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# Exercises for older cyclists to improve traffic safety

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# Overview

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Aim of the study

Training

Participants

Results

- cycled distance
- perceived effects of the training
- performance in cycle course

Discussion

# Aim

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## Older cyclists

- physical problems, e.g.
  - motility reduced
  - balance reduced

=> Cycling more difficult, might prevent from using the bike

=> Higher risk of

- single bike crashes (e.g. getting on or off the bike)
- collisions (e.g. turning to the off-side)

## Requirement analysis of tasks for cyclists from a sports perspective

- getting off the bike
- turning

...

=> Sports training to improve the required abilities

# Training

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Demands in traffic	Skills	Required abilities
Getting off the bike	<ul style="list-style-type: none"><li>- Precise stopping</li><li>- Movement from sitting to standing</li><li>- Standing one-legged on one pedal</li><li>- Lifting the foot over the frame if necessary</li></ul>	<ul style="list-style-type: none"><li>- Anticipation</li><li>- Reaction</li><li>- Balance</li><li>- Flexibility in the joints of trunk, hip, and foot</li><li>- Movement coupling</li></ul>
Turning	<ul style="list-style-type: none"><li>- Indicating the turn (cycling one-handed)</li><li>- Looking over the shoulder while cycling</li></ul>	<ul style="list-style-type: none"><li>- Movement coupling</li><li>- Balance</li><li>- Trunk stability</li><li>- Flexibility in shoulders and neck joints</li><li>- Orientation, peripheral vision</li></ul>

# Methods

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## **Participants**

Contacts to sports clubs in medium sized cities in Saxony and Saxony-Anhalt

- conditions:

- space and time for training

- trainer

- random assignment to intervention and control group

- costs paid by German Federal Ministry of Transport, Building and Urban Development

Determine cities with training and control groups at random

# Methods

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## Participants

Recruited cyclists of 60 years and older in 14 cities

140 persons in intervention groups, 160 in control groups

100€ for participation in 3 test sessions for all

+ regular training for intervention group, 5 months, 2 \* 1 hour / week

### Frequency of bike use, Test Session 1.

	<i>Intervention group (N=146)</i>	<i>Control group (N=167)</i>
<i>Less than 1-2 times per month</i>	<i>2.1%</i>	<i>3.6%</i>
<i>1-2 times per month</i>	<i>2.1%</i>	<i>3.6%</i>
<i>1-2 times per week</i>	<i>16.4%</i>	<i>22.2%</i>
<i>3-4 times per week</i>	<i>32.2%</i>	<i>22.8%</i>
<i>Daily or nearly daily</i>	<i>46.6%</i>	<i>51.5%</i>

# Methods: Training

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International Cycling Safety Conference, Helmond, November 21, 2013

# Methods: Training

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International Cycling Safety Conference, Helmond, November 21, 2013



# Tests

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## Test Sessions

- 1: January / February 2013
- 2: June / July (August) 2013
- 3: October / November 2013

## Tests of physical fitness

Bicycle computer: **distance cycled**

Questionnaires: **physical complaints**, cycling habits, ...

Cycle course: **safety relevant skills** (Heidemann, Hufgard, Sindern, Riek & Rudinger, 2009)

Mobility diary: mobility behaviour, perceived problems

# Distance cycled

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Bicycle computers mounted on participants' bikes  
Cycled distance between Test Sessions 1 and 2

Group	Mean	Standard deviation
Intervention (n=122)	1,017 km	1,057 km
Control (n=127)	918 km	895 km

No difference between groups, t-test for independent samples:  $p = .82$   
=> no effect of training

No difference between groups before but estimates of low validity

# Effects on physical complaints: Ratings

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Ratings (5-point scale)

Physical complaints (a) in general and (b) when cycling in the fields

(- Diabetes)

(- Vision)

(- Hearing)

- **Motility**

- **Cardiovascular system**

- **Nerve system**

- **Muscle strength**

**Mean value of physical complaints these four fields**

GLM:

Effect of training (interaction of group and test session) on

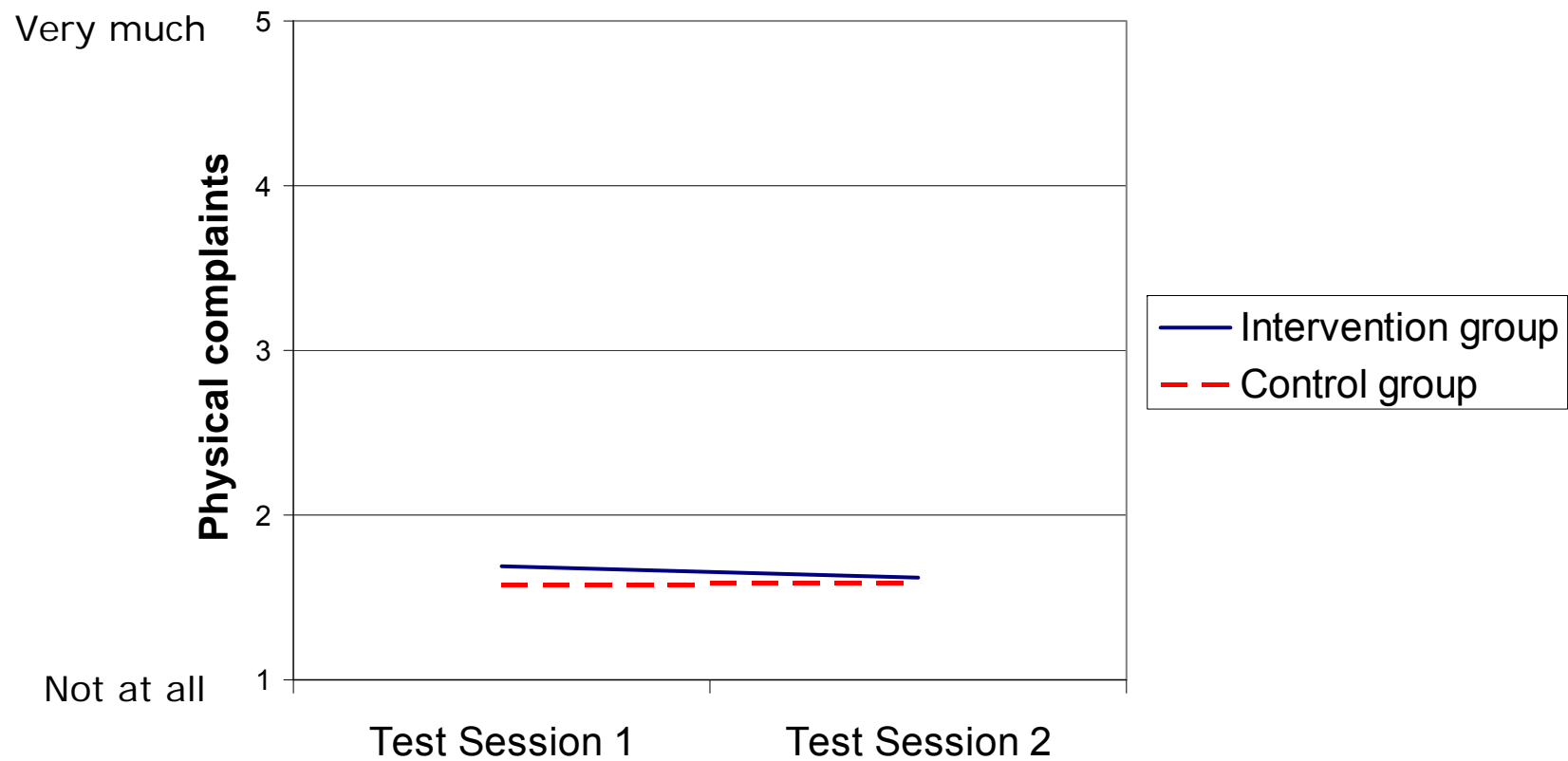
- mean value of general complaints  $p = .033$ ,  $\eta^2 = .016$

- muscle strength in general  $p = .001$ ,  $\eta^2 = .036$

No effect on physical complaints when cycling.

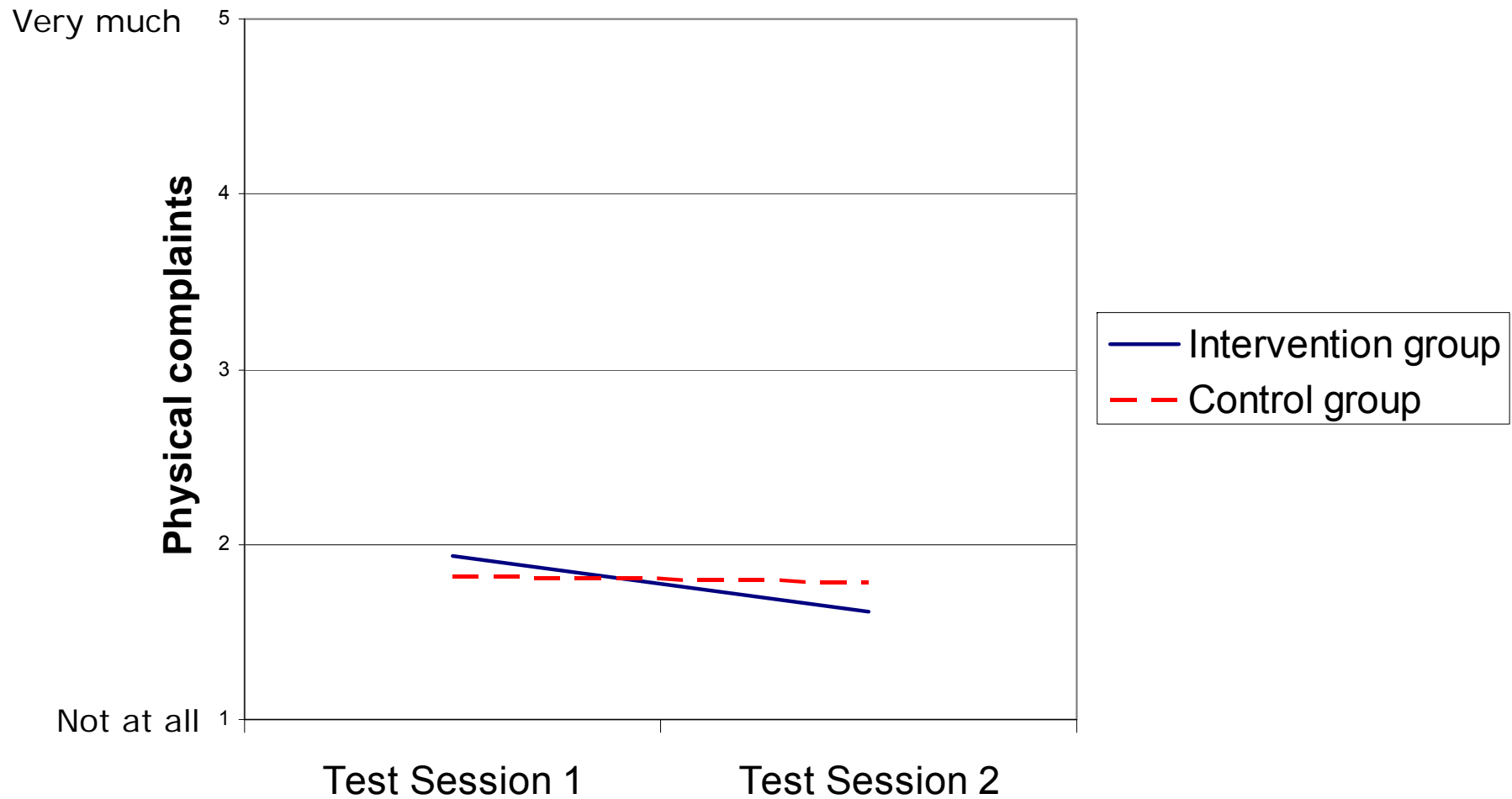
# Effects on physical complaints: Ratings

**Mean of motility, cardiovascular system, nerve system, muscle strength, general**



# Effects on physical complaints: Ratings

## Muscle strength, general



# Effects on physical complaints: Perceived changes

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Motility:	21 improved 3 improved somewhat 3 easier to get on and off the bike 1 turning round easier 1 turned round more often
Physical state:	2 improved in general 6 endurance improved 15 fitter 2 somewhat fitter 1 stronger muscles 1 stronger muscles in the neck 1 posture improved 1 body tension improved
Balance:	15 balance better 2 balance not decreased

# Effects on physical complaints: Perceived changes

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Nothing changed: 14 nothing changed  
1 nothing or very little changed  
5 nothing changed because already cycled a lot before  
5 nothing changed because already a lot of sports before  
3 little changed because very active before  
1 attended training seldom for health reasons  
1 exercises too difficult

Cycling: 8 more than before  
1 tried to cycle more than before  
6 more fun when cycling

Safety: 13 safer  
1 somewhat safer  
1 safe enough to cycle into the town centre  
4 reactions faster

# Effects on physical complaints: Perceived changes

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## Further reported changes

6 paid more attention or rode more carefully

3 had bought helmets: 2 used them regularly, 1 for cycle tours only

2 respected traffic rules more often than before

3 had met nice cyclists at the training sessions



# Cycle course

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## Example of task

Turning to the  
off-side

## Potential faults

- no turn around the shoulder
- no hand-sign
- not naming the number
- touching the line with the front wheel



# Cycle course

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Proportion of participants accomplishing task correctly

Examples of tasks	<i>Intervention group</i> Test session 1	<i>Intervention group</i> Test session 2	<i>Control group</i> Test session 1	<i>Control group</i> Test session 2
<i>Dismounting to the left into a hula hoop</i>	69%	72%	67%	72%
<i>Dismounting to the right into a hula hoop</i>	71%	82%	74%	80%
<i>Turning to the off-side</i>	61%	69%	43%	64%

GLM: no interaction between test session and group: no effect of training

# Discussion

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## Distance cycled

Ceiling effect: participants had cycled already very much before

## Physical complaints

Small effect on ratings

Low level of complaints before intervention

- optimistic self-perception and description?
- reference for „complaints“ with age?

Effects in free answers

## Safety

No transfer from training to cycling behaviour

Performance has reached no ceiling

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# Thank you for your attention!

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