Do 3D zebra crossings improve pedestrian safety?

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3D zebra crossing?

Conventional

3D

Research questions

- Do 3D zebra crossings have a measureable impact on crossing **VRU's** safety?
  - Is there an effect on the driving speed of passing vehicles?
  - Is there an impact on other forms of road users' behaviour (yielding, jaywalking,...)?
  - Is there an effect on the occurrence of serious traffic conflicts?

Study set-up

- Before-after analysis of effects of converting a classic zebra crossing into a 3D zebra crossing

- 3 test sites in Flanders - Belgium

- Assessment of behavioural effects:
  - Impact on driving speed
  - Impact on behaviour (e.g. yielding)
  - Impact on occurrence of serious traffic conflicts

Research site 1 - Beersel

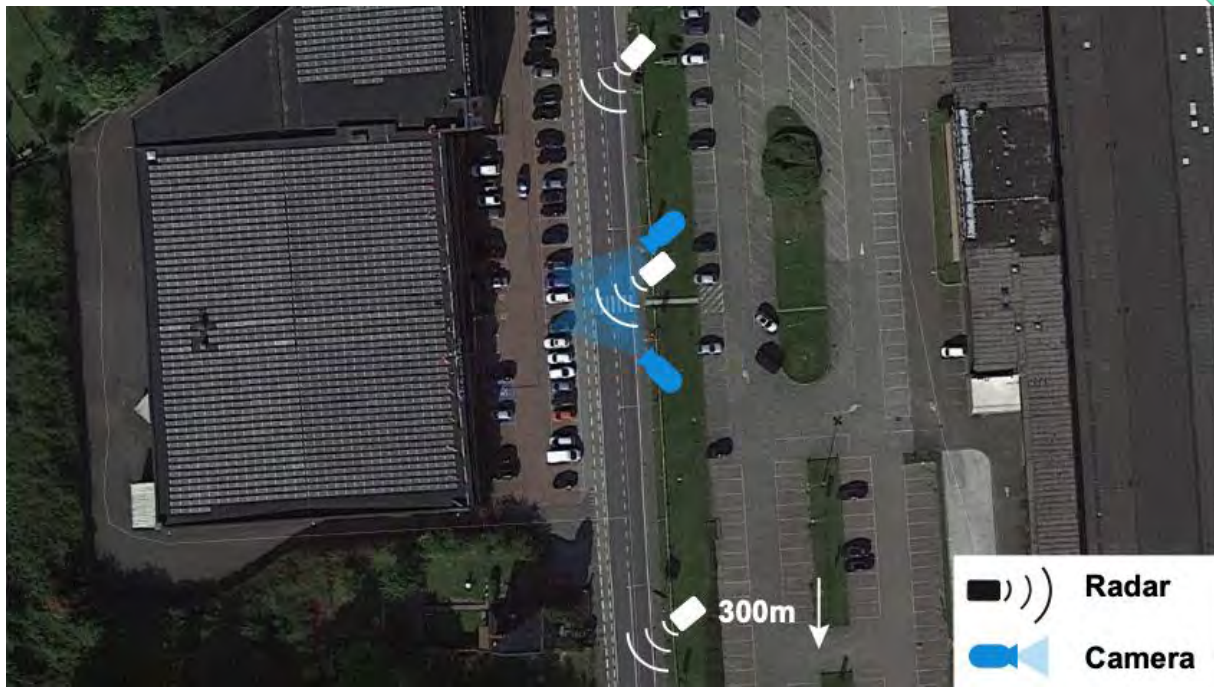
Research site 2 - Bilzen

Research site 3 - Antwerp

Data collection

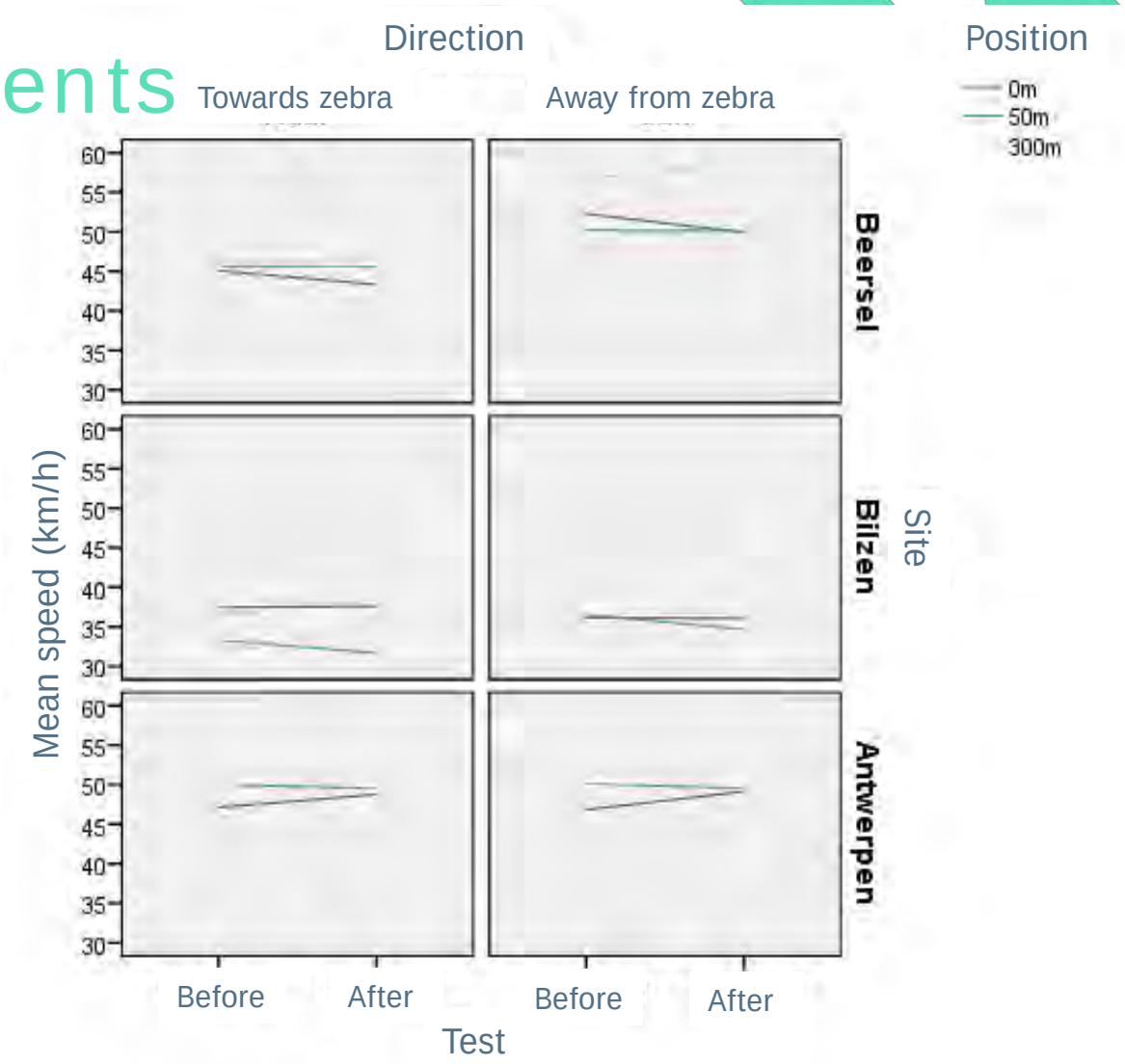
- Speed measurements using radar
  - At 300m away from crossing
  - 50m away from crossing
  - At crossing (0m)
  - Measurement in two directions
    - Towards zebra
    - Away from zebra
- Two video cameras (facing both driving directions)

- Data analysed:
  - Speed data: 4 days (all motor vehicles)
  - Road user behaviour: 1 day (all interactions)
  - Traffic conflict observations: 4 days



Results speed measurements

- 6 measurements points per site (0m, 50m, 300m; both directions)
  - 300m is control site
- Hypothesis: speed closer to 3D zebra crossings lowers compared to control site (position * test)
  - Hypothesis could not be confirmed: changes between before and after are small and non-systematic accross locations



Effect	df	F	Sig.
Intercept	1; 5	414,643	,000
Position	2; 10	2,461	,135
Test	1; 5,002	,030	,869
Position * Test	2; 10,002	2,220	,159
Site	5; 9,851	3,973	,031
Position * Site	10; 10	60,215	,000
Test * Site	5, 10	,564	,726
Position * Test * Site	10, 1035898	277,419	,000

Behavioural observations

- Preselecting crossing VRU using RUBA
- Verification by researcher to remove false positives
- Coding of interactions in predefined codebook

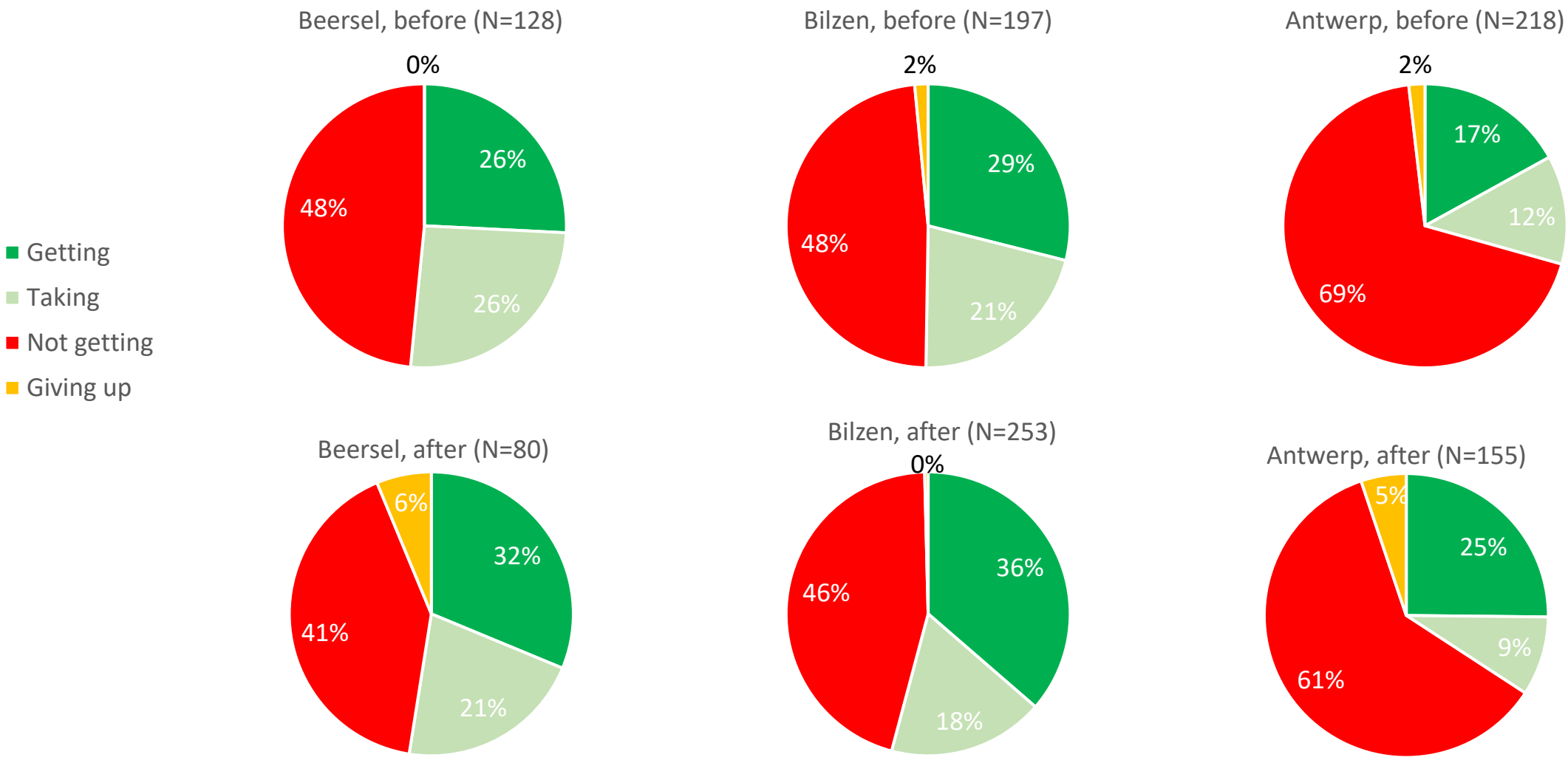
Behavioural observation

- Four categories of yielding behaviour

	Defensive behaviour	Assertive behaviour
According to rules (=pedestrian goes first)	Getting	Taking
Not according to rules (=motor vehicle goes first)	Giving up	Not getting

Behavioural observation

- Results yielding process – significant difference over all 3 locations combined (**Fisher's** Exact Test: p=0.006)



Traffic conflict analysis

- Serious **traffic conflict = ‘**near-**crash’**
- Measurement through T-Analyst
- Conflict indicators:
  - Minimal Time-to-Collision (TTCmin) < 1.5s
  - Post Encroachment Time (PET) < 1.0s

Traffic conflict analysis

	Before period			After period			Statistical significance (Fisher)
Site	# serious conflicts	# interactions	# conflicts per 1000 interactions	# serious conflicts	# interactions	# conflicts per 1000 interactions	
Beersel	9	315	28,6	1	242	4,1	p=0.049
Bilzen	5	765	6,5	4	930	4,3	p=0,7394
Antwerp	1	956	1,1	2	1137	1,8	p=1.000
							p=0,0537

Conclusions

- 3D zebra crossings do not significantly affect driving speed
- Slight improvement in yielding behaviour
- Some indications of reduction in number of serious conflicts
  - But low numbers

Conclusions

- In any case no indications that 3D zebra crossings would have a negative effect on road safety

- But found effects are too small and too uncertain to conclude that 3D zebra crossings have a positive effect on road safety
- No generalisation was recommended

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Questions?