CALL FOR MORE INTERVENTIONS! SCOPING REVIEW OF CYCLING LITERATURE ON SOCIAL, EMOTIONAL, AND COGNITIVE HEALTH



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OUTRIDE

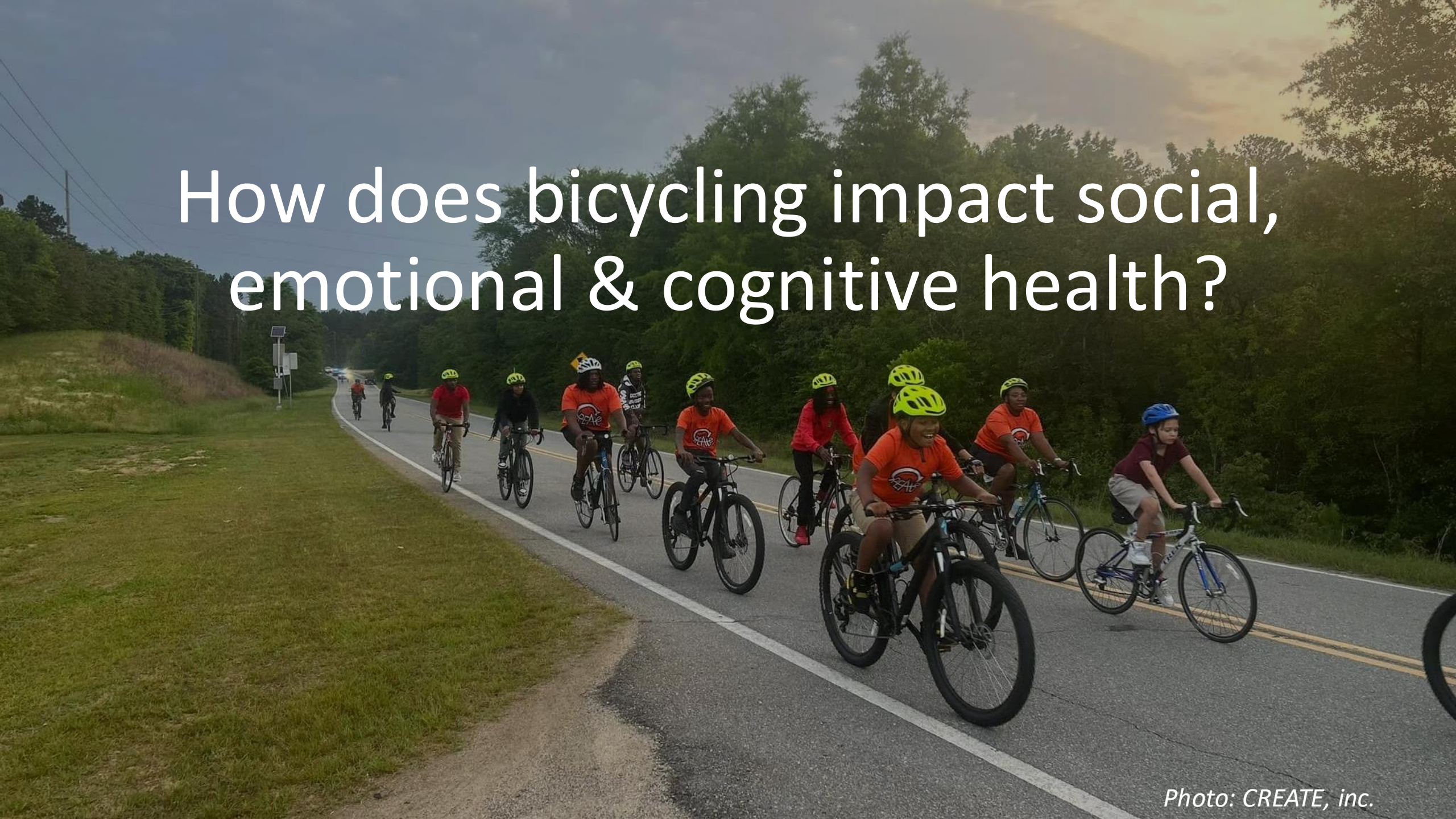
Photo: Brian Rimm

INTRODUCTION

- Population-level studies show bicycling can have powerful effects on holistic well-being
  - Bicycle commuting associated with lower risk of prescription for mental[1]
  - Bicyclists have higher self-rated wellness[2]
  - Bicyclists have lower sickness absence and higher mental health scores[3]
- Do these associative outcomes replicate for interventions?

[1]*Friel et al. (2024);* [2]*Smiley et al. (2020);* [3]Mytton, Panter & Ogilvie (2016)

How does bicycling impact social, emotional & cognitive health?



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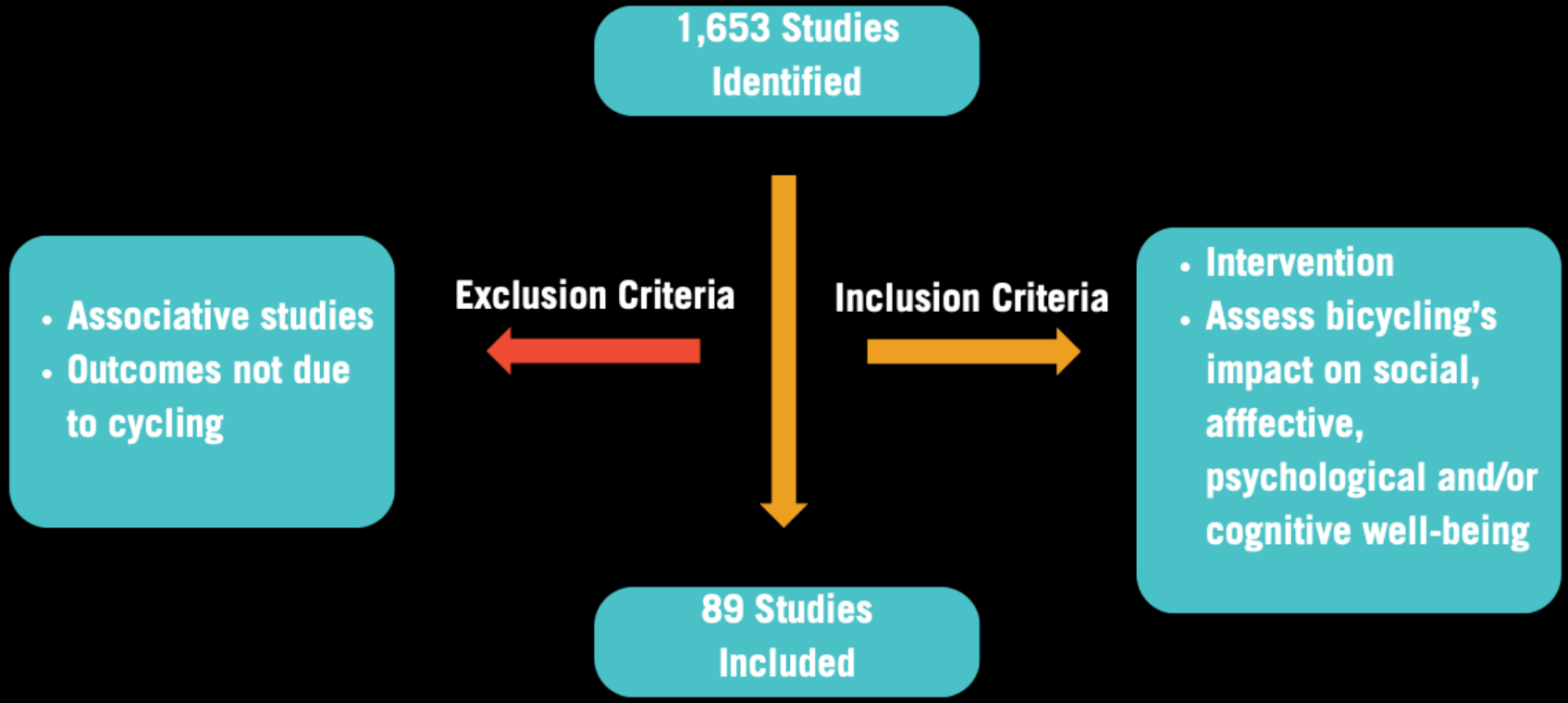
SCOPING REVIEW



METHODS

- Integrated Joanna Briggs Institute (JBI) and PRISMA-ScR
- Database Searches: EBSCOhost, ProQuest, PsycINFO
- Search Terms:

Mountain Biking" OR "Road Biking" OR "Road Cycling" OR "Bicycling"
BY TITLE AND ABSTRACT

AND "Mental Health" OR "Mental Wellbeing" OR "Health" OR
"Wellbeing" OR "Physical Health" OR "Physical Wellbeing" OR
"Psychological Wellbeing" OR "Psychological Health" OR "Cognitive" OR
"Neurological" OR "Physical" OR "Social

- All studies imported into Rayyan and screened by 2 independent reviewers
  - 3rd reviewer resolved disagreements

DOMAINS OF WELL-BEING

Well-Being Domain	Example Measures
Psychological Well-Being	General Self Efficacy Scale Rosenberg Self Esteem Scale SF-36
Social Well-Being	UCLA Loneliness Scale Social Interaction Anxiety Scale (SIAS) Sense of Belonging
Affective Well-Being	Beck Depression Inventory (BDI) Positive and Negative Affect Schedule (PANAS)
Cognitive Well-Being	Wisconsin Card Sorting Task (WCST) Stroop Task EEG measures Trail Making Task (TMT)

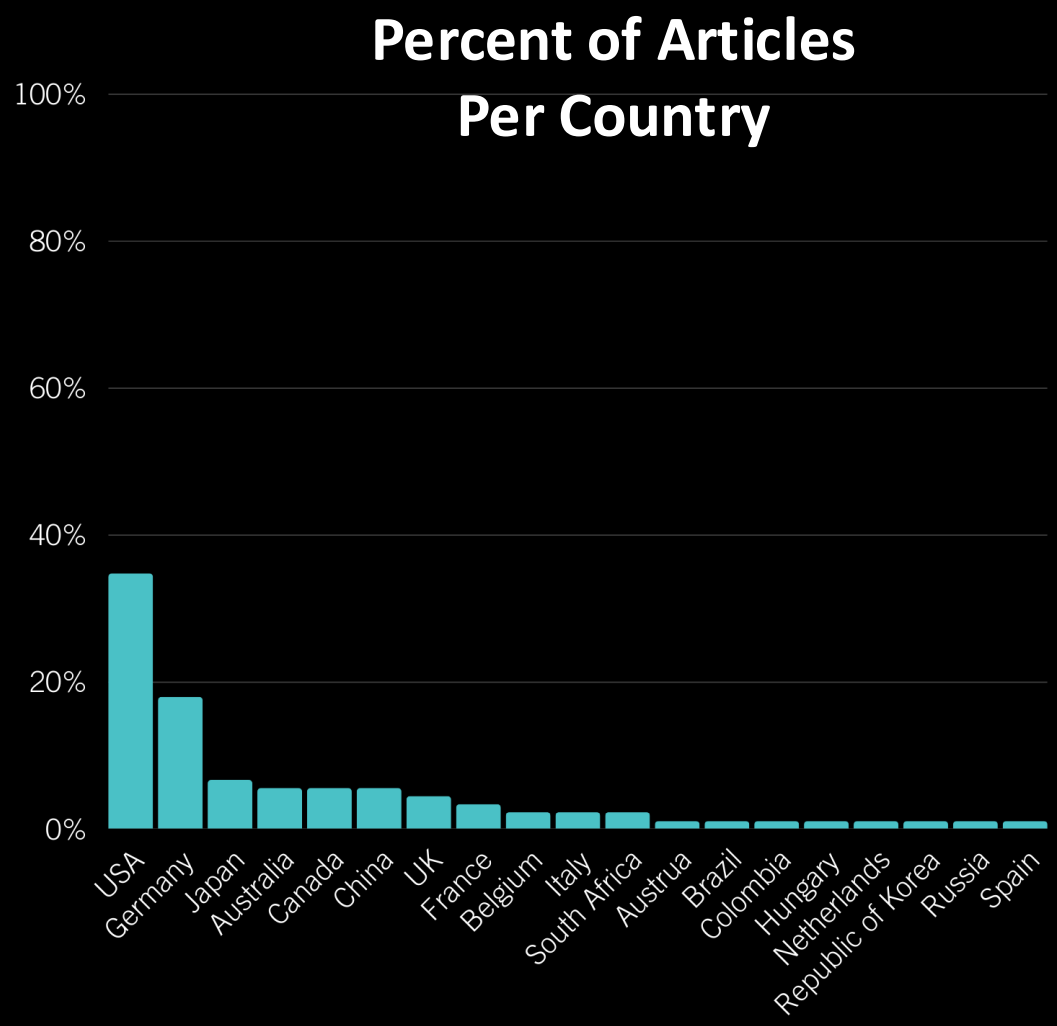
STUDY CHARACTERISTICS

67.4%
Studied Adults

60.7%
Acute in Design

80.9%
Cognitive Focus

79.8%
Indoor + Stationary Bike



PSYCHOLOGICAL WELL-BEING

Definition: Broader state of mental and emotional health

- 15 studies included measures of general well-being

Findings

- Improved mental health scores and general self-efficacy among long term interventions
- No differences in acute studies

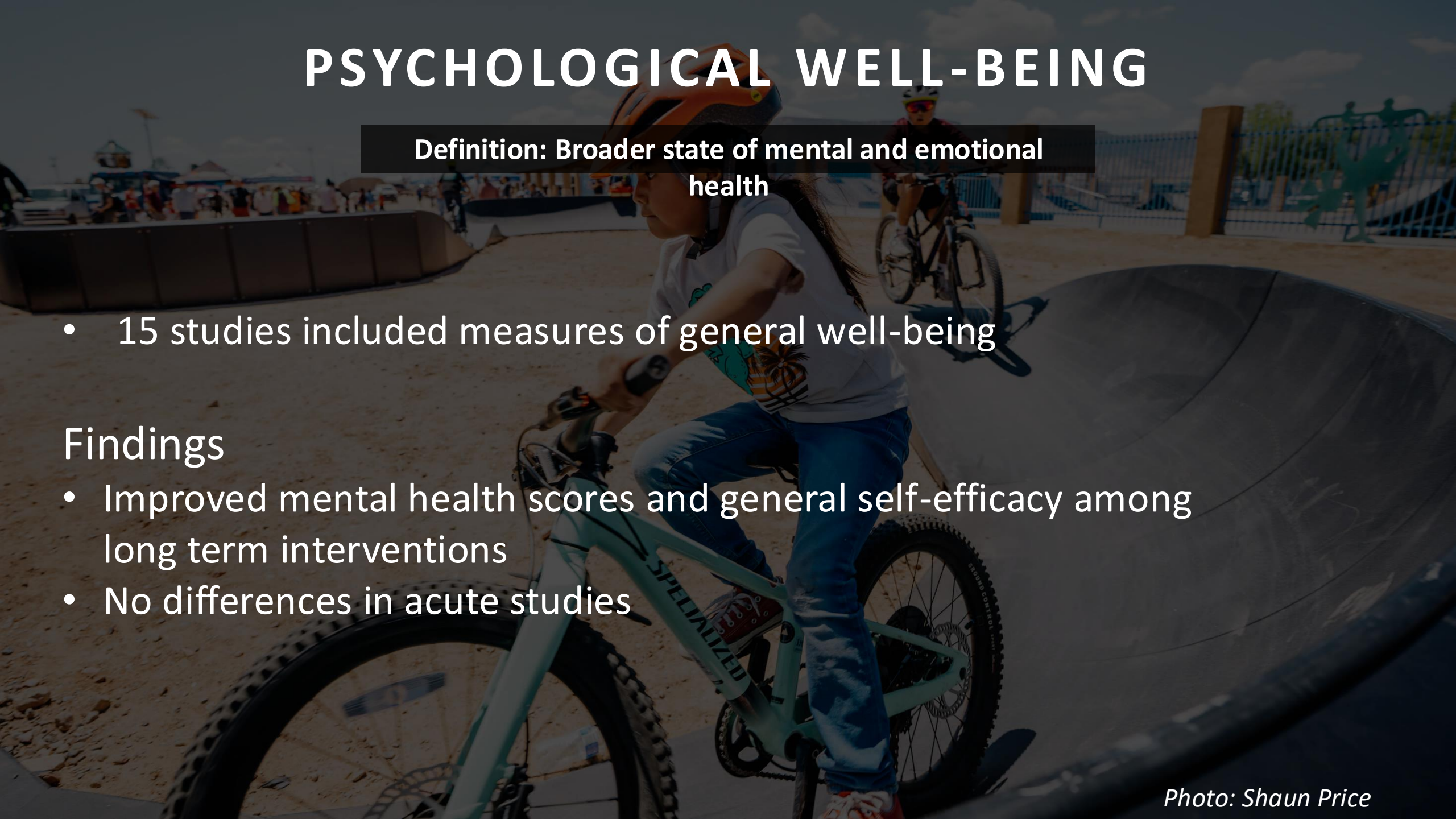


Photo: Shaun Price

EXAMPLE STUDY: PSYCHOLOGICAL WELL-BEING

Effects of active commuting on health-related quality of life and sickness-related absence (Neumeier et al. (2020)

- 12-month intervention
  - Intervention: Active commuting by e-bike
  - Control: Commute as usual

- Significant positive changes in the intervention group on four subcomponents of the SF-36
  - Physical functioning
  - Mental health
  - Vitality
  - General health

Source: Neumeier et al. (2020)

SOCIAL WELL-BEING

Definition: Perception of relationship quality and integration within social systems

- 11 studies included measures of social well-being

Findings

- **Qualitative Themes: Social connection, expanding social circles, fitting in**
- **Increased social functioning, significant increase in social network size & prosocial behaviors**



Photo: Brian Rimm

EXAMPLE STUDY: SOCIAL WELL-BEING

Joy, Exercise, Enjoyment, Getting out: A Qualitative Study of Older People's Experience of Cycling in Sydney, Australia (Zander et al. (2013)

- 12-week bicycling promotion program
- Qualitative Interviews suggest social benefits:

"They had a new experience to talk about with friends and inspired others to take up cycling themselves. In addition, cycling "plugged participants into" a new community, allowing them to interact with people outside their usual social group."

AFFECTIVE WELL-BEING

Definition: Balance of positive and negative emotions and mood, ability to regulate

- 26 studies included measures of affective well-being

Findings

- **Acute improvements in mood & emotions**
- **Improvements in depression and positive emotions in long term studies**
- Mixed results for changes in anxiety, but different measures used

Photo: Brian Rimm

EXAMPLE STUDY: AFFECTIVE WELL-BEING

Outdoor cycling improves clinical symptoms, cognition and objectively measured physical activity in patients with schizophrenia: A randomized controlled trial (Ryu et al. 2019)

- 16-week Intervention
  - Intervention: Outdoor Cycling
  - Control: Occupational Therapy (OT)

- In comparison to the Control Group, the Intervention Group Improved:
  - Psychotic symptoms
  - Depression symptoms
  - State and trait anxiety

COGNITIVE WELL-BEING

Definition: Ability to think, learn, and remember

- 72 studies included measures of cognitive well-being

Findings

- Acute improvements in processing speed
- Changes in cortical arousal

EXAMPLE STUDIES: COGNITIVE WELL-BEING

The effect of cycling on cognitive function and well-being in older adults (Leyland et al. 2019)

- 8-week Intervention
  - Pedal Cyclists
  - E-Bike
  - Non-Cycling Control
- Both cycling groups improved accuracy
- E-bike participants also improved in processing speed and mental health scores

Four weeks of high cadence training alter brain cortical activity in cyclists (Ludyga et al. 2017)

- 4-week Intervention
  - Low cadence cycling
  - High cadence cycling
- EEG: Greater increase of frontal alpha/beta ratio was confirmed in high cadence group

KEY TAKEAWAYS

- Robust associative studies pointing to the benefits of bicycling for well-being
- In general, interventions show a mix of positive and neutral trends toward the impacts of bicycling on various domains of well-being
- Important to put research into action and to evaluate programs to understand whether outcomes persist beyond the lab

LIMITATIONS + MOVING FORWARD

- Expand studies that are:
  - Outdoor
  - Long term interventions
  - Tail ends of lifespan
- Focus on social, affective, psychological domains of well-being
- Consistency among measures and search terms



Photo: Anansi Charter School

THANK YOU

Reach out!
Email:
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ADDITIONAL CITATIONS

Brookman et al (2020)
Dishmna et al (2010)
Enders et al (2016)
Geard et al (2007)
Leyland et al (2019)
Li et al (2023)
Ludyga et al (2017)
Proost et al (2024)
Ryu et al (2020)
Samendinger et al (2019)
Storzer et al (2016)
Tollar et al (2019)