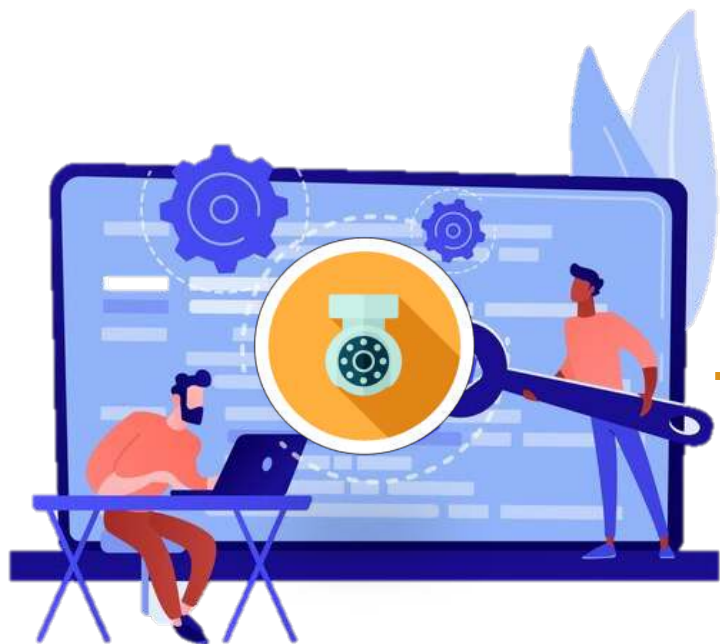# Using behavioural insights to increase older adults' acceptance of camera-based active and assisted living technologies

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Supervisors

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- Camera-based AAL is theoretically interesting but practically complex

Camera-based AAL technologies
in-development

Non-acceptance

Camera-based AAL technologies
in-use

Camera-based AAL technologies face consistent and strong **rejection**

"I think the whole thing is terrible."[1]

"I don't think I want to watch this. I don't see how [...] having this would benefit me."[3]

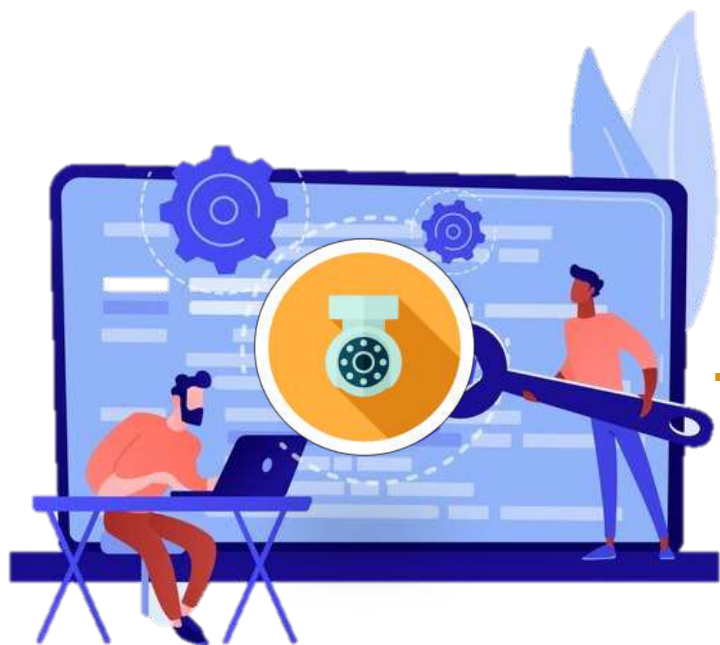"I really don't like it. You never know, if there is somebody watching you or not"[2]

"It doesn't fit well with me. I like my privacy."[4]

"I don't want those things in my house."[5]

1. Berridge, C., & Wetle, T. F. (2020). Why Older Adults and Their Children Disagree About In-Home Surveillance Technology, Sensors, and Tracking. *The Gerontologist*, *60*(5), 926–934. 8
2. Ziefle, M., Himmel, S., & Wilkowska, W. (2011). When your living space knows what you do: Acceptance of medical home monitoring by different technologies. In A. Holzinger & K. M. Simonic (Eds.), *Information Quality in e-Health. USAB 2011. Lecture Notes in Computer Science, vol 7058* (pp. 607–624). Springer.
3. Demiris, G., Oliver, D. P., Giger, J., Skubic, M., & Rantz, M. (2009). Older adults' privacy considerations for vision based recognition methods of eldercare applications. *Technology and Health Care: Official Journal of the European Society for Engineering and Medicine*, *17*(1), 41–48.
4. Bian, C., Ye, B., Hoonakker, A., & Mihailidis, A. (2021). Attitudes and perspectives of older adults on technologies for assessing frailty in home settings: a focus group study. *BMC Geriatrics*, *21*(1), 1–13.
5. Alkhatib, S., Kelly, R., Waycott, J., Buchanan, G., Grobler, M., & Wang, S. (2021). "Who Wants to Know all this Stuff?!": Understanding Older Adults' Privacy Concerns in Aged Care Monitoring Devices. *Interacting with Computers*, *33*(5), 481–498.

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- Camera-based AAL is theoretically interesting but practically complex

Camera-based AAL technologies
**in-development**

Non-acceptance

My research

Camera-based AAL technologies
in-use

To use **behaviour change theory** to understand how best to facilitate older adults' **acceptance** of camera-based AAL technologies, and to locate, understand, and empirically validate **mechanisms of action** through which **interventions** can enhance said acceptance

Why behaviour change, and how?
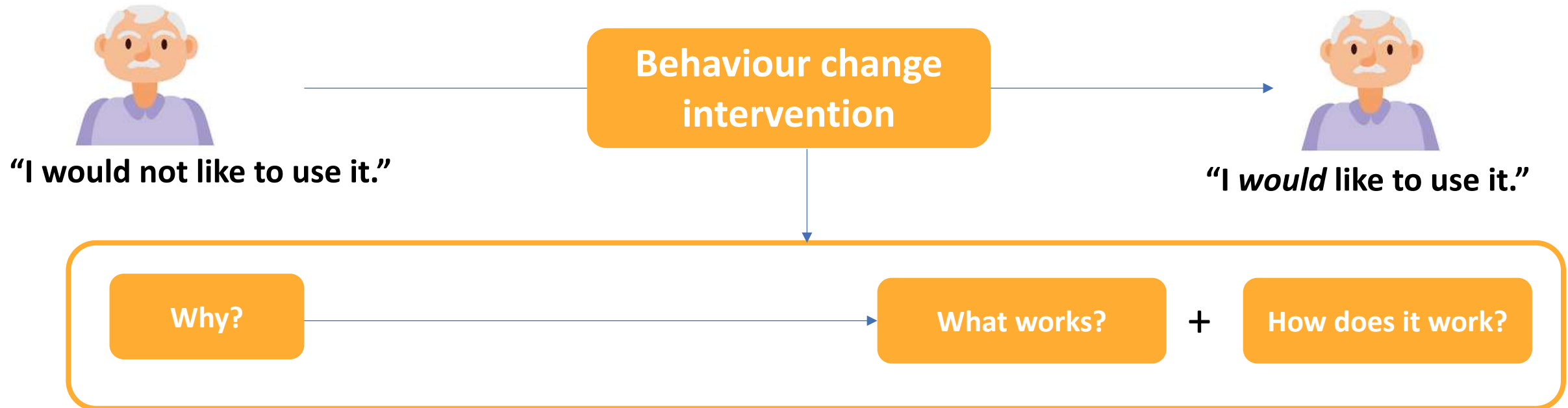
- **Mechanisms of action**: causal processes through which an intervention affects behaviour (i.e., acceptance)

- Targeting mechanisms of action produces desired behaviour change
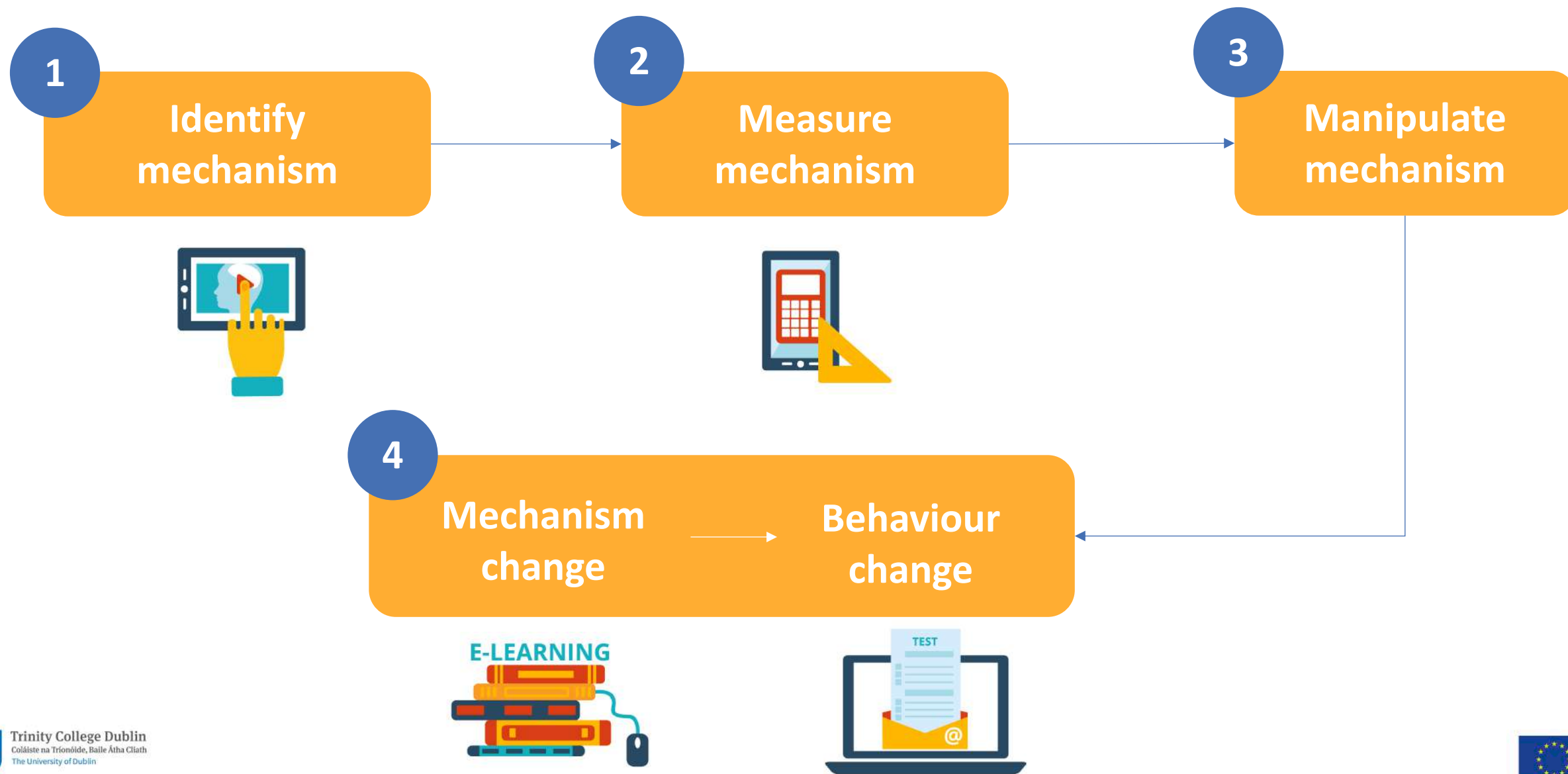
1 Identify mechanism

2 Measure mechanism

3 Manipulate mechanism

4 Mechanism change → Behaviour change

E-LEARNING

TEST

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RQ1 | What are the **barriers and facilitators** to older adults' acceptance of camera-based AAL technologies?

1

Identify mechanism → **A scoping review** of the **barriers and facilitators** to older adults' **acceptance** of camera-based AAL technologies

Databases accessed

- MEDLINE
- CINAHL
- Embase
- Google Scholar
- ACM
- Web of Science

- Reference lists and citations

Search strategy

- AAL
- Older adults
- Private residence   ("the home")
- Acceptance

- Inception to March 2023

Population, Concept, Context (PCC) Eligibility Criteria

- **P:** Older adults (aged ≥ 60)
- **C:** Data on barriers and facilitators to acceptance
- **C:** Private residence

47 eligible studies → **28 barriers, 19 facilitators**

RQ1   What are the **barriers and facilitators** to older adults' acceptance of camera-based AAL technologies?

"I don't need this now, but perhaps at a later point."[6]

"I can't really see at this point and possibly […] in the future."[4]

"You know from a practical point of view, I don't see a use currently."[4]

"I wouldn't mind having one like this in the future."[7]

Perceived lack of current need

Self-other distinction in perceived need

"I don't need this […] I have friends who'd benefit from this a great deal."[6]

"I don't think I need this […] but I can think of others who definitely need this."[6]

"Thinking of other people, I think it is marvellous."[4]

6.   Demiris, G., Hensel, B. K., Skubic, M., & Rantz, M. (2008). Senior residents' perceived need of and preferences for "smart home" sensor technologies. *International Journal of Technology Assessment in Health Care*, *24*(1), 120–124. https://doi.org/10.1017/S0266462307080154

7.   Jaschinski, C., & Allouch, S. B. (2015). An Extended view on Benefits and Barriers of Ambient Assisted Living Solutions. *International Journal on Advances in Life Sciences*, *7*(1&2), 40–53. https://doi.org/http://www.iariajournals.org/life_sciences/tocv7n12.html
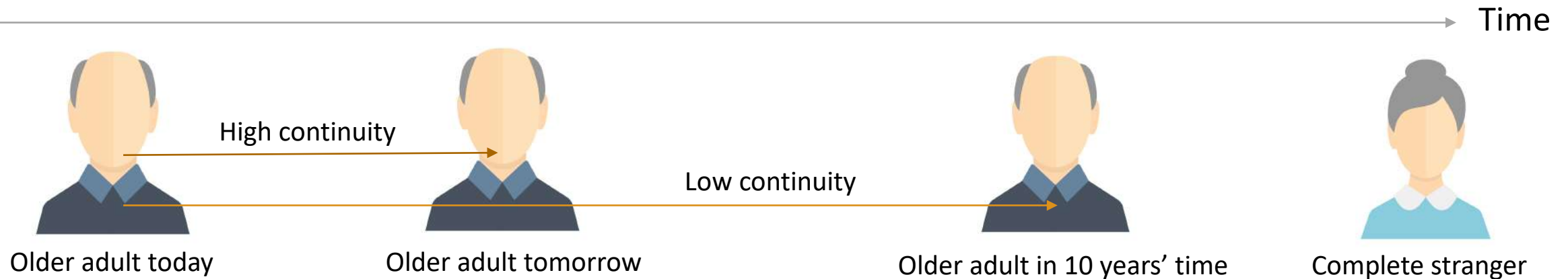
RQ1 What are the **barriers and facilitators** to older adults' acceptance of camera-based AAL technologies?
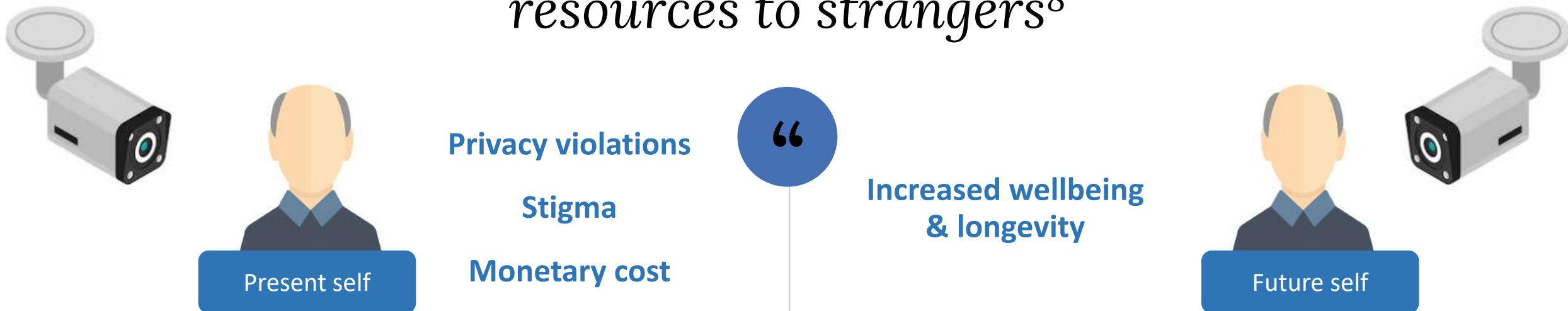
Future self-continuity

- Degree of felt **psychological connectedness** between the **present and future self**[8]

- Varies as a function of time[8]

- More continuous selves are more **similarly**, **vividly**, and **positively appraised**[9]

- Has **behavioural implications**: predicts future-oriented behaviours including saving for retirement[8], exercise[10], smoking[11], career planning[12], etc.

Time

High continuity

Low continuity

Older adult today   Older adult tomorrow   Older adult in 10 years' time   Complete stranger

8.   Hershfield, H. E. (2011). Future self-continuity: how conceptions of the future self transform intertemporal choice. *Annals of the New York Academy of Sciences*, *1235*(1), 30–43.
9.   Bixter, M. T., McMichael, S. L., Bunker, C. J., Adelman, R. M., Okun, M. A., Grimm, K. J., Graudejus, O., & Kwan, V. S. Y. (2020). A test of a triadic conceptualization of future self-identification. *PLOS ONE*, *15*(11), e0242504. Ersner-Hershfield, H., Garton, M. T., Ballard, K., Samanez-Larkin, G. R., & Knutson, B. (2009). Don't stop thinking about tomorrow: Individual differences in future self-continuity account for saving. *Judgment and Decision Making*, *4*(4), 280–286.
10. Rutchick, A. M., Slepian, M. L., Reyes, M. O., Pleskus, L. N., & Hershfield, H. E. (2018). Future self-continuity is associated with improved health and increases exercise behavior. *Journal of Experimental Psychology: Applied*, *24*(1), 72–80.
11. Zhao, X., Dichtl, F. F., & Foran, H. M. (2020). Predicting smoking behavior: intention and future self-continuity among Austrians. *Psychology, Health & Medicine*, *27*(5), 1042–1051
12. Chishima, Y., & Wilson, A. E. (2021). Conversation with a future self: A letter-exchange exercise enhances student self-continuity, career planning, and academic thinking. *Self and Identity*, *20*(5), 646–671.

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Study 1: Identifying mechanisms underpinning acceptance

If individuals consider their future selves as different people, they may have no more reason to reward the future self than to give resources to strangers[8]

Privacy violations

Stigma

Monetary cost

Increased wellbeing & longevity

"

Present self

Future self

8.   Hershfield, H. E. (2011). Future self-continuity: how conceptions of the future self transform intertemporal choice. *Annals of the New York Academy of Sciences*, *1235*(1), 30–43.

2

Measure mechanism

A **cross-sectional study** of the association between future self-continuity and acceptance

RQ2 What is the association between **future self-continuity** and older adults' **acceptance** of camera-based AAL technologies?

Future self

Lower acceptance

Greater acceptance
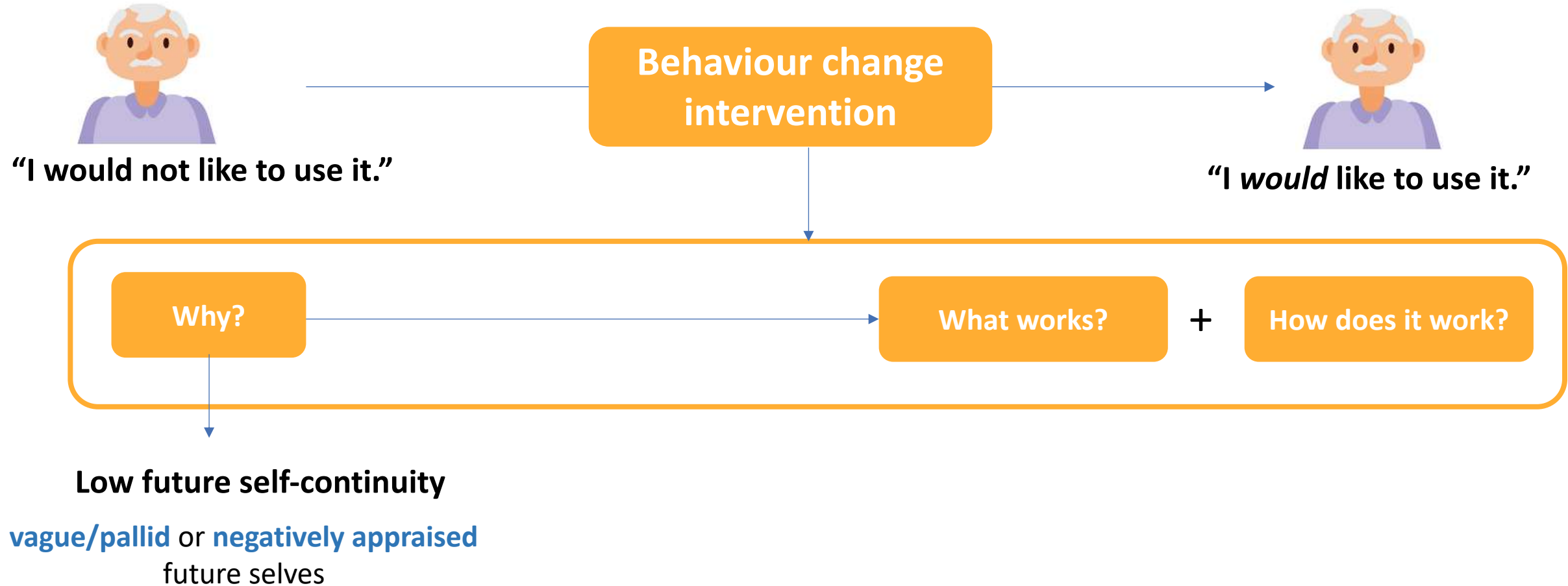
Lower acceptance

Greater acceptance

OR = 3.21, 95% CI [1.94, 5.31]

OR = 3.09, 95% CI [1.76, 5.43]

- Older adults with more **vividly** and **positively** appraised future selves reported greater acceptance

- **Future-self interventions** may benefit acceptance

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Why behaviour change, and how?

"I would not like to use it."

Behaviour change intervention

"I *would* like to use it."

Why? → **What works?** + **How does it work?**

Low future self-continuity

vague/pallid or **negatively appraised** future selves

3

Manipulate mechanism

A **"future-self intervention"** designed to increase older adults' continuity to their future selves

Future-Self Intervention

Questions about the future + future self

Personalised story about the future + future self

What would you like to do more of in the future when you are older?

Where would you like to live in the future?

Why there?

Who is one person you would like to spend time with in the future? [name and relationship]

Next

Please read the following text out loud:

When I get older, I would like to spend more time [playing the piano]. When I get older, I would like to live [in the mountains] because [I like to ski]. I also would like to spend more time with my [friend], [Nicholas].

In order to enjoy the lifestyle I want in the future, I will need to take the necessary steps today. For me, it [is] important to achieve this lifestyle.

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Study 3: Manipulating future self-continuity

Optimising the future-self intervention

- Semi-structured interviews with n = 7 older adults (M_{age} = 71.7 years, 57.1% male)

- Experience, likes/dislikes, **acceptability, relevance, usability**, recommendations for improvement

- Iterative modifications to yield usable, acceptable, engaging, and feasible intervention

"It was it was good, because **it was simple**. It was in your, in your face. Do you know? So, people who wouldn't be as [good] as me with tablet usage- they'd still able to do it fine."

– P1

"**Very easy to understand**. Some of them not so easy to answer. You just have to, as I say, **the challenge; Think**. that's why I don't like box ticking exercises."

– P2

"I was **allowed to tell my own story**, and I like that.

- P2

"It was concise, and **it hit on [...] the things that would be in your head at times about growing older.** It was put together well."

– P4

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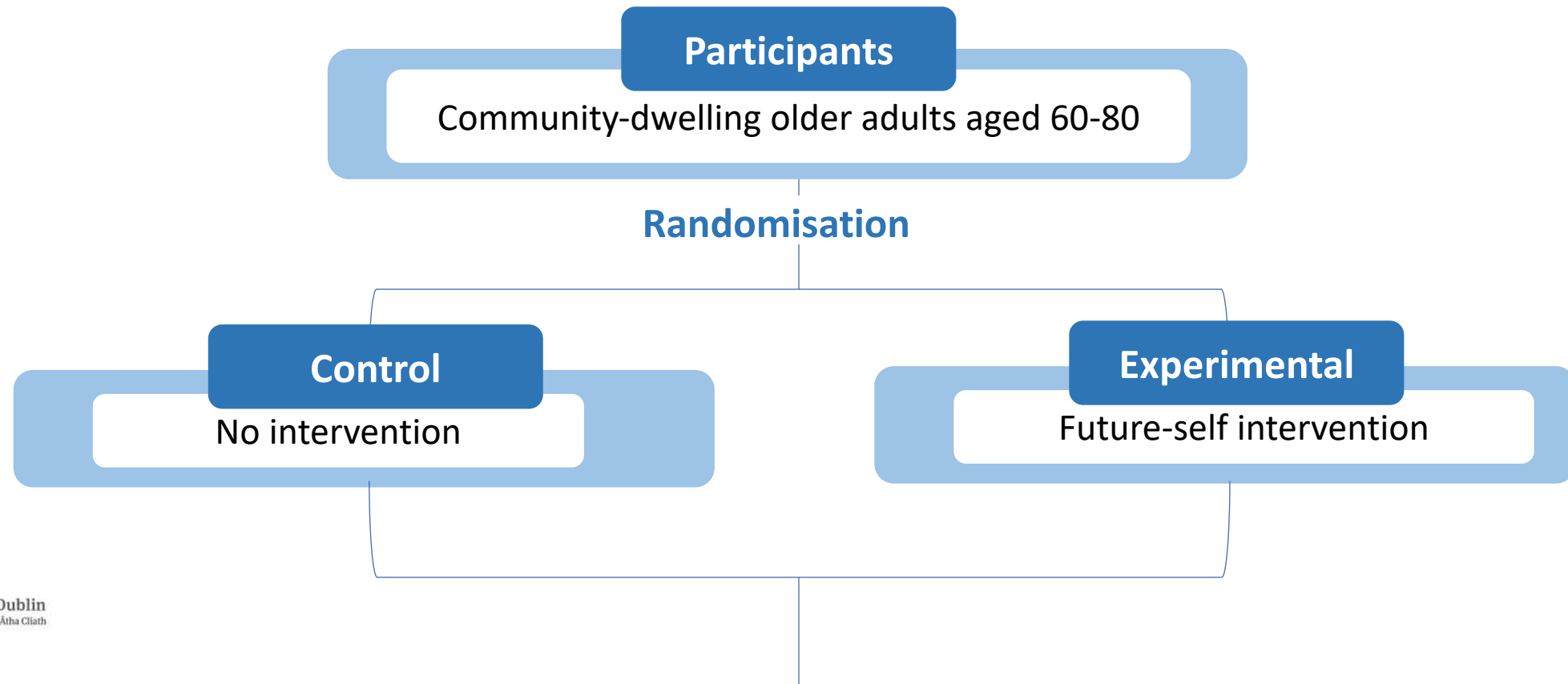
4

Mechanism change → Behaviour change

A **randomised controlled** investigation of the effect of a **"future-self intervention"** on acceptance

RQ3 Does a "future-self intervention" increase older adults' acceptance of camera-based AAL technologies, and if so, how?

Participants

Community-dwelling older adults aged 60-80

Randomisation

Control

No intervention

Experimental

Future-self intervention

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Study 4: Effects of manipulating future self-continuity on acceptance

Brief Results: Effects on Acceptance

- *n* = 181 participants (M$_{age}$ = 65.4; 54.7% female; 92.3% White/Caucasian)

- **Age moderated intervention effect on acceptance** (β = -1.75, *p* = .002):

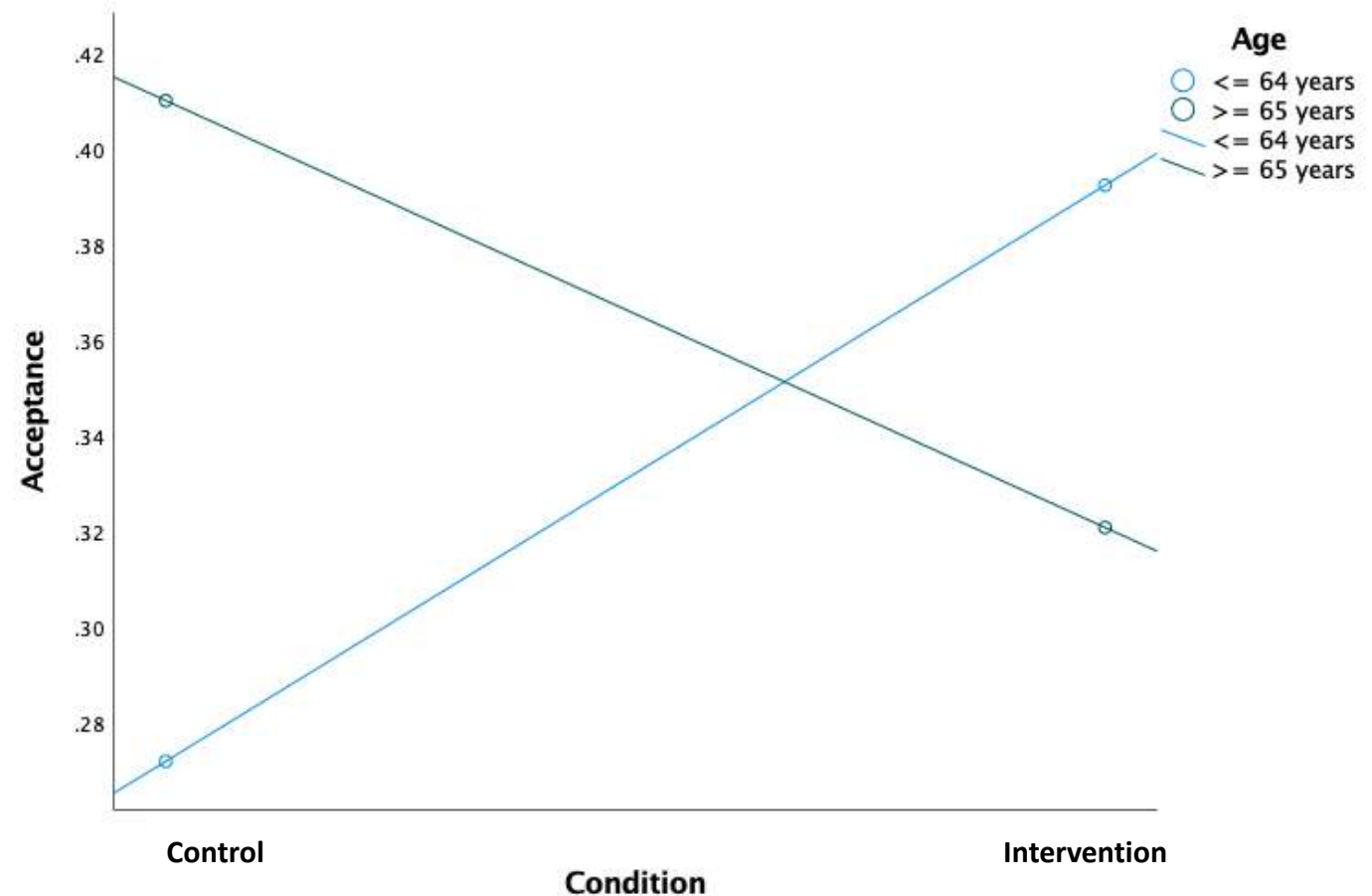 - Acceptance significantly higher in intervention versus control group **only in younger old (≦ 64 years)**

Age
- ○ <= 64 years
- ○ >= 65 years
- — <= 64 years
- — >= 65 years

Figure 1. Line graph of Condition*Age interaction effect on log-transformed acceptance.

Brief Results: Mechanisms

FSCQ-Positivity

$B = .488, p = .012*$

$B = .096, p = .033*$

Condition

Acceptance

$B = .113, p = .111$
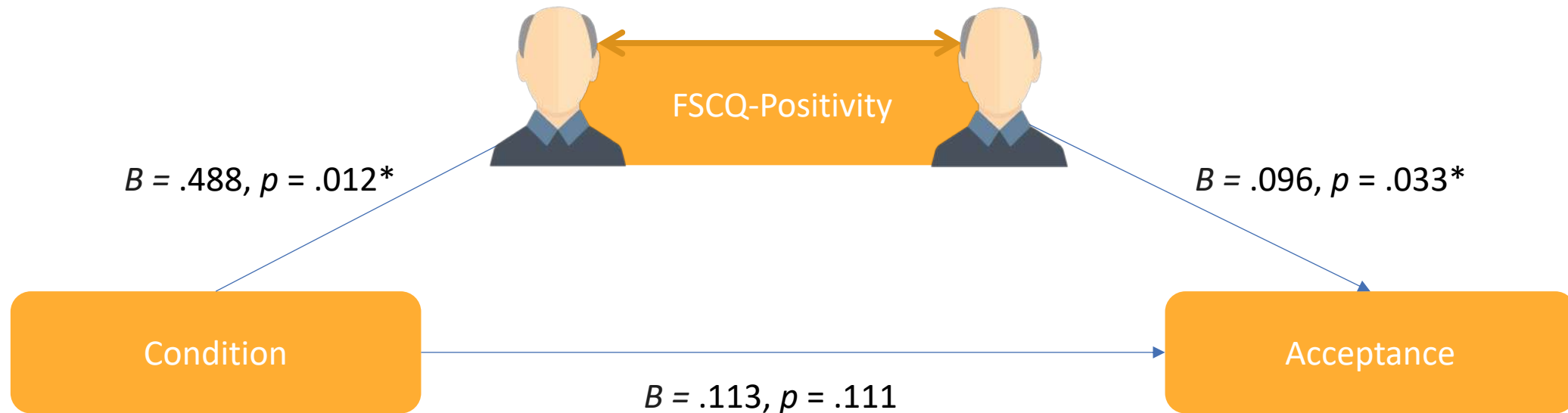
Figure 4. Path coefficients for unadjusted model predicting acceptance from group allocation through FSCQ-positivity, for participants aged $\leqq$ 64 years. Coefficients represent unstandardised regression weights (standard errors). FSCQ = Future Self-Continuity Questionnaire. *p < .05, **p < .01, ***p < .001.

- Results identified future self-positivity as mechanism underpinning intervention effectiveness

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Why behaviour change, and how?

"I would not like to use it."

Behaviour change intervention

"I *would* like to use it."

Why? → **What works?** + **How does it work?**

Low future self-continuity
vague/pallid or **negatively appraised** future selves

Future-self intervention
question-and-answer exercise to prompt deliberate thinking about the future (self)

Increasing felt positivity towards the future self
Increased valuation of benefits due to future self

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An experimental medicine approach to behaviour change

1 **Identify mechanism**

2 **Measure mechanism**

3 **Manipulate mechanism**

Scoping review identified **barriers and facilitators** to acceptance – facilitated theorising on **future self-continuity**

Cross-sectional study demonstrated **positive association between future self-continuity and acceptance**

Qualitative study yielded usable, acceptable, engaging, and feasible **future-self intervention**

4 **Mechanism change** → **Behaviour change**

Randomised controlled study found that intervention was **effective at increasing acceptance in those aged ≦ 64 years via future self-positivity**

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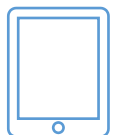Coláiste na Tríonóide, Baile Átha Cliath
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Identified novel mechanism underpinning acceptance of camera-based AAL technologies

- expands our understanding of acceptance beyond the Technology Acceptance Model[13]

Developed novel acceptance-facilitating intervention

- Practical and feasibly implemented e.g., in marketing materials, consultations with practitioners

Important to investigate interventions that work for older adults on the whole

- Targeting vivid future self-views may be pertinent

Informs development of other acceptance-facilitating interventions

- Other means of facilitating vivid/positive future selves may be beneficial

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13. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

Thank you!

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@natalietaq

1. What is your first name?
2. What is one value that is important to you? (for example, being honest, reliable, organized, etc.)
    - I value being _____
3. When you are older, will being [answer to Q2a] still be important to you?
    - Yes
    - No
4. What do you like doing in the daytime?
    - I like _____
5. What do you like doing over the weekends?
    - I like _____
6. Is it important to you that you can continue doing these things in the future, when you are older?
    - Yes
    - No
7. How would you feel if you were not able to keep doing the things that you enjoy when you are older?
    - I would feel _____
8. What is the first name of one person you like spending time with?
9. What is this person's relationship to you?
    - This person is my _____

10. Would you like to continue spending time with this person in the future, when you are older?
  - Yes
  - No

11. About how many hours do you work per week, if any?
  - _____ hours

12. When you are older, how many hours per week would you like to work, if any?
  - _____ hours

13. What would you like to do more of in the future when you are older?
  - I would like to spend more time _____

14. Currently, you would say your health is...
  - Very poor
  - Poor
  - Fair
  - Good
  - Excellent

15. In the future, you would want your health to be...
  - Very poor
  - Poor
  - Fair
  - Good
  - Excellent

16. Do you have any chronic conditions now?
- Yes
- No

17. How would you feel if your health declined in the future?
- I would feel _____

18. In the future, do you wish to be able to help yourself and manage life well on your own?
- Yes
- No

19. How would you feel if you had to depend on others for help in the future?
- I would feel _____

20. Do you think that there is a risk that you could experience a fall in the future, when you are older?
- 20. Yes
- 21. No

21. In the future, where would you want to live?
- In my own home
- With my adult child/children
- In an assisted living facility or continuing care residence
- In a nursing home

22. Why there?
- I want to live there because _____
23. How would you feel if you lived in a nursing home in the future?
- I would feel _____
24. How would you feel if you remained living at home in the future?
- I would feel _____
25. Is it important to you that you can continue living at home in the future?
- Yes
- No
26. Do you think there is a risk that you might not be able to live the life that you want in the future?

    Yes

    No
27. (If "Yes" to Q26) Do you think you can lower this risk by taking the necessary steps today?
- Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree
28. Currently, do you feel confident that you are on the path to having the future that you want?
- Yes
- No

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