

# Application of behaviour change theory to the design, development and implementation of camera systems for active and assisted living

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#### **Background and Context**

#### "I think the whole thing is terrible."<sup>1</sup>

"I really don't like it. You never know, if there is somebody watching you or not"<sup>2</sup>

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Camera-based AAL technologies face consistent and strong **rejection**  "I don't think I want to watch this. I don't see how [...] having this would benefit me."<sup>3</sup>

"It doesn't fit well with me. I like my privacy."<sup>4</sup>

"I don't want those things in my house."<sup>5</sup>







#### **Conceptual Framework**

#### **Research Aim**

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





#### **Research Approach**

#### Why behaviour change?



The Experimental Medicine Approach to Behaviour Change<sup>6</sup>

- · Theory-led, mechanisms-focused approach to changing behaviour
- Mechanisms: targetable influences on behaviour





#### An experimental medicine approach to behaviour change



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An experimental medicine approach to increasing older adults' acceptance of camera-based AAL technologies





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A candidate mechanism underpinning acceptance

#### **Future self-continuity**

- Degree of felt psychological connectedness between the present and future self<sup>11</sup>
- Varies as a function of time<sup>11</sup>



#### **3 dimensions of future self-continuity**<sup>11</sup>

How **similar** do you feel to your future self?

How vividly can you imagine your future self?

How **positively** do you feel towards your future self?







#### **3 dimensions of future self-continuity**<sup>11</sup>

How **similar** do you feel to your future self? How **vividly** can you imagine your future self?

"you're still a young person looking out of an older body [...] **in here you never age.**"<sup>13</sup>

"If you were, say, growing old and demented, then I could imagine this [assistive robot] being a good thing, **but for me**?"<sup>14</sup> "in a way nobody thinks of themselves as an older person."<sup>13</sup>

"No, I can't imagine myself using a wheelchair. If I did, I would surely end up bedridden."<sup>15</sup> How **positively** do you feel towards your future self?

"For me, a robot is associated with an onset of **dependence**."<sup>16</sup>

"The reason I did not want a wheelchair – I would become an **invalid**!"<sup>17</sup>





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<sup>11</sup>









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

Measure mechanism

A descriptive correlational study of the association between FSC and acceptance

 Recruited using Amazon MTurk (n = 183)

Inclusion criteria:

- Aged  $\geq$  60 years
- Living in private residence





Participants

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RQ2

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



#### Logistic regression results

FSCQ-vividness positively predicted acceptance

(OR = 3.19, p < .001)

**FSCQ-positivity** positively predicted acceptance (*OR* = 2.83, *p* < .001)



RQ2

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

**Mediation analysis results** 



*Figure 1.* Mediation models of effects of (a) future self-vividness and (b) future-self positivity on acceptance through perceived usefulness, controlling for chronic disease status and income as covariates. Coefficients for paths b and c' represent log odds. [odds ratios]. Coefficients for path a represent unstandardised regression weights. \*\*\*p<.001,\*\*p<.05





RQ1

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



The Experimental Medicine Approach to Behaviour Change







Strategies to increase people's felt continuity to their future selves





#### Exploring methods to enhance future self-continuity



12:07 AM · Aug 27, 2022

"The days are long, but the years are short."

This brilliant painting shows human aging as you walk by it





Exploring methods to enhance future self-continuity

#### **Digital age-progression**



current self avatar

age-progressed 15 years future self with SUD age-progressed 15 years, recovered future self

- Led to alcohol/drug abstinence in 86% of SUD participants<sup>18</sup>
- Pre-to-post intervention increases in FSC in abstainers but not in those who relapsed



#### Add a photo

Remove hats and glasses, keep a clear background and face the camera straight on

Take or upload photo

Led to more concrete construals of the future older self and reduced ageism in adults ( $M_{age}$  = 26.4)<sup>19</sup>

Strong vividness
manipulation
X Resource intensive
X Low applicability to AAL
decision-making context





#### "Future-self" intervention<sup>20</sup>

#### Questions about the future + future self -> Personalised story about the future and 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.

#### Mechanism

Increases future self-continuity by prompting concrete, vivid future-self-thinking

#### **Behavioural results**

Experimental participants 4x as likely to sign up to retirement savings plan

Strong vividness

manipulation

✓ Less resource-intensive

✓ Scalable





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



Adapting and developing a "future-self intervention"



- Think aloud protocol<sup>21</sup> and semi-structured interviews with older adults aged 60 – 80 (n = approx. 5 or until saturation)
- Results will help to optimise intervention for acceptability, feasibility, usability, relevance, and effectiveness
- Initial test of target manipulation
- Methodological contribution to the literature



RQ3

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



- Between-group differences in acceptance, perceived usefulness, privacy concerns
- Mediational tests of intervention effects on acceptance through future self-continuity





#### **Research Approach**

An experimental medicine approach to increasing older adults' acceptance of camera-based AAL technologies

A scoping review of barriers and facilitators to acceptance

 Identified future selfcontinuity as a candidate mechanism underpinning acceptance

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A correlational study of the association between future self-continuity and acceptance

- Measured mechanism
- Demonstrated correlations between future self-continuity and acceptance



An experimental test of the effect of a future-self intervention on acceptance

- Establish casual effects of a future-self intervention on acceptance
- Examine mediating processes





### **Progress to-date**

Scoping revi	ew									
Document	Targeted publication avenue	Planned publication year	Conference presentations							
Protocol	JBI Evidence Synthesis	2023								
Manuscript (v. 2022)	JMIR	2023	Presented – CBC, University College London (Nov 2022)							
Manuscript (v. 2023)	JMIR	2023								
Correlational study										
Protocol	N/A	N/A	N/A							
Manuscript	Psych & Aging	2023	Accepted – Aging & Cognition, UT Dallas (Dec 2022, \$500 travel award) Presented – theconf2023, TCD (Mar 2023)							
Think-aloud + e	experimental study									
Ethics application	Submitted 20 <sup>th</sup> Feb; amendments ongoing									
Protocol	N/A	N/A	Submitted – ICBM conference							
	Methodological – BMJ Open Experimental – Lancet Digital Health	2024	ТВС							





### **Research timeline**

Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

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Steps in	Action	20	)21	2022			2023			2024					
EMA		Jun-	Sep-	Jan-	Apr-	Jul-	Oct-	Jan-	Apr-	Jul-	Oct-	Jan-	Apr-		
		Aug	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun		
1	Develop scoping														
	review protocol														
	Conduct review														
	Write-up														
2	Develop														
	correlational study														
	protocol														
	Ethics application														
	Data collection +														
	analysis														
	Write-up														
3&4	Develop														
	experimental study													Pa	per submission &
	protocol													n	blication nineline
	Ethics application													pe	
	Intervention														
	development														Scoping review protocol
	Methodological														+ manuscript
	write-up														
	Data collection +														Correlational study
	analysis for														manuscript
	experimental study														
	Write-up														
Misc.	Remainder														
	publications														
	Thesis														Explore scope for
															testing intervention
															"in the wild"
							Г	DkIT: Intervention AIAS: Interventio				n			
							_	development testing							
									opine			ເຮວເ	ing		***

#### Future research avenues

 Dependent variable in studies is self-reported acceptance, i.e., not actual acceptance behaviour



• Potential scope for testing future-self intervention "in the wild" for greater ecological validity









## Thank you!

#### **Natalie Tham**







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