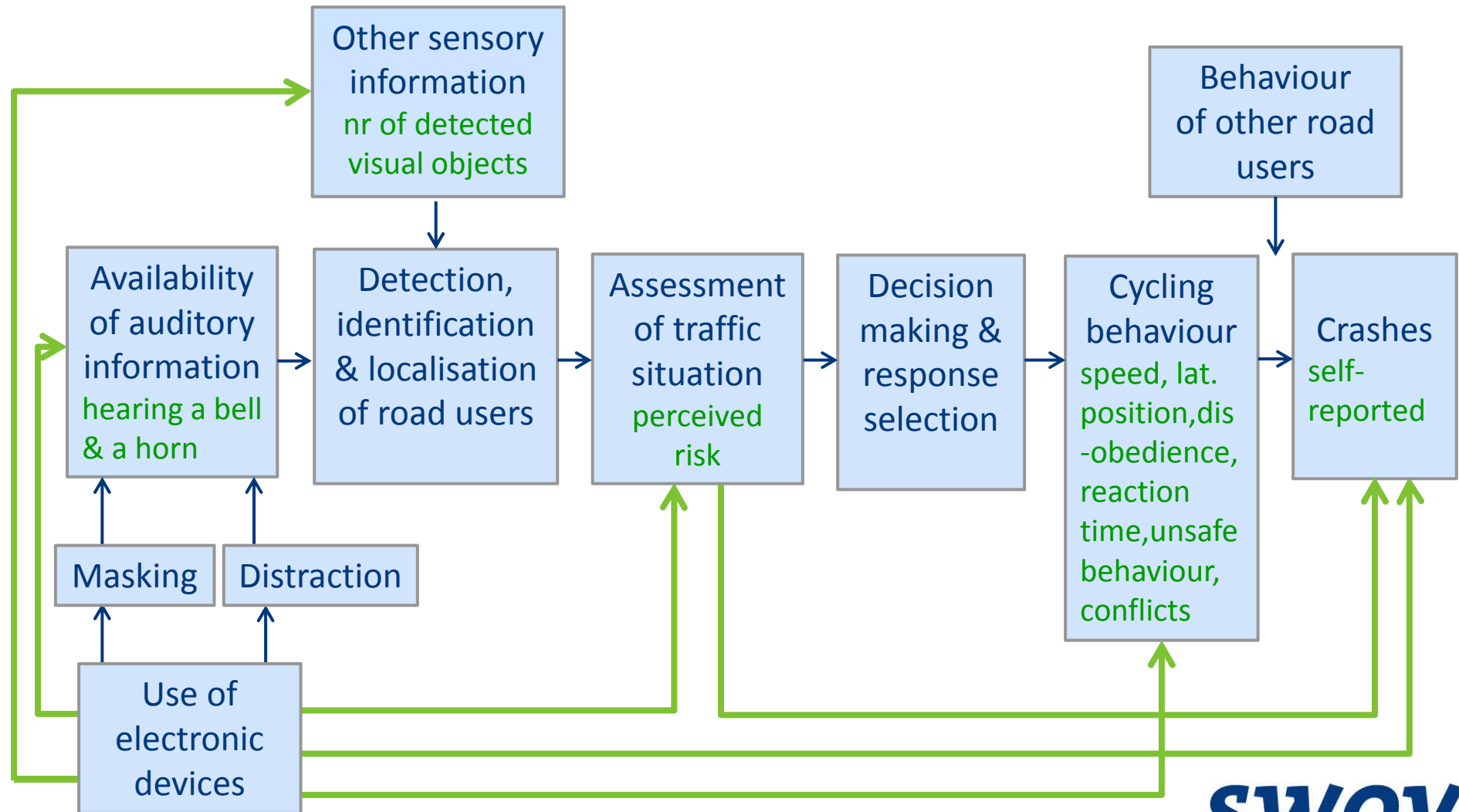
# Results: auditory perception

- Device use compromises auditory perception<sup>5</sup>
- In-earbuds particularly detrimental
- Listening to music through one earbud has no negative effect on cycling behaviour and number of missed auditory stimuli
  - However, it can negatively impact sound localisation: we need two ears to localise sounds!



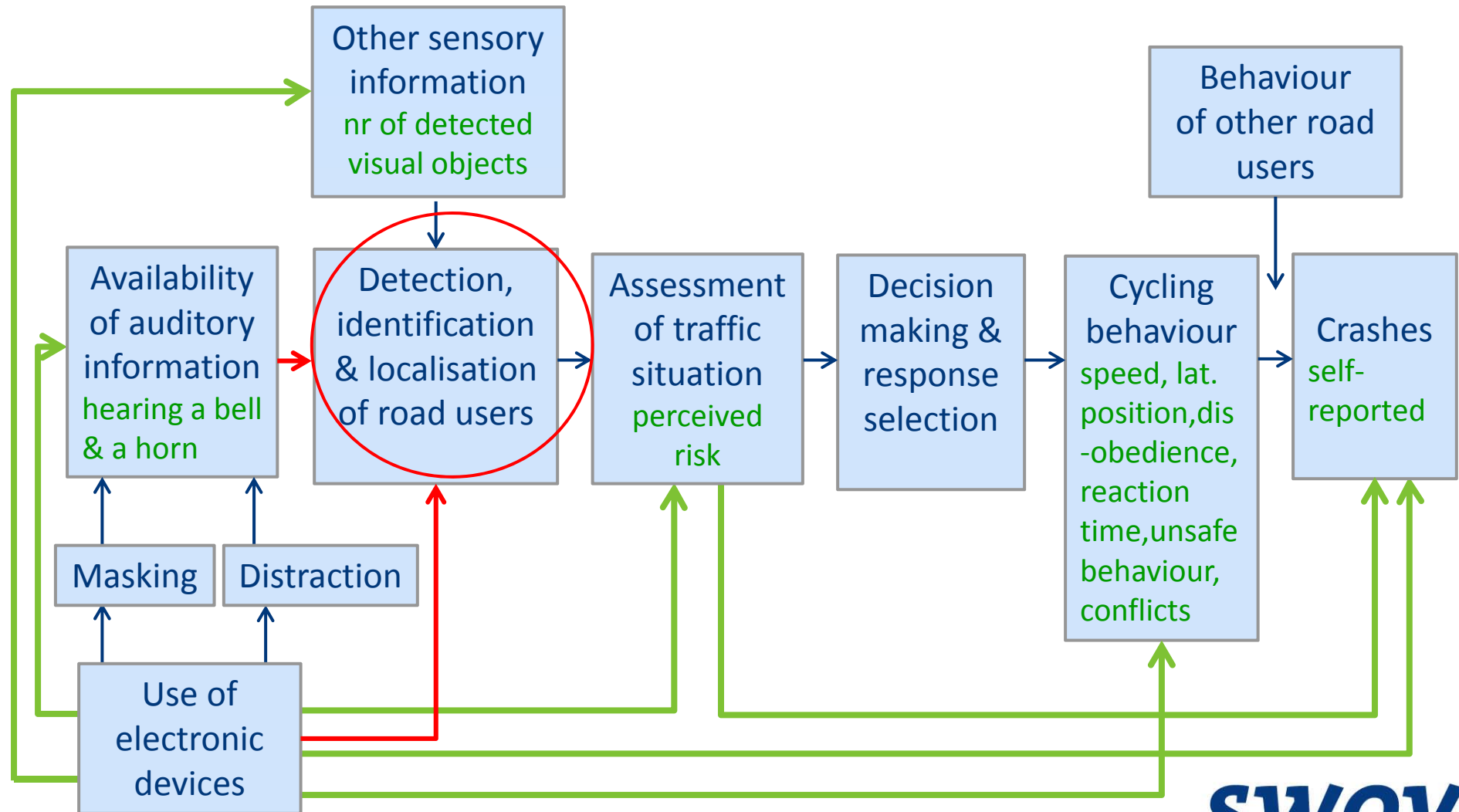
<sup>5</sup> De Waard, Edlinger & Brookhuis (2011)

# Knowledge gaps

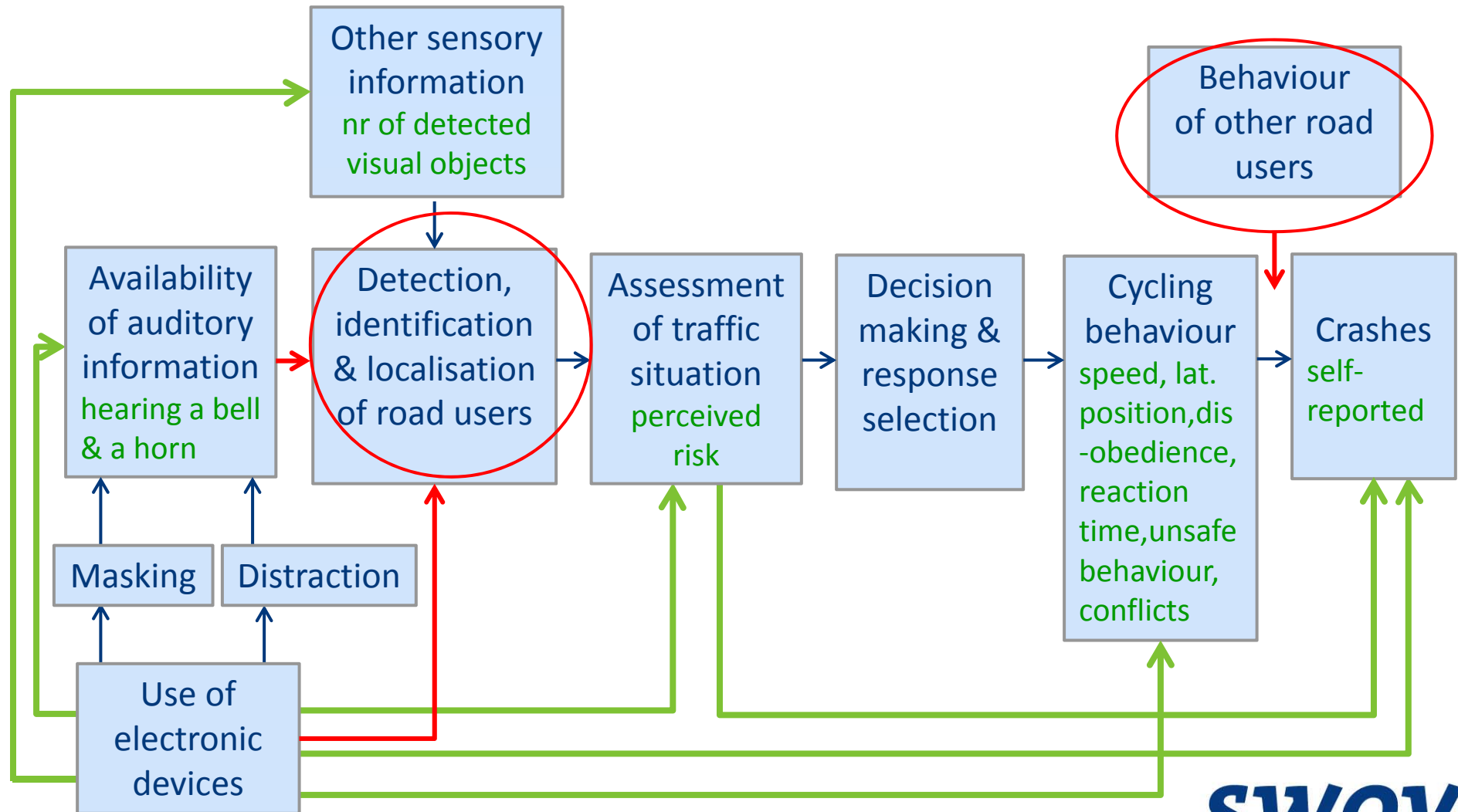




# Knowledge gaps



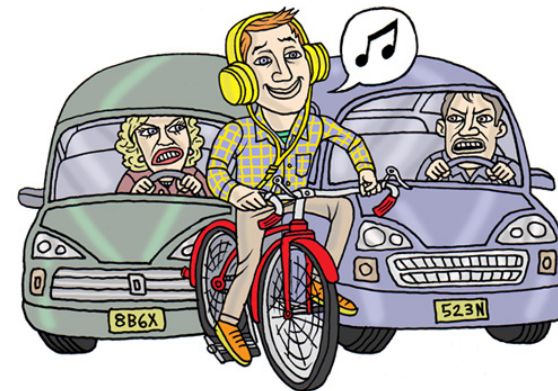
# Knowledge gaps





# Conclusion

- The use of devices negatively influences self-reported crash risk and some aspects of cycling performance
- It is difficult to prove that the found effects are (only) due to the limited availability of auditory information



*Illustration by Mark Alan Stamaty*

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# Conclusion

- Cyclists listening to music and talking on the phone miss auditory information
- Concerns about limited availability of auditory information should be taken seriously
  - cyclists using electronic devices encountering quiet (electric) cars?





- Thank you for your attention!



# References:

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2. IEA (2012). *Hybrid and Electric Vehicles: The electric drive captures the imagination*. International Energy Agency
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