

An application of the Safe System Approach to a set of self-reported cycling crashes



**CYCLEWAYS
TO A HEALTHIER
LIFESTYLE.**
more pedalling, live longer

Get the facts.



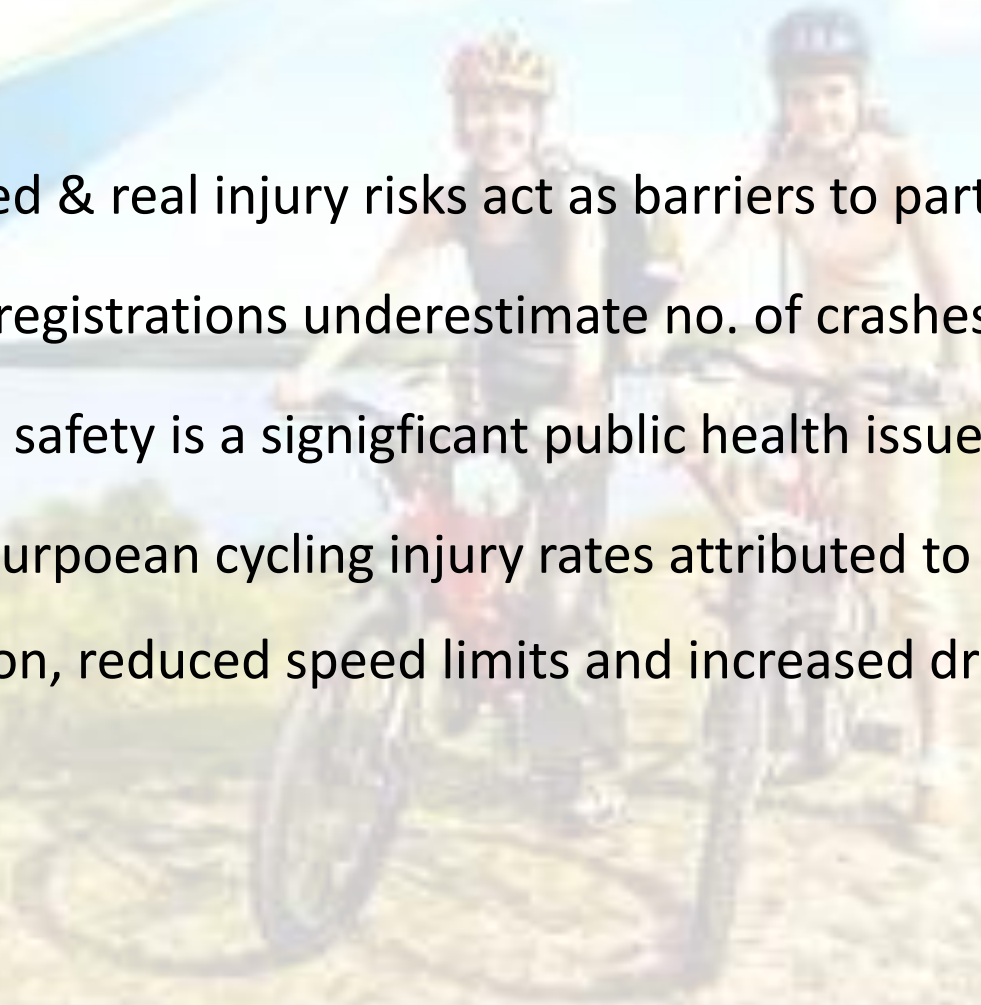
Sydneycycleways.net

Significance

- Personal, social & environmental benefits of cycling identified
- Positive relationship between cycling and health

However:

- Perceived & real injury risks act as barriers to participation
- Official registrations underestimate no. of crashes
- Cyclists' safety is a significant public health issue
- Lower European cycling injury rates attributed to better infrastructure, education, reduced speed limits and increased driver responsibility



The SSA and cycling safety

- SSA –adopted in Australia as an approach to road safety.
- Emphasises holistic view of road safety, with shared responsibility for prevention of crashes
- Safe system approach - 4 elements:
 - safe road use (behaviour)
 - safe roads and roadsides (infrastructure)
 - safe speeds (speed)
 - safer vehicles (vehicles)
- Minimal application to more vulnerable road users, such as cyclists



AIM

Assess whether the SSA can be usefully applied to a set of self-reported cycling crashes to classify crash contributors.

Methods: Safer Cycling Study

The background of the slide features a photograph of two cyclists riding on a gravel path. The cyclist in the foreground is wearing a dark tank top and a helmet, while the one behind is in a light-colored tank top and helmet. A vibrant rainbow is visible in the sky above them, and the overall scene is bright and clear.

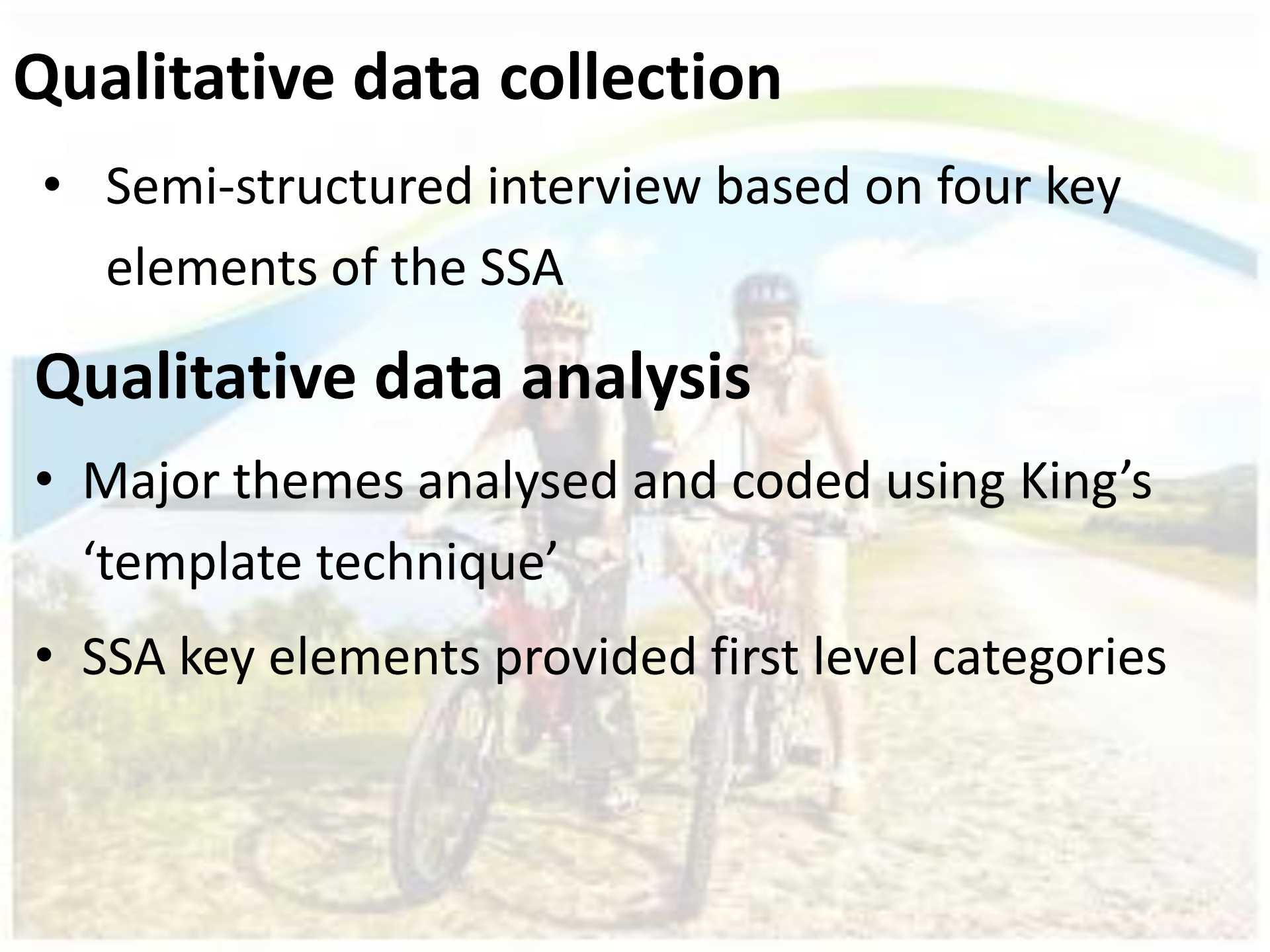
- Prospective cohort study
- Over 2000 cyclists recruited March to November 2011
- Data collected via web-based online questionnaires
- Baseline questionnaire completed
- Six survey weeks over 12 months
- Crashes defined as collisions or falls (Reynolds et al, 2009)

Qualitative data collection

- Semi-structured interview based on four key elements of the SSA

Qualitative data analysis

- Major themes analysed and coded using King's 'template technique'
- SSA key elements provided first level categories



Template for causes of crashes

<i>First level category</i>	<i>Second level category</i>	<i>Third level categories</i>
Safe road use	Motor vehicle driver	Travelling too close; driver inattention; disobedience of road rules; aggressive behaviour
	Cyclist	Failed to adjust behaviour; inattention; poor judgment; disobeyed road rules; didn't unclip from cleats; fatigue; aggressive behaviour
	Other cyclists	Travelling too close for conditions; cyclist inattention; disobedience of road rules; apparent aggressive behaviour; deliberately trying to cause accident
	Pedestrian	Walking too close for conditions; inattention; aggressive behaviour; disobedience of road rules; lack of knowledge of rules
	Animal	Crossed path of cyclist
Safe roads and Roadsides	Infrastructure maintenance	Overgrown vegetation; loose gravel; cracks in surface; uneven surface; other maintenance problems
	Infrastructure design	Tight bend in shared path, oncoming path users obscured; parking spaces in inappropriate places for major cycling route; shared path too narrow in busy area; bike path in dog leash-free area, grates inappropriate for cyclists; slippery surface; train track on road; roundabout problems; poor lighting; poor signage
	Lack of cycling infrastructure in busy area	Infrastructure comes to abrupt ending forcing cyclist to merge with busy traffic; poor linkage of cycling infrastructure
	Intersection of infrastructure	
Safe vehicles	Driver	Cyclist in vehicle blind spot
	Cyclist	Malfunction of bicycle
Safe speeds		Travelling too fast for conditions: cyclist/ driver

Strengths/ Limitations



Representativeness

- Broad sampling strategy
- Self-selection of motivated people
- ALL crashes investigated
- Need to be able to access internet

Self-report

- Cyclists' views non-expert opinions of causes
- Possible recall/ reporting bias
- However, offers broader insight into crashes

Results

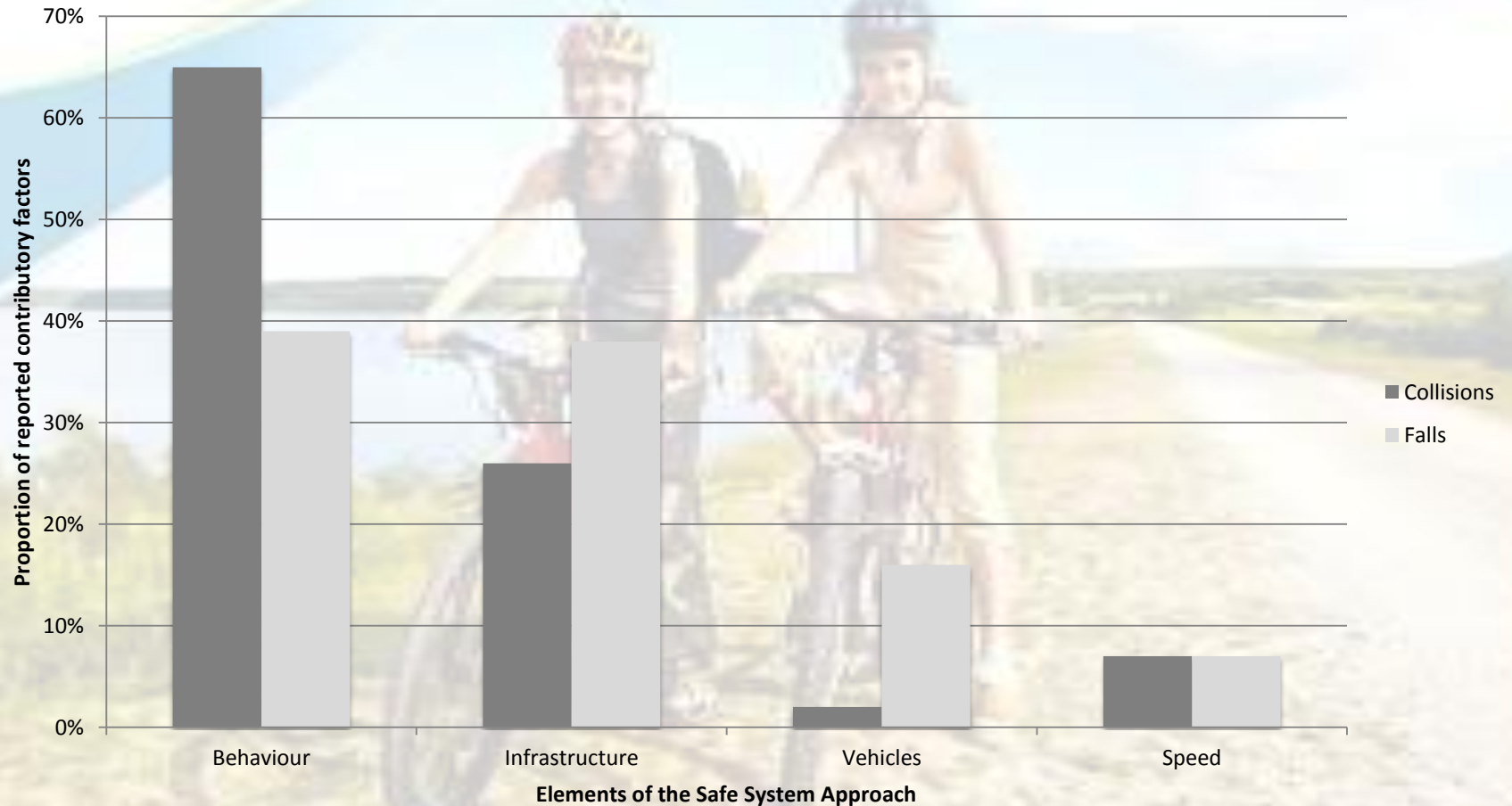
- 136 cyclists reported 145 crashes May 2011 to March 2012
- 78 falls, 67 collisions
- 34 falls & 31 collisions req'd treatment by GP/ ED
- Ave age: 43 (sd +/- 9.6 years)
- 72% male, 28% female
- No injuries required hospital stay
- 3 collisions & no falls reported to police
- 276 contributory factors identified

Demographics

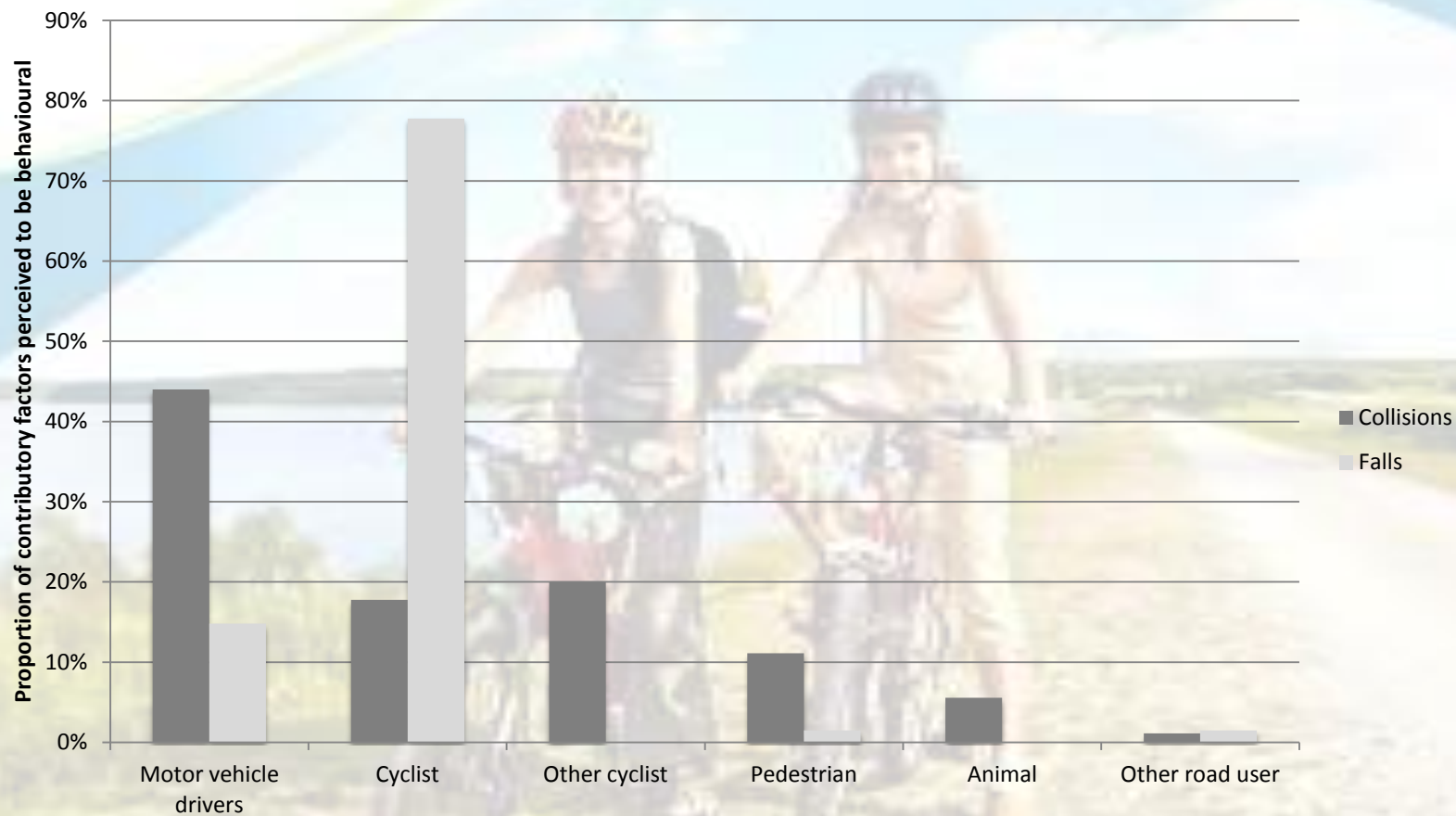
Experience levels	Percentage
Novices	1.5
Intermediate	18.5
Experienced	49
Advanced	27
Expert/ professional	4

Type of infrastructure	% of time spent on infrastructure in last 12 months
Roads	51
Shared paths	17
Bicycle path	9
Pedestrian footpath	5
Bicycle lane	15
Other infrastructure	3

Factors contributing towards crashes

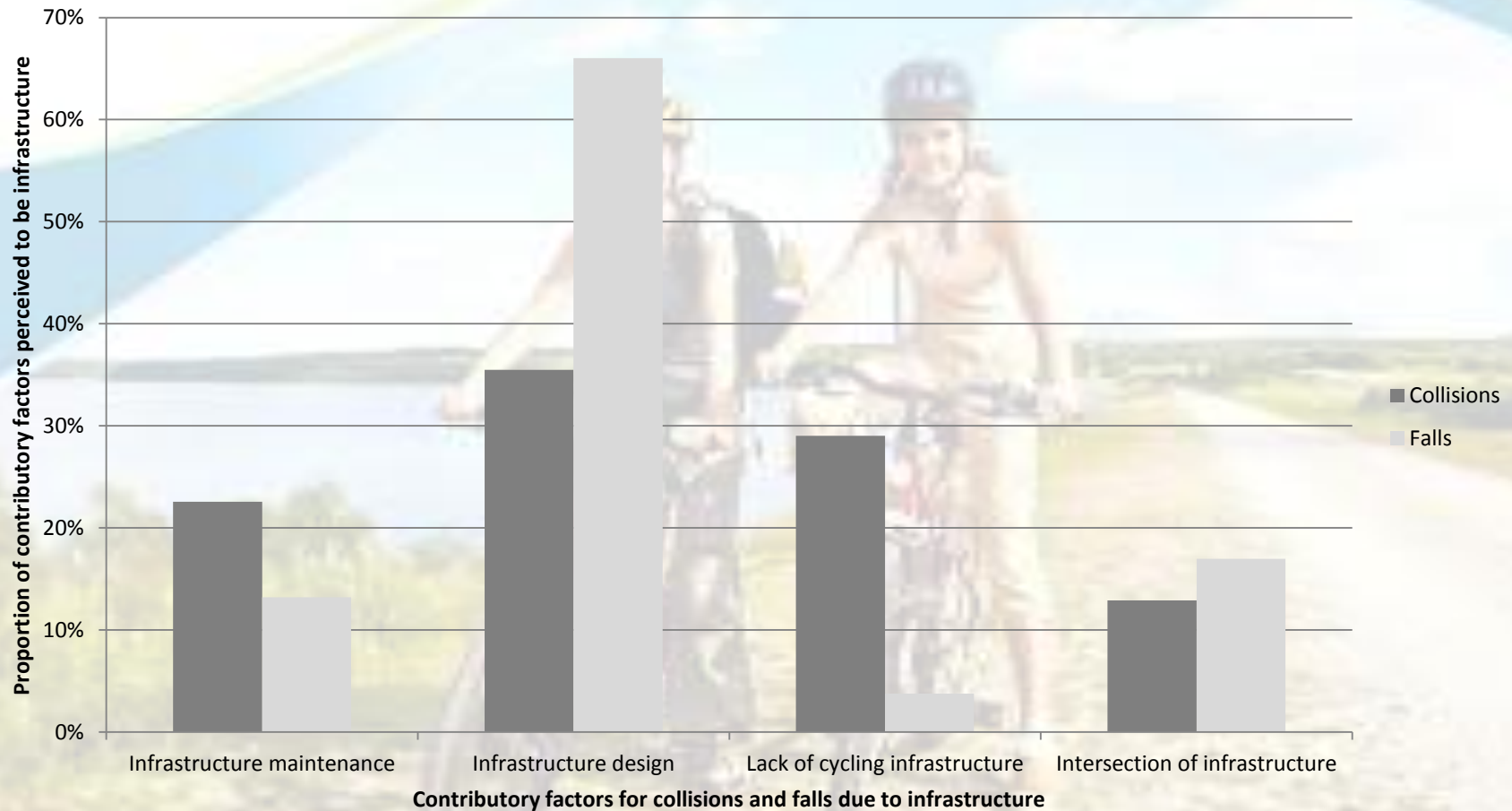


Contributory factors related to behaviour



Contributory factors for collisions and falls classified as behavioural

Contributory factors related to infrastructure



Behavioural factors contributing to collisions

Behavioural factors reported for collisions	Number of reports
Motor vehicle driver inattention	28
Cyclist inattention	10
Other cyclists' inattention	13
Pedestrian inattention	5
Animal crossing the path of cyclist	5

Behavioural factors contributing to falls

Behavioural factors reported for falls	Number of reports
Cyclist inattention	13
Cyclist failure to unclip from cleats	16
Failure to adjust cycling behaviour to conditions	6
Motor vehicle drivers not looking out for cyclists	4

Infrastructure factors contributing to collisions

Infrastructure factors reported for collisions	Number of reports
Cyclists poorly catered for on roundabouts	3
Poor linkage of cycling infrastructure	4
Cycling infrastructure coming to an abrupt end	3
Intersection of infrastructure	4
Poor infrastructure maintenance (23%) (e.g. overgrown vegetation; loose gravel; uneven surfaces and potholes in the road or path)	7

Infrastructure factors contributing to falls

Infrastructure factors reported for falls	Number of reports
Slippery surfaces (e.g. slippery surface paint on the road temporary roadwork covering)	19
Poor layout of existing infrastructure (e.g. bike lanes ending as enter roundabout, bollards or barriers in path)	8
Poor lighting or signage	3
Bicycle inappropriate grates in the roadway	3
Intersection of infrastructure	9
Poor infrastructure maintenance (e.g. loose gravel on route, uneven surface, retained water on path)	7

A photograph of two cyclists riding on a gravel path. The cyclist on the left is wearing a red helmet and a dark vest, while the cyclist on the right is wearing a dark helmet and a light-colored tank top. They are both smiling. The background shows a body of water and a clear sky. A large, stylized rainbow graphic with green and blue bands arches over the scene. The word "Discussion" is overlaid in the center in a bold, black, sans-serif font.

Discussion

Behaviour

Driver inattention

- Improve quality and skills of car drivers
- ‘Soft’ (communication/ education) and ‘hard’ (enforcement) methods (De Geus, 2012).
- Adequate overtaking distances required
- Cyclist training on riding defensively near cars

Cyclist inattention

- Increased vigilance
- Increased conspicuity

Pedestrian inattention

- SSA: increased understanding of relationship between VUGs

Infrastructure

The background of the slide features a photograph of two cyclists riding on a gravel path. The cyclist on the left is wearing a yellow helmet and a dark tank top, while the cyclist on the right is wearing a black helmet and a light-colored tank top. In the background, a vibrant rainbow arches across a clear blue sky. The overall scene is bright and outdoorsy.

Lack of

- Bike specific facilities provide improved safety

Design

- Infrastructure modifications achieve widespread benefits
- Under SSA, needs to accommodate user errors
- Needs to meet international best practice standards

Maintenance

- Increased expenditure by councils
- Better integration into other planning and construction processes

Vehicles

A background image showing two cyclists riding on a paved path. The cyclist on the left is wearing a dark tank top and a yellow helmet, while the cyclist on the right is wearing a light-colored tank top and a white helmet. A large, vibrant rainbow arches over the scene, set against a bright, slightly hazy sky. The overall tone is positive and active.

Bicycle failure

- Regular bike servicing important
- Encourage attendance at bicycle maintenance course

Unable to unclip

- Proper information/ training needed to allow cyclists to use clip-in pedals safely and effectively (Patel, 2004)

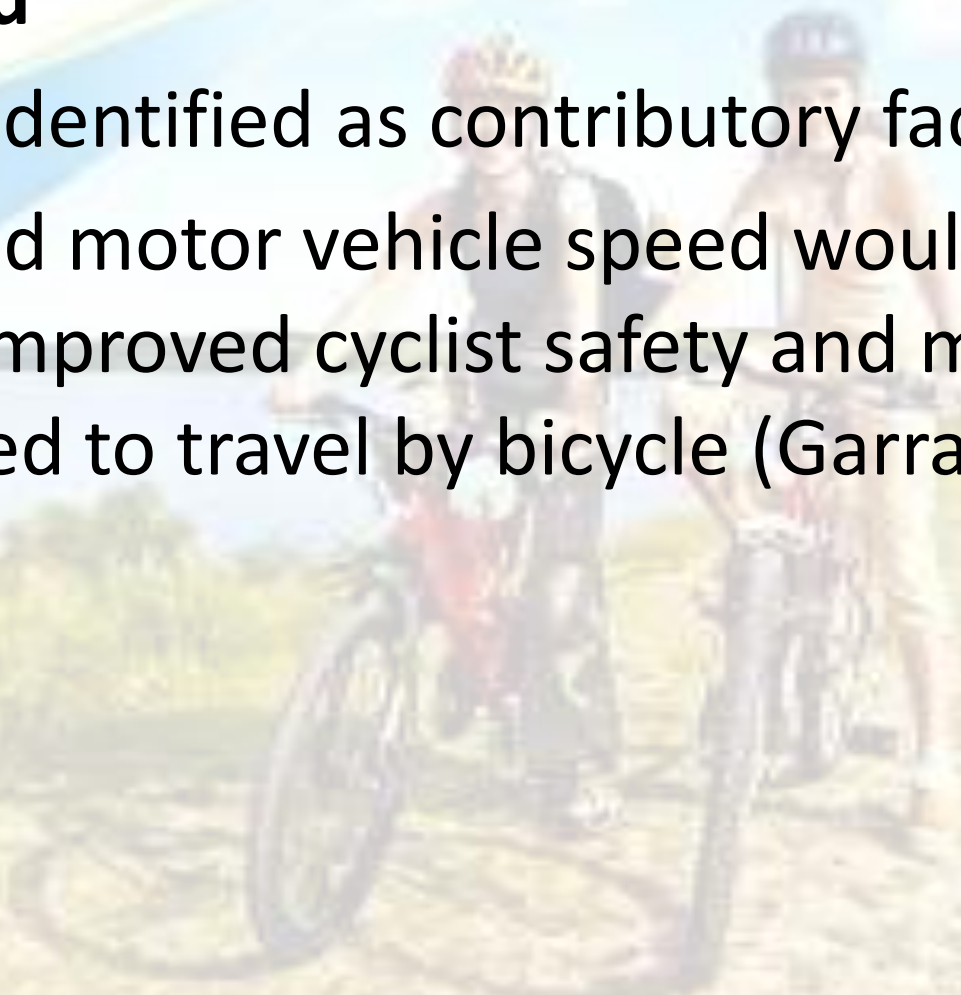
Vehicle design

- Not identified
- Addition of adequate protection around MVs could reduce casualties

Speed

MV speed

- Rarely identified as contributory factor
- Reduced motor vehicle speed would undoubtedly mean improved cyclist safety and more people prepared to travel by bicycle (Garrard, 2008)



Conclusions

- SSA offers useful framework to:
 - analyse bike crashes
 - consider countermeasures for cycling safety
- Paradigm shift required in cycling away from blaming user behaviour to improving system
- SSA in cycling safety policy documents would encourage broader range of safety strategies