cycle BOOM

DESIGN FOR LIFELONG HEALTH & WELLBEING

E-bikes and their benefit for older adults

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ICTTP 2016

University of Reading

CINN Centre for Integrative Neuroscience and Neurodynamics

EPSRC Pioneering research and skills

Lifelong Health & Wellbeing Research for Healthy Ageing

Oxford Brookes University

Cardiff University Prifysgol Caerdydd

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UWE Bristol University of the West of England

Age and cognitive function

- Age, also in the absence of pathological conditions, is associated with **cognitive decline** (e.g., Sandberg, 2014; Park, 2000; Salthouse, Atkinson, & Berish, 2003; Salthouse, 2004)

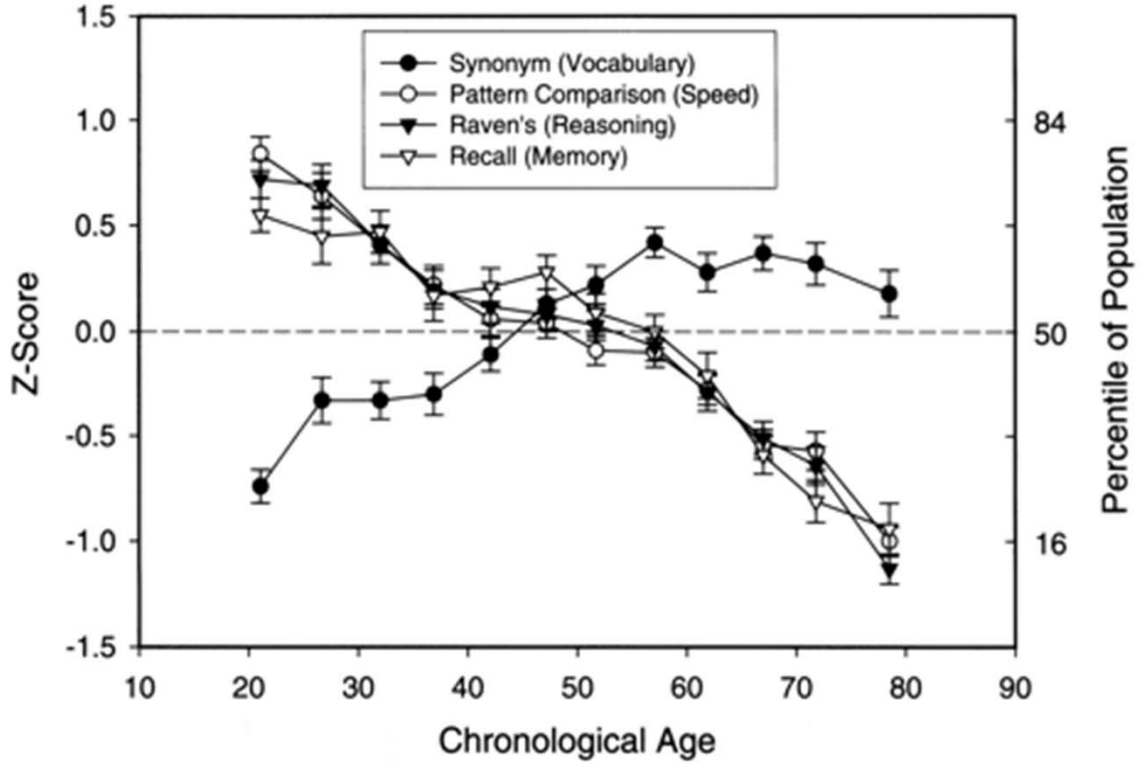


Fig. 1. Means (and standard errors) of performance in four cognitive tests as a function of age. Each data point is based on between 52 and 156 adults.

- Executive functions start to decline from the age of 20 onwards

Meta-analysis exercise & cognition

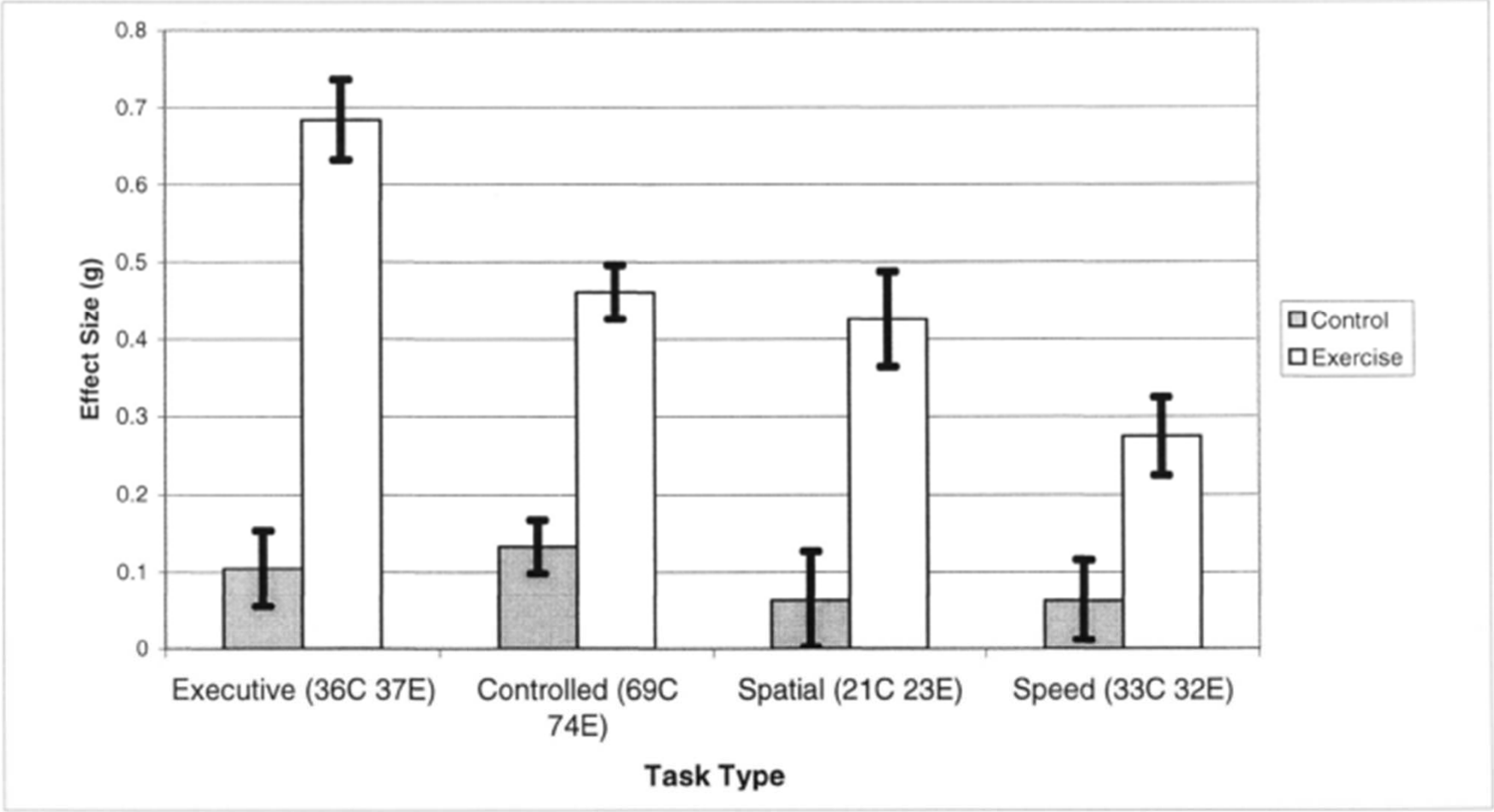


Fig. 1. Effect sizes for the different process-task types reflecting the four theoretical hypotheses concerning the process-based specificity of the benefits of fitness training. Parenthetical notations on the *x*-axis indicate the number of effect sizes contributing to the point estimates for each task type in the exercise (E) and nonexercise (C) groups. Error bars show standard errors.

Colcombe & Kramer (2003) *Psych.Sc.*

Cycling, ageing, cognition and well-being

- Cycling accounts for only **1%** of all journeys amongst people aged 65 and older in the UK
  - 23% in the Netherlands
  - 15 % in Denmark
  - 9 % in Germany

- Benefits of activity in **outdoor environments** on we of older adults (see e.g. Sugiyama & Thompson, 2007)

- Older adults who are **physically active** report higher of well-being and physical function (Spirduso & Cronin, 2001

Pedalling brain power!

- **Aerobic exercise** has been shown in laboratory conditions to improve cognitive function in older adults, particularly executive function (e.g., Erickson, 2011, Colcombe & Kramer, 2003)

- Benefits of **cycling** for regeneration in the brain (Erickson et al., 2011; Thomas et al., 2015)

Wellbeing and cognition trial

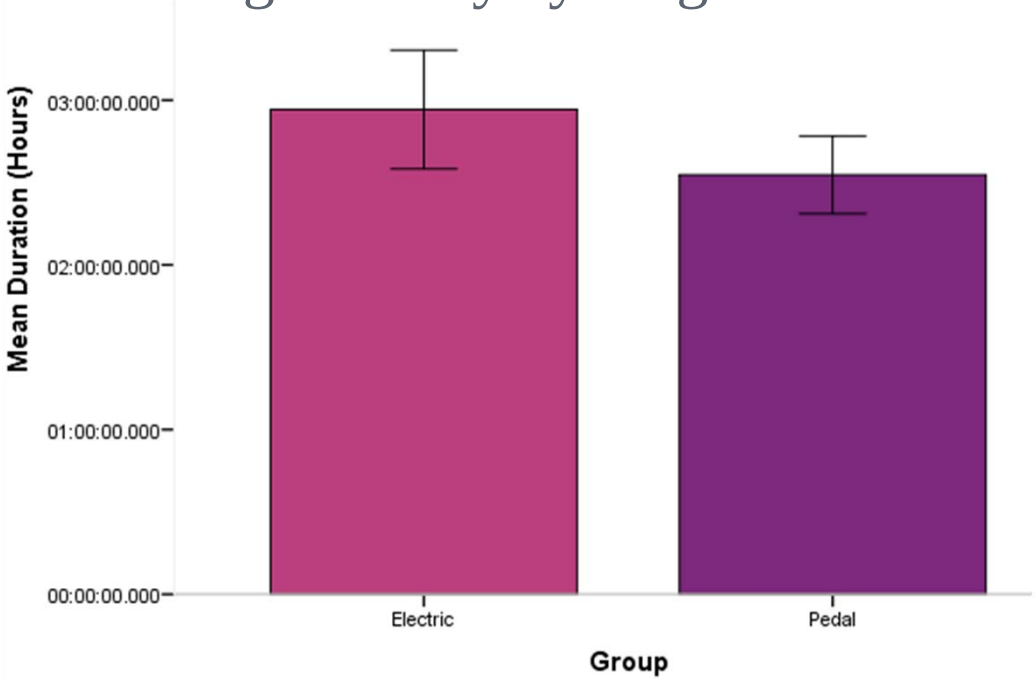
- Investigate the impact of cycling for an **8-week** period on older adults' cognition and well-being
- Participants, over 50, cycle for an 8 week period
  - At least **1 ½ hours/week**
    - 37 Pedal bike participants
    - 40 E-bike participants
      - Levels of assistance
- Complete a diary of rides
  - Duration and physical intensity of ride
  - Other physical activity undertaken
- Cognition and wellbeing are measured before the trial (pre-intervention) and after (post-intervention) – Change score

Participant demographics

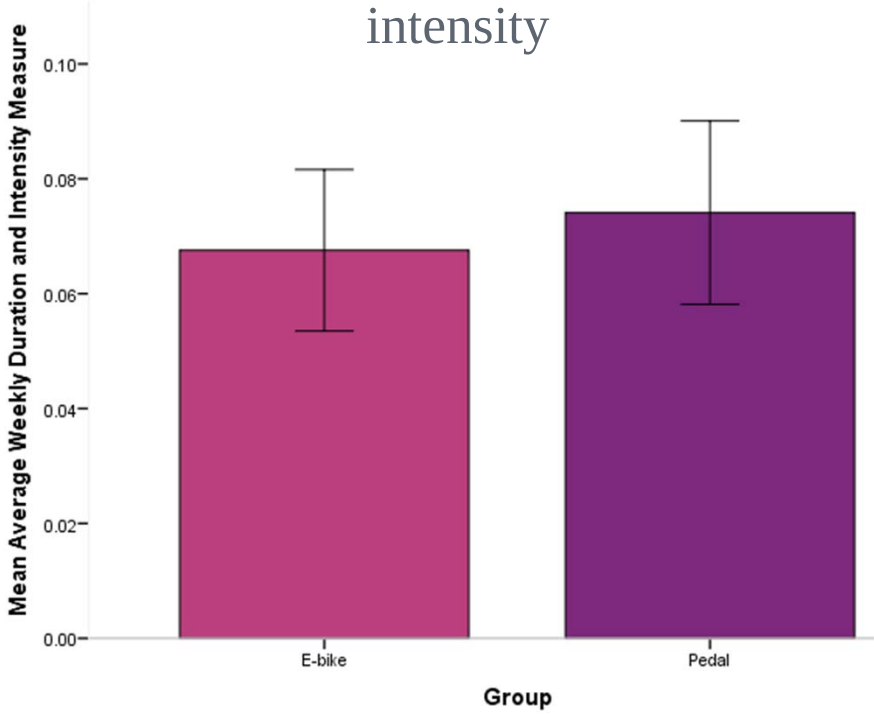
Group	Age	Gender	MMSE	PWB	PANAS	PASE	SF36 Mental health	SF36 Physical health
E-bike *N*=40	62 (7.6) Range 50-83	20 Females	26.88 (1.26)	4.71 (.52)	33.86 (5.01)	45.36 (31.46)	76.92 (15.5)	78.08 (17.73)
Pedal *N*=37	63 (7.6) Range 51-83	18 Females	26.86 (1.90)	4.81 (.48)	35.94 (5.13)	50.54 (33.66)	80.49 (12.1)	81.25 (12.74)

Cycling during the intervention

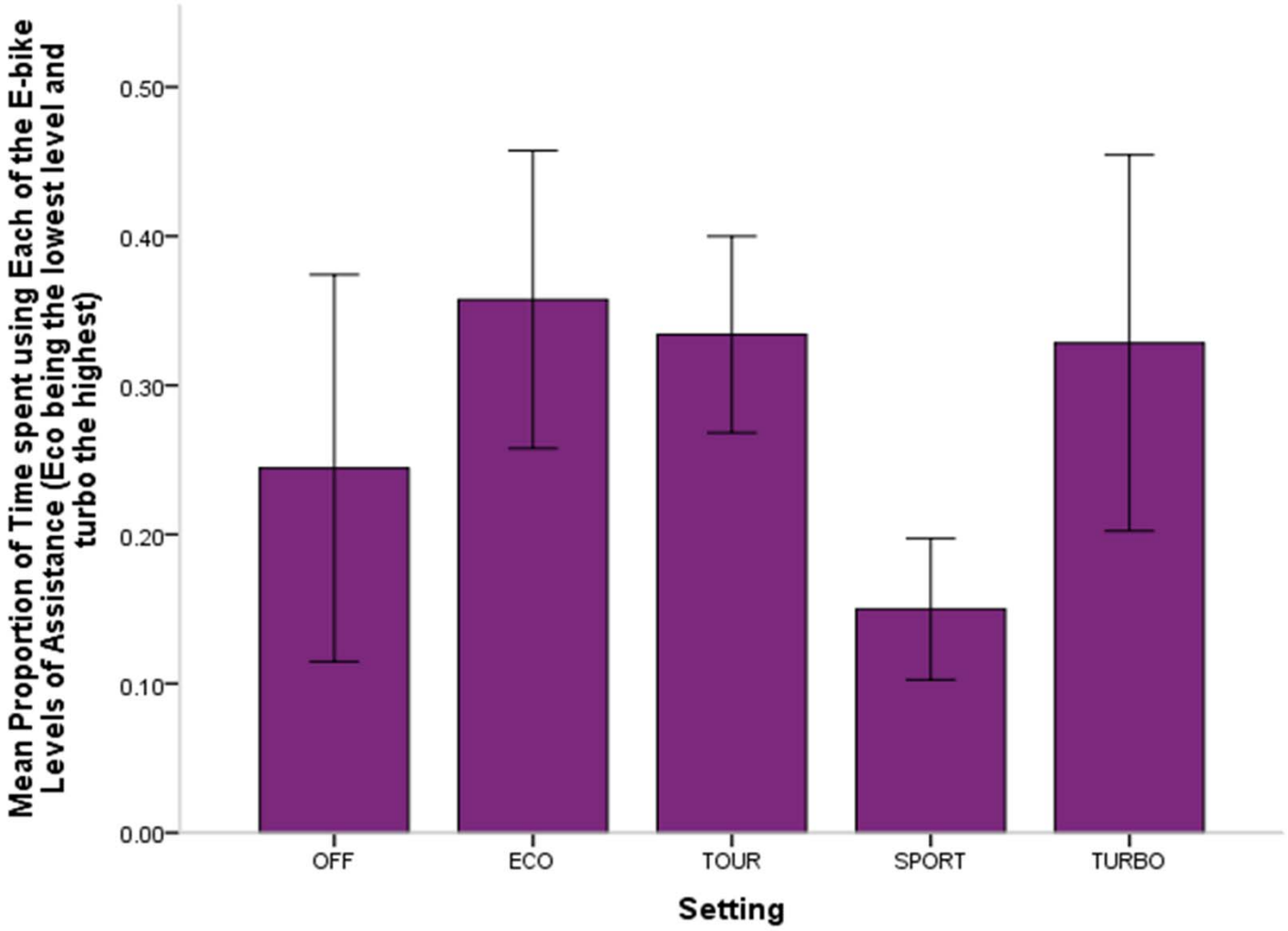
Average weekly cycling duration



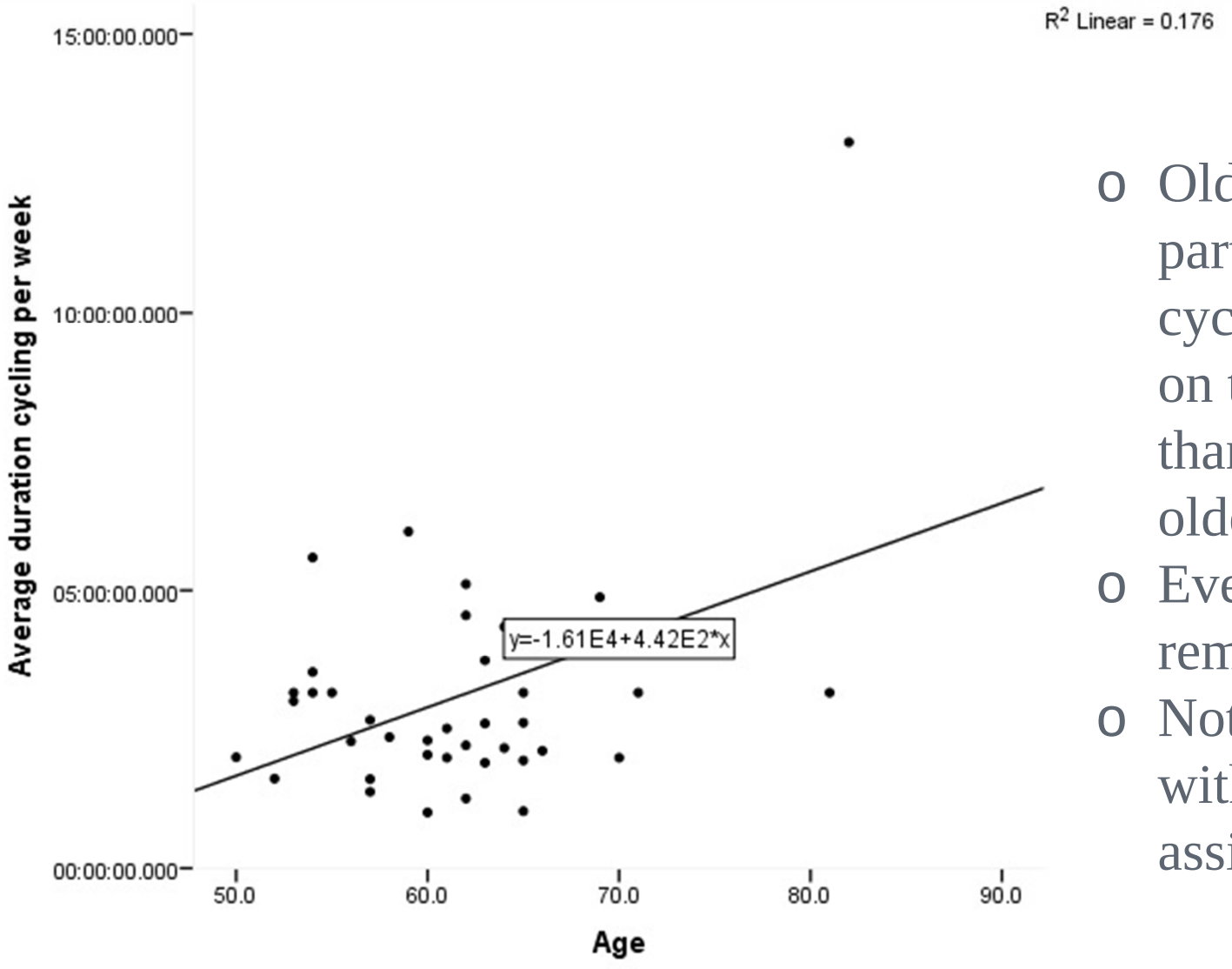
Average weekly cycling duration and intensity



E-bike participants: Assistance level

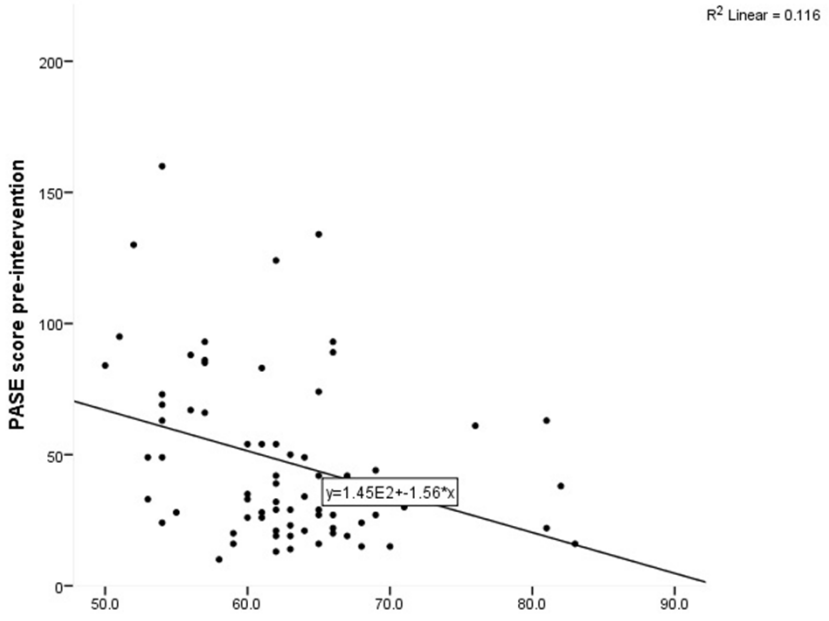


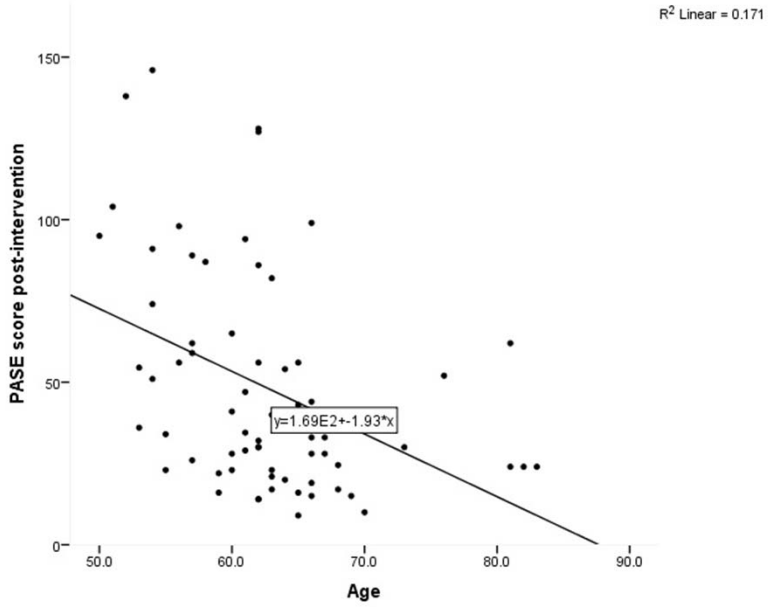
Age and cycling duration



- Older participants cycled for longer on the e-bike than younger older adults
- Even when removing outlier
- Not correlated with level of assistance

Cycling as a way to engage older adults in exercise

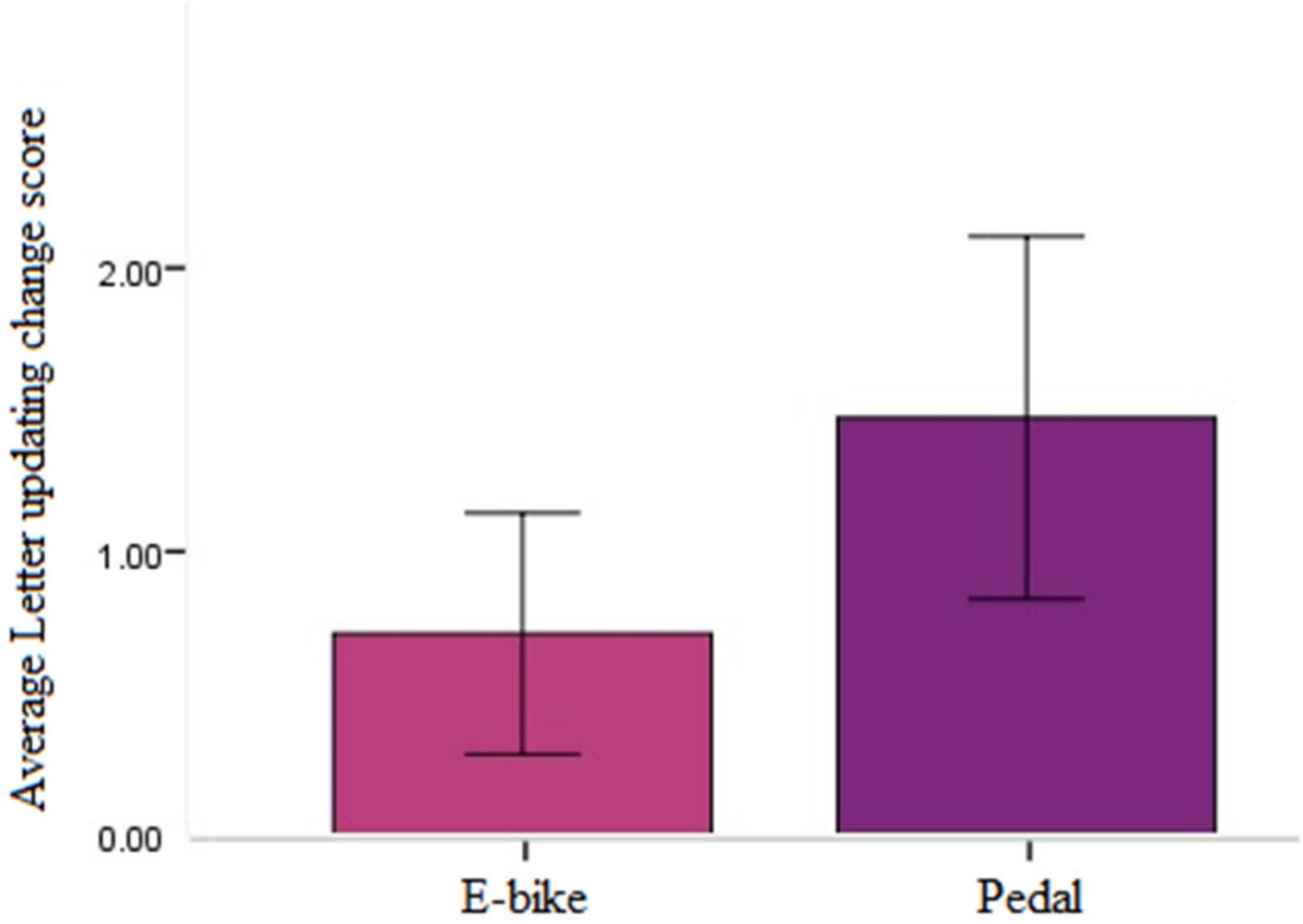




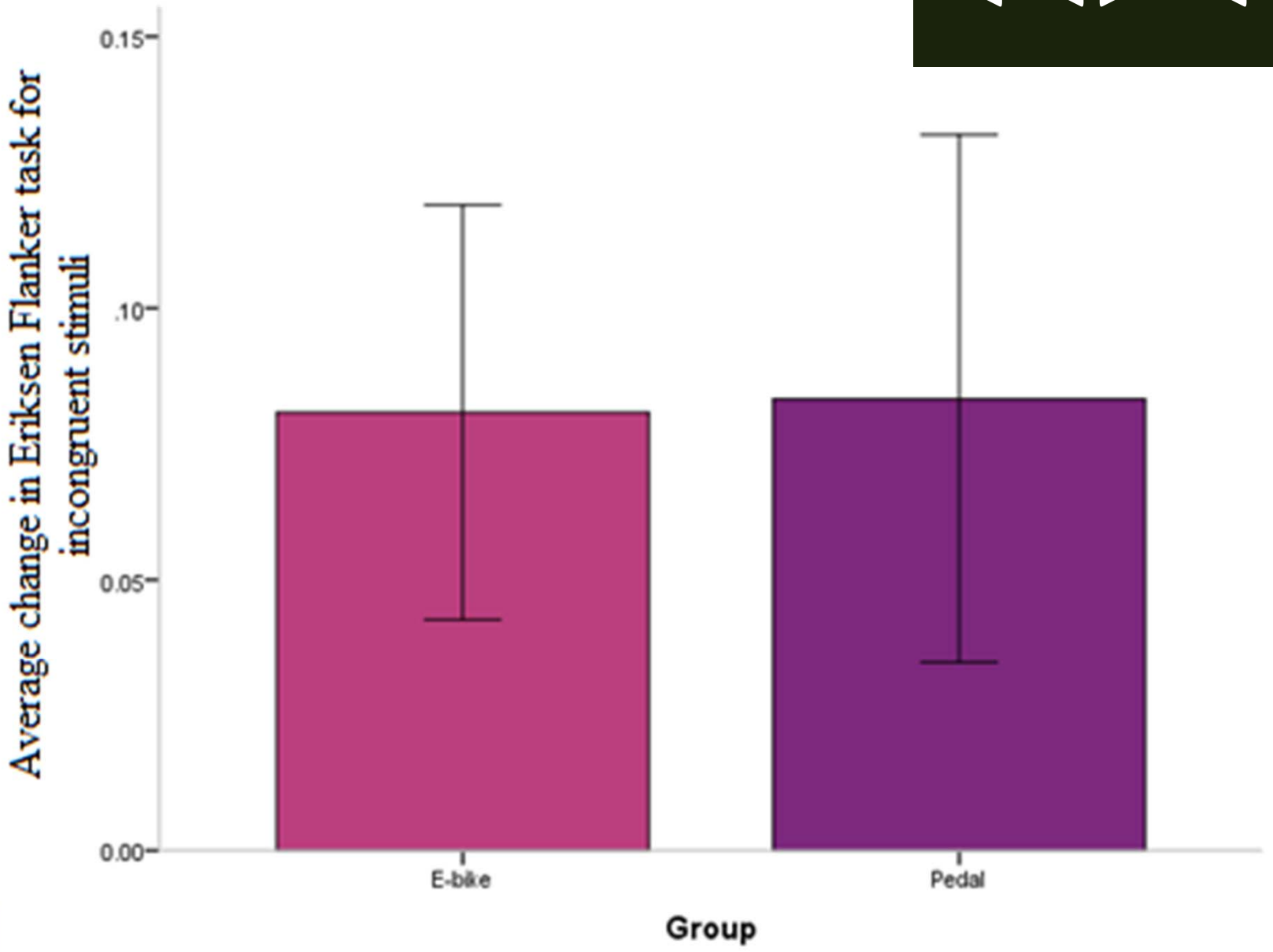
- Physical activity levels (measured by the PASE) correlate with age
  - The younger the participant, the more physical activities they conducted before taking part in the trial and during
- However, this measure did not correlate with duration
  - Suggesting that those more physically active do not necessarily cycle more during the trial
- Cycling appears to be a way to engage older adults in physical exercise
  - EVEN for those less physically activate prior to the trial

Cognitive tasks - Letter updating task

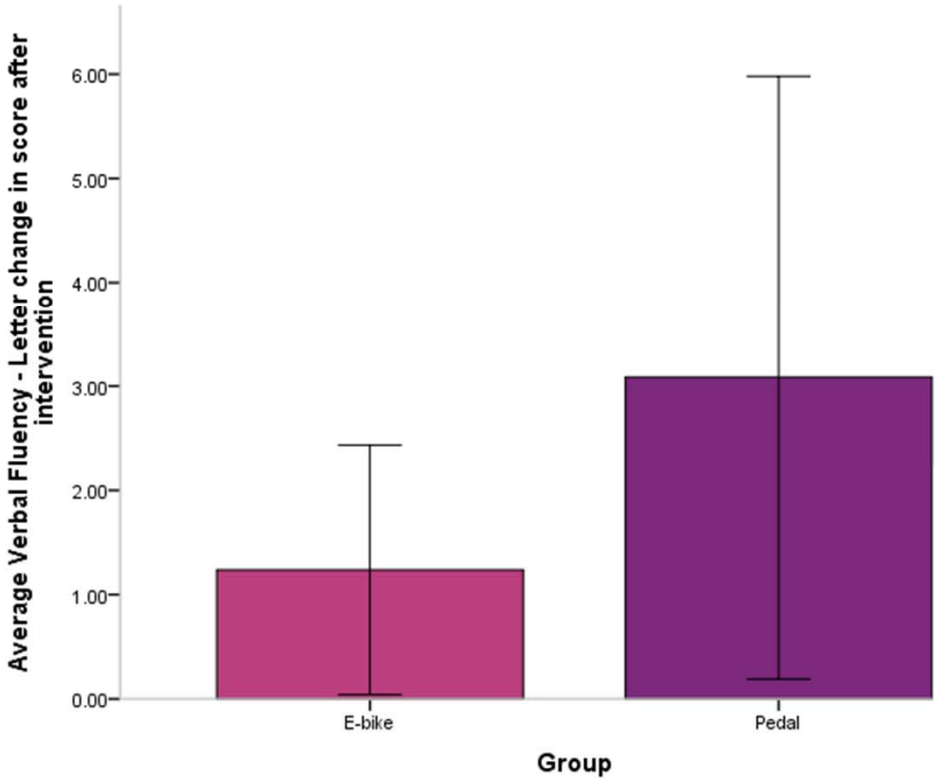
H HJ HJ**W** JW**B** WB**C**

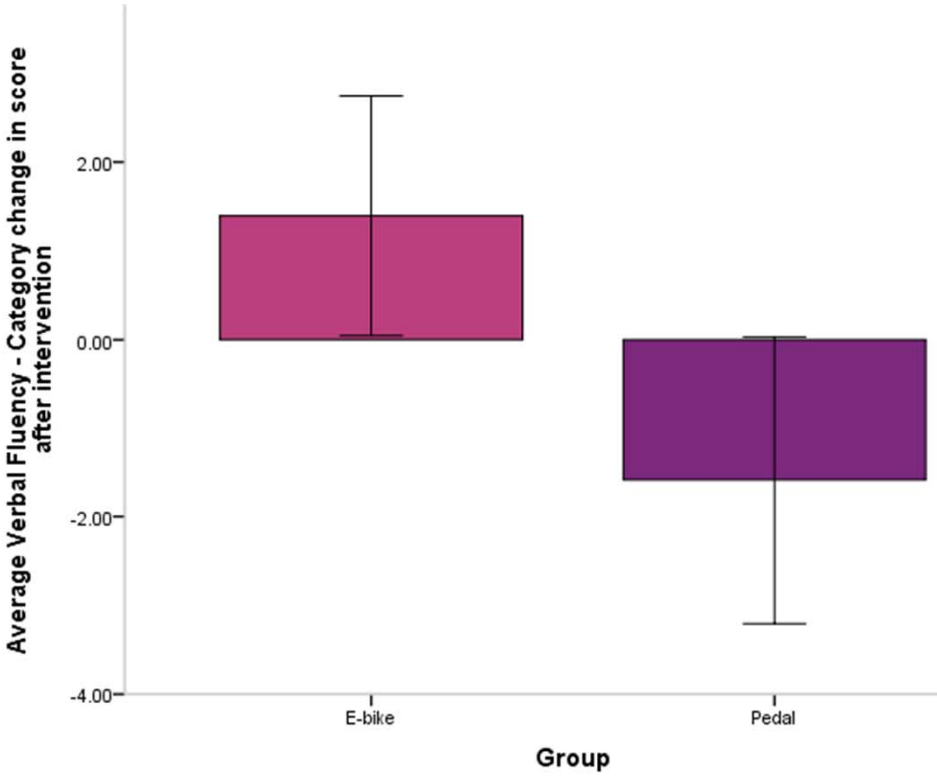


Cognitive function – Eriksen flanker task

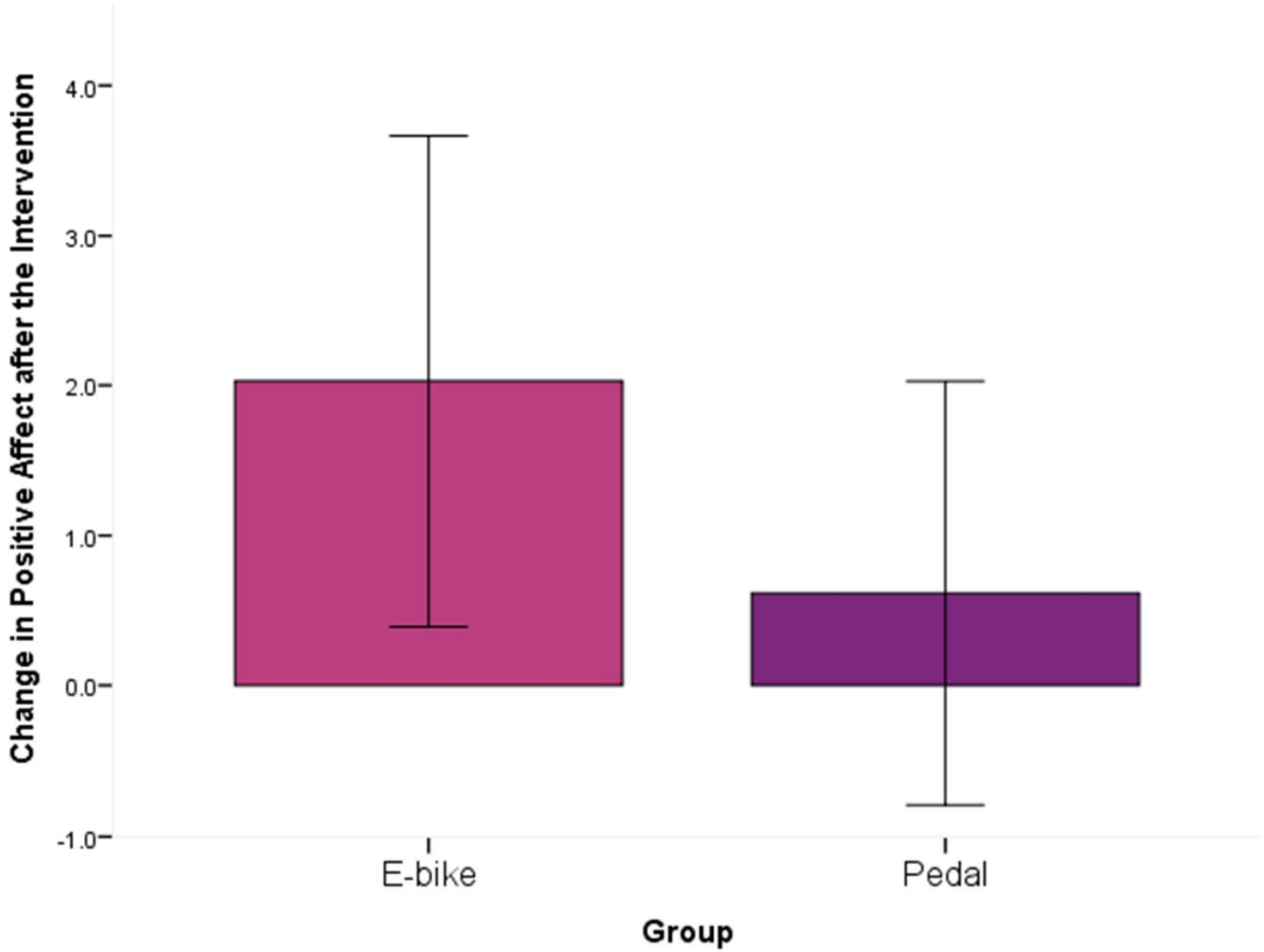


Verbal fluency – Letter and category





Wellbeing – Positive affect

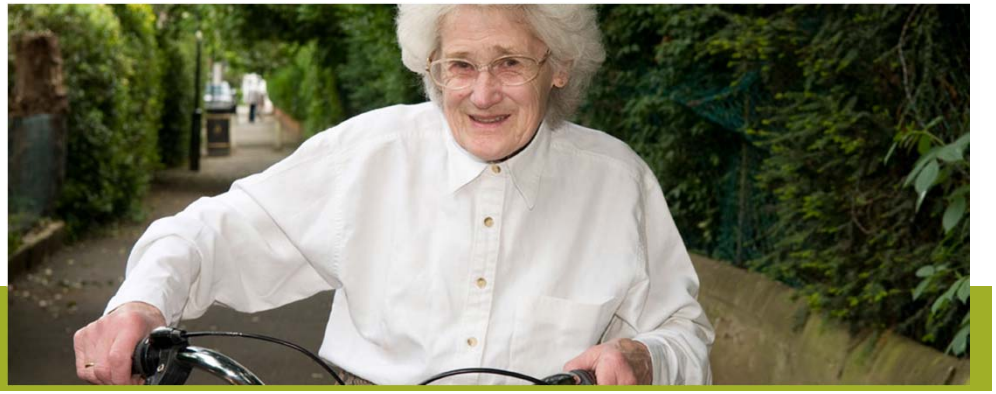


Physical activity and cognitive change

- The level of physical activity before starting the trial did not correlate with any of the measures of change in cognition/well-being
- This suggests that those with a higher level of physical fitness before starting the trial did not benefit ore or less than those who were less physically active
- Prior fitness unlikely to predict whether someone will benefit from cycling

Conclusions

- Older adults re-engaging with cycling cycled for long periods each week during the trial
- Those less physically active before the trial did not cycle less than more physically active participants
- Cycling using an e-bike appears to have as much impact on cognitive function and well-being as regular cycling
  - Despite a lower level of physical exertion being required
- E-bikes have the potential to aid older adults re-engaging with cycling and cycling seems to be a clear way to get exercise into older adults lifestyles
  - even for those less physically active before the intervention
- Urban planning should support older adult cycling



Thanks!

CycleBOOM team

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Bristol

Kiron Chatterjee - Interviews

Heather Jones – Interviews

Cardiff

Justin Spinney – Mobile rides

Carl Mann – Mobile rides

http://www.cycleboom.org/