



# Distraction among bicyclists and pedestrians

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# Introduction

- In many (EU) countries active mobility is encouraged →
  - cycling becomes more popular
  - E-bike, sports, older people , ...
- Use of portable devices by bicyclists and pedestrians ?
- Effects on road safety ?
- Role of distraction ? Research ?

# Recent trends

- Portable electronic devices:
  - Phoning
  - Texting
  - Listen to music
- 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)





# Distraction

- cf “Everybody knows what attention is” (James, 1890)
- Various definitions in literature, all focussing on driver – not cyclist/pedestrian, e.g.:
- “the diversion of attention away from activities critical for safe driving towards a competing activity” (Lee et al, 2008)
- “diversion of attention from driving, because driver is temporarily focusing on an object, person, task or event not related to driving” (Hedlund et al, 2005)

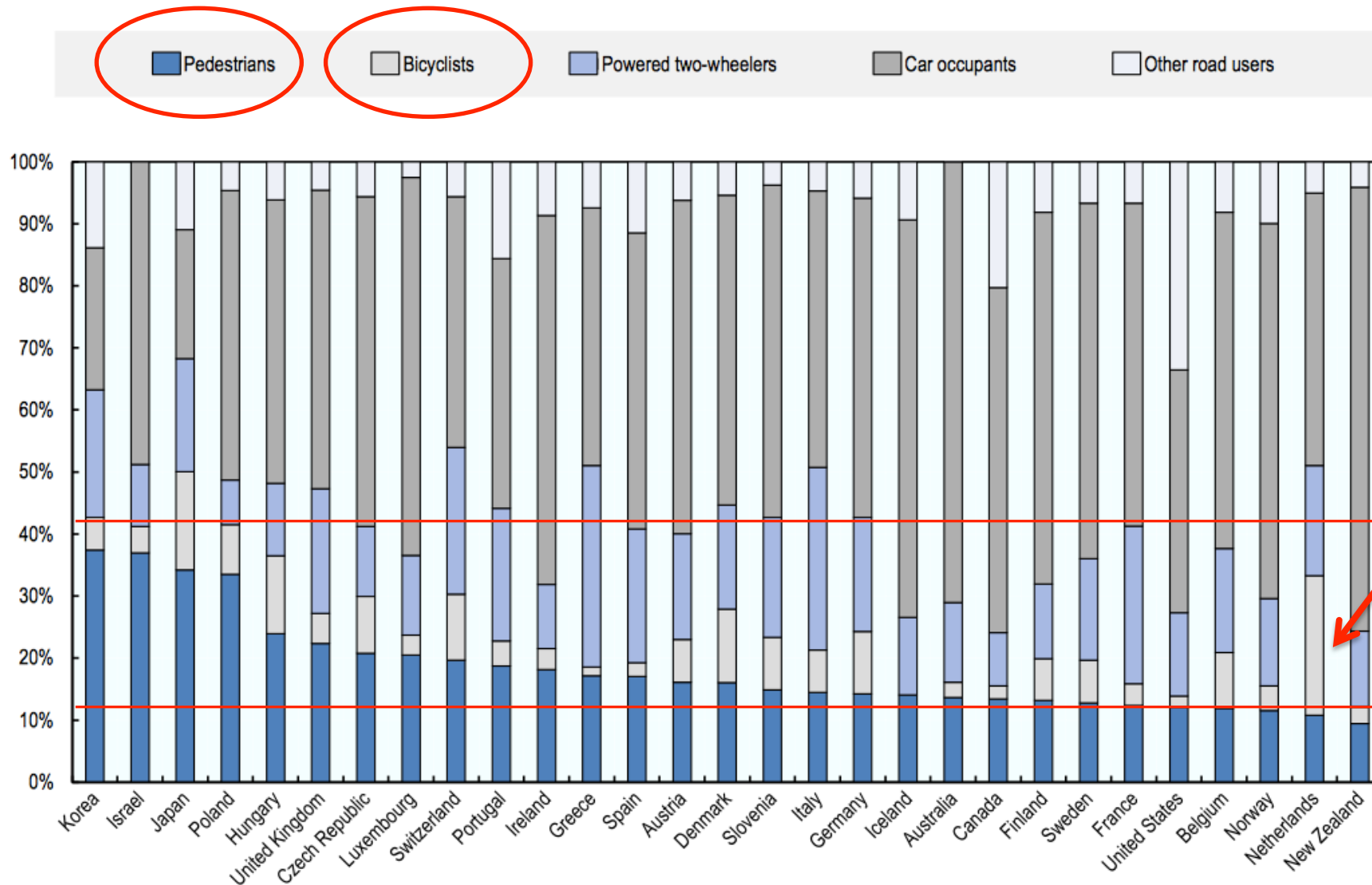
→ distraction = attention for the wrong things



# Sources of distraction

- Talking and listening
  - phone, music, passenger
- Operating
  - dialling, texting, internet, navigation, music-player
- Various other
  - eating, drinking, day dreaming, looking at advertisements & bill boards, make up, ..

# Cycling & pedestrian safety



Fatalities (average 2007-2011) Share of different road user classes (OECD/ITF 2013)

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# Change in fatalities 2000-2011

Country	Bicyclists	Car occupants	Pedestrians
Australia	10%	-34%	-36%
Austria	-32%	-47%	-38%
Belgium	-49%	-51%	-22%
Canada	25%	-23%	-21%
Czech Republic	-58%	-49%	-51%
Denmark	-48%	-54%	-67%
Finland	-64%	-23%	-34%
France	-48%	-61%	-39%
Germany	-40%	-55%	-38%
Greece	-41%	-47%	-41%
Hungary	-53%	-46%	-64%
Ireland	-10%	-63%	-45%
Israel	-20%	-24%	-32%
Italy	-30%	-57%	-40%
Japan	-32%	-63%	-33%
Korea	-14%	-58%	-46%
Netherlands	-14%	-57%	-35%
New Zealand	-53%	-44%	-11%
Norway	-15%	-56%	-64%
Poland	-55%	-30%	-38%
Portugal	-29%	-59%	-53%
Slovenia	-46%	-62%	-65%
Spain	-42%	-70%	-58%
Sweden	-55%	-60%	-27%
Switzerland	-19%	-56%	-47%
United Kingdom	-17%	-49%	-47%
United States	-2%	-42%	-7%

- Decrease in number of cyclist and pedestrian fatalities in many countries
- However: decrease generally less than among car occupants
- Lack of exposure data!

## Cyclists:

- Denmark: risk (fatalities/km) dropped by about 40% between 2001 – 2010 (OECD/ITF 2013)
- NL: risk declined only by 18% between 2001 and 2009 and has not decreased since 2004 (Reurings et al. 2012)

Source: OECD/ITF 2013



## However, ..

- Crashes involving bicyclists and pedestrians often not recorded
- Particularly: crashes with personal (serious) injuries
- Number of seriously injured cyclists is showing an increasing trend over the period 2000–2009 in the Netherlands, the UK and Germany (Pastor 2012)
- Lack of exposure data!



# Literature review

- Cycling and walking while phoning, listening to music, texting
- Risk perception
- Observational studies
- Questionnaires
- Crash data (official & self-reported)
- Few studies found
- Bicyclists: 6 studies from NL + 1 BE, 1 DK/AUS, 1 JPN
- Pedestrians: 14 from US + 2 AUS





# Prevalence

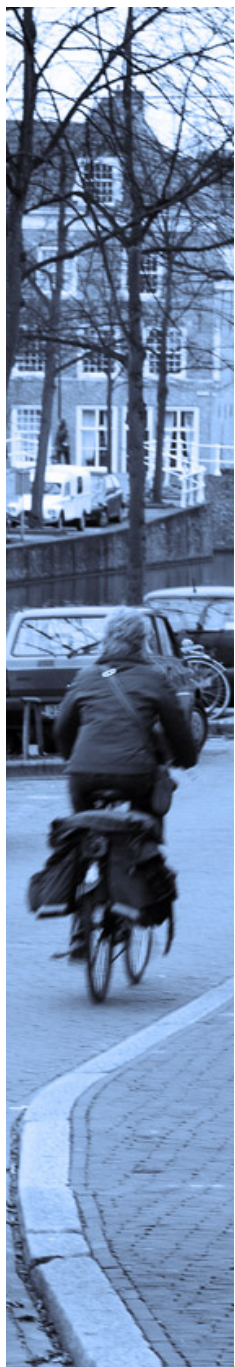
US:



- Nearly 1/3 of **pedestrians** crossing street either listened to music, used hand-held phone or was texting while crossing street (Thomson et al. 2012)
- 8% of pedestrians use mobile device while crossing (Cooper et al., 2012)
- 22% of pedestrians listen to music while crossing (Walker et al. 2012)

NL:

- 39% of **cyclists** at least occasionally listen to music and 55% engage in a phone call (Goldenbeld et al. 2012)

Age	Using the phone while cycling	Listening to music while cycling
12-17	77%	76%
25-34	76%	54%
35-49	47%	23%
50-65	34%	14%





Effects on behaviour			
	C	P	
missed bicycle bell	↑		
missed horn honking	↑		
speed	—	— / ↑	
lateral position	—	—	
response time	—	—	
detected visual objects	—	—	
subjective risk rating	↑		
number of conflicts	—	— / ↑	
disobedience of traffic rules	↑		
unsafe behaviours	↑		
mistakes		—	
looking at relevant objects?		— / ↑ / ↓	
injury rate			
crash risk (self-reported)	1.4 –1.8		
↑ Increase   ↓ decrease   — no effect			

(Based on reviews by Stelling & Hagenzieker, 2012; Stelling et al., 2013, 2014; SWOV 2013)





Effects on behaviour				
		C	P	
missed bicycle bell		↑		
missed horn honking		—		
speed		↓	↓	
lateral position		—	↑	
response time		↑	↑	
detected visual objects		— / ↓	↓	
subjective risk rating		↑		
number of conflicts		—	— / ↑	
disobedience of traffic rules		—		
unsafe behaviours		↑	↑	
mistakes			↑	
looking at relevant objects?		↓	— ↓	
injury rate			↑	
crash risk (self-reported)		1.4 – 1.8		
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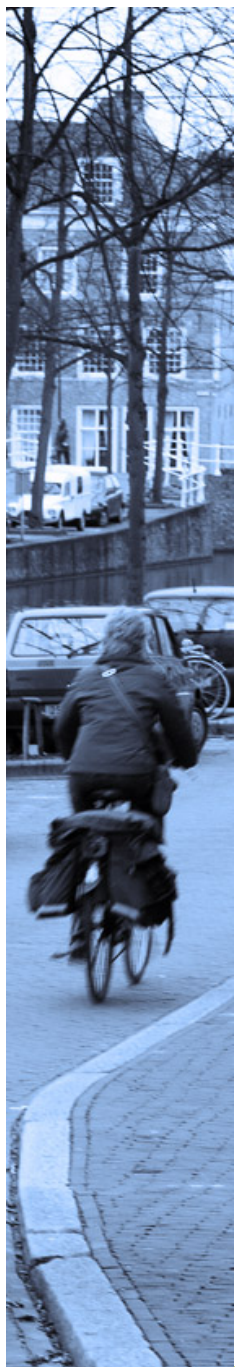
(Based on reviews by Stelling & Hagenzieker, 2012; Stelling et al., 2013, 2014; SWOV 2013)





Effects on behaviour			texting	
			C	P
missed bicycle bell				
missed horn honking				
speed				↓
lateral position				
response time				
detected visual objects			↓	
subjective risk rating				
number of conflicts				
disobedience of traffic rules				↑
unsafe behaviours			↑	↑
mistakes				
looking at relevant objects?			↓	↓
injury rate				↑
crash risk (self-reported)				
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Effects on behaviour	🎵		📱		texting	
	C	P	C	P	C	P
missed bicycle bell	↑		↑			
missed horn honking	↑		—			
speed	—	— / ↑	↓	↓		↓
lateral position	—	—	—	↑		
response time	—	—	↑	↑		
detected visual objects	—	—	— / ↓	↓	↓	
subjective risk rating	↑		↑			
number of conflicts	—	— / ↑	—	— / ↑		
disobedience of traffic rules	↑		—			↑
unsafe behaviours	↑		↑	↑	↑	↑
mistakes		—		↑		
looking at relevant objects?		— / ↑ / ↓	↓	— / ↓	↓	↓
injury rate				↑		↑
crash risk (self-reported)	1.4 – 1.8					

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# Results: auditory perception

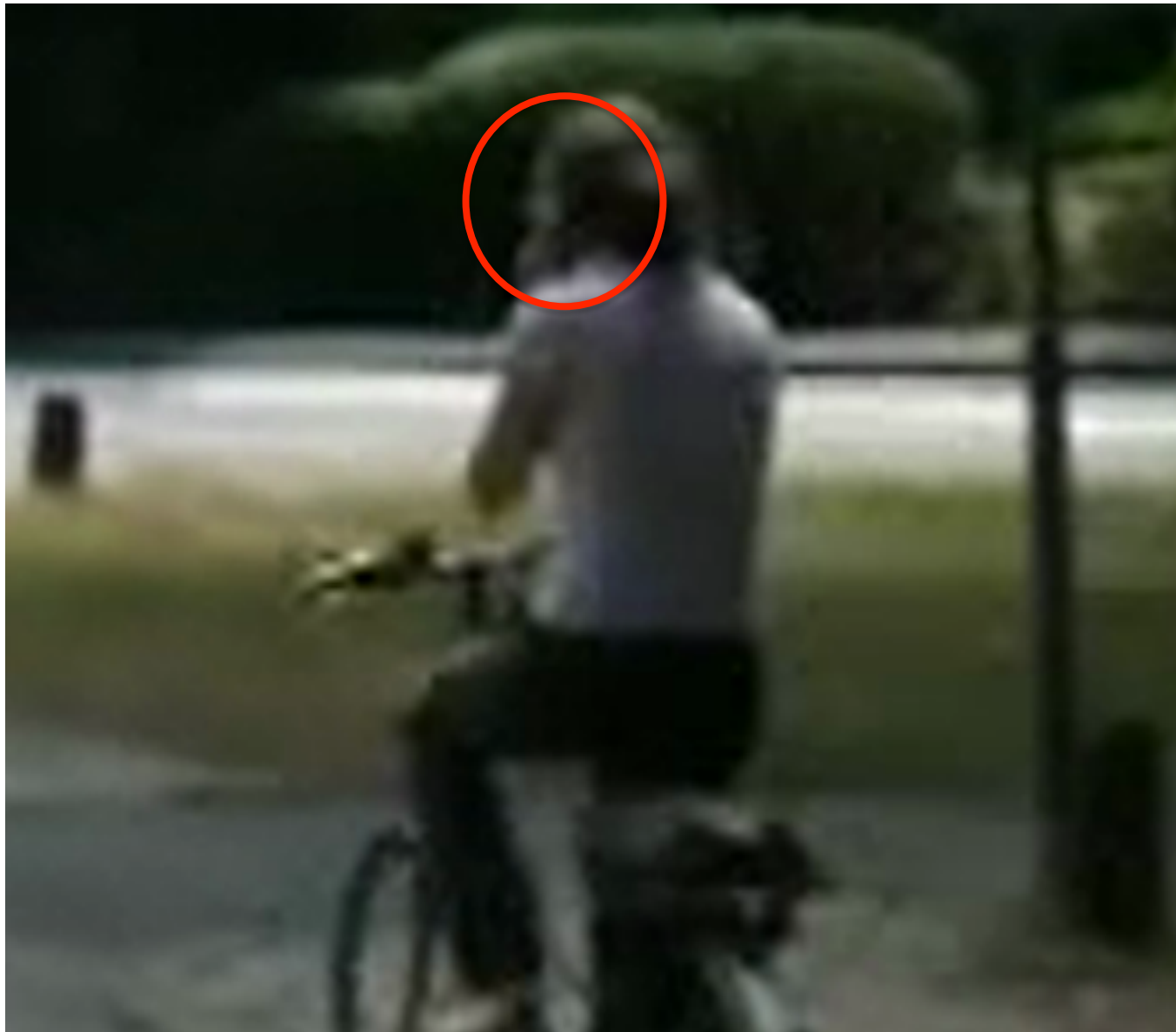
- Device use compromises auditory perception<sup>5</sup>
- In-earbuds particularly detrimental
- Listening to music through one earbud has no negative effect on cycling behaviour and number of missed auditory stimuli
  - However, it can negatively impact sound localisation: we need two ears to localise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



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









# Results: crashes

- Official crash records provide no information about the use of electronic devices
- Device use increases the crash risk for teen cyclists (factor 1.4) 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)



# Conclusions (1)

- Only few studies on distraction among cyclists and pedestrians available
- Severe under-reporting of bicyclist/pedestrian crashes and injury & exposure data largely absent for these road user groups

→ Crash/injury risks unknown

- Listening to music, conversing on the phone and texting **negatively** influence behavioural performance and self-reported crash risk



## Conclusions (2)

- Cyclists and pedestrians listening to music and conversing on the phone miss auditory information
- The few available studies show usage of portable devices while walking and cycling is considerable
- Concerns about limited availability of auditory information should be taken seriously
  - cyclists using electronic devices encountering quiet electric cars?
- Which measures can be taken ?
  - Education and information
  - Prohibit (hand-held) use ??







# References

1. Hagenzieker, M.P., & Stelling, A. (2013). Schatting aantal verkeersdoden door afleiding. [in Dutch with English summary]. SWOV Institute for Road Safety Research.
2. IEA (2012). *Hybrid and Electric Vehicles: The electric drive captures the imagination*. International Energy Agency
3. OECD/ITF (2013). Cycling, Health and Safety.
4. OECD/ITF (2013). Road Safety Annual Report.
5. Pastor, C. (2012). *Cycling Safety in Europe*. In: Proceedings of International Cycling Safety Conference 2012. 7-8 November 2012, Helmond, The Netherlands.
6. Reurings, M.C.B., Vlakveld, W.P., Twisk, D.A.M., Dijkstra, A., et al. (2012). *Van fietsongeval naar maatregelen: kennis en hiaten. Inventarisatie ten behoeve van de Nationale Onderzoeksagenda Fietsveiligheid (NOaF)*. R-2012-8. SWOV.
7. Stelling, A. & Hagenzieker, M. (2012) Afleiding in het verkeer. Een overzicht van de literatuur [in Dutch with English summary]. SWOV Institute for Road Safety Research.
8. Stelling, A, Hagenzieker, M., & Van Wee, B. (2013) *Cycling and sounds: the impact of the use of electronic devices on cycling safety*. Paper presented at the 3rd International Conference on Driver Distraction and Inattention, Gothenburg, Sweden.
9. Stelling-Konczak, A., Hagenzieker, M, & Van Wee, B. (2014; in prep). Traffic sounds and cycling safety: The use of electronic devices by cyclists and the quietness of (hybrid) electric cars.
10. SWOV (2013) Fact sheet "Use of media devices by cyclists and pedestrians"



# Studies included in overview

## Pedestrians:

- Bungum et al. 2005 (USA)
- Byington & Schwebel 2013 (USA)
- Cooper et al. 2012 (USA)
- Hatfield & Murphy 2007 (AUS)
- Hyman et al. 2010 (USA)
- Loeb & Clarke 2009 (USA)
- Nasar et al. 2008 (USA)
- Nasar & Troyer 2013 (USA)
- Neider et al. 2010, 2011 (USA)
- Schabrun et al. 2014 (AUS)
- Schwebel et al. 2012 (USA)
- Sotiraki et al. 2012 (review GR)
- Stavrinos et al. 2011 (USA)
- Walker et al. 2012 (USA)
- Thomson et al. 2012 (USA)
- Liberty Mutual 2013 (USA)
- Wang et al. 2012 (USA)

## Cyclists:

- Chataway et al. 2014 (DK/AUS)
- De Waard et al. 2010, 2011, 2014 (NL)
- Goldenbeld et al. 2010, 2012 (NL)
- Ichikawa & Nakahara 2008 (JPN)
- Terzano 2013 (NL)
- Vansteenkiste et al. 2014 (BE)