

Scotland's Healthy Ageing Innovation Cluster

Wednesday 08 March 2023



ON AIR

Attendees please note

1. We are **recording this event** and it will be hosted on our HAIC webpage resources so it can be watched on demand
2. If you **do not** wish to appear on the recording, you should move to the designated seats/ table so you are not on camera

Today's event

Joanne Boyle, Digital Health & Care Innovation Centre

Agenda

- 1000** Welcome and introductions – Joanne Boyle, Head of Engagement, DHI
- 1010** Partner update – **SHIP Dementia Medicines Challenge** – Suzanne Graham
- 10.20** **National Frailty Challenge** - Louise Mushet & Katherine Snow
- 1030** **Alzheimer Scotland Codesign, Dementia Circle, ADAM, Purple Alert, Virtual Reality** - Fiona Corner
- 1200** **Research I-Support for Carers** - Dr Kieren Egan
- 1230** **Lunch /refreshment break**
- 1330** **Interface** - Lorraine Thomson
- 1345** **Scottish National Investment Bank** - Graham Watson
- 1400** **Neuromotor Pen Manus Neurodynamica** - Dr Rutger Zietsma
- 1415** **Brain Health Special Interest Group** - Dr Mario Parra Rodriguez SDRC
- 1430** **Future Meetings Discussion**– Joanne Boyle, DHI
- 1500** **Event close**

Welcome and introductions

Joanne Boyle, Digital Health & Care Innovation Centre

An Introduction to Scotland's Healthy Ageing Innovation Cluster



Partner update: SHIP

Dementia Medicine Challenge – Suzanne Graham

Medicines and Dementia Open Innovation Challenge

Suzanne Graham



Scottish Government
Riaghaltas na h-Alba
gov.scot



Medicines & Dementia Open Innovation Challenge



Vision

A future where the quality of life of people at risk of dementia is improved by identifying them earlier and slowing the time to full diagnosis.

Governance

- Sponsored by Alison Strath, Chief Pharmacist & Euan Dick, Head of CSO.
- North Region Innovation Hub hosting on behalf of Scotland
- Clinical Leads
 - Ewan Morrison, National Director for Medicines Innovation, Scottish Government
 - Lyn Pirie, Dementia Nurse Consultant, NHS Grampian
 - Fiona Ferguson, Nurse Consultant for Older Adults Mental Health Services, NHS Grampian



2022 Medicines & Dementia Open Innovation Challenge

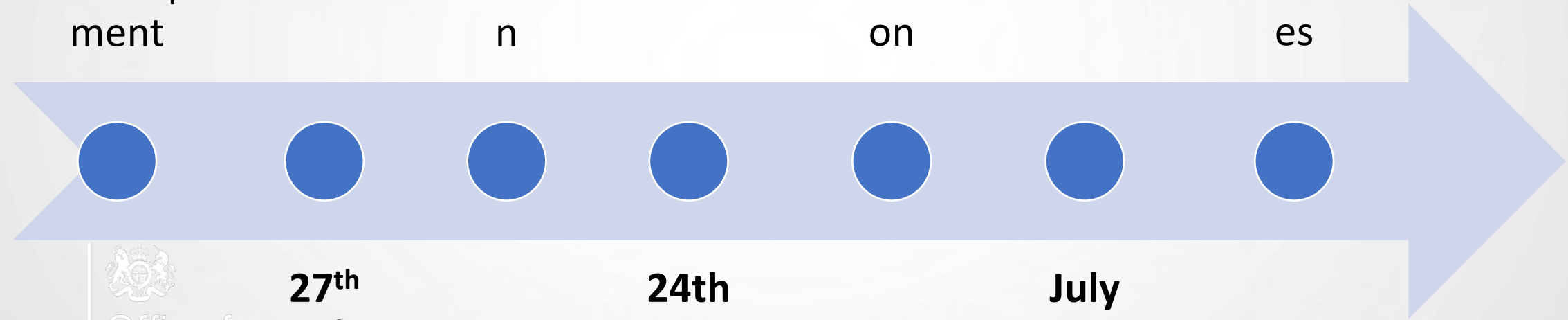


Discover
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&
Challeng
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Develop
ment

10th
March
Onlin
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briefi
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sessio
n

May –
June
Evaluati
on

October
Phase 1
Commenc
es



Office for
Life Sciences

27th
Feb
Compet
ition
opens
on

24th
May
Compet
ition
Closes

July
Result
s

Scottish Health and Industry Partnership | ship@gov.scot



Medicines & Dementia Open Innovation Challenge



Focus

Medicines and developing innovative new tools for use in clinical practice supporting people at risk of dementia to manage their medications.

Innovation Themes

- 1) identification of people utilising clinical risk factors for example cardiovascular risk factors, family history, diabetes or hypertension.
- 2) adherence to medicines for conditions identified as being linked to development of dementia such as delirium, confusion and other risk factors that may be highlighted by the applicants which will require supporting evidence.

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Life Sciences

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Process



Pre-commercial Procurement: Small Business Research Initiative (SBRI)

Aims:

- Solve a challenge within the health and care sector by connecting with innovative businesses
- Provide a structured process for us to engage with innovative businesses

Benefits:

- Help NHS achieve their objectives
- Provide a route to market for the companies
- Funding provided to the companies - applicants can apply for a share of a total challenge fund of £240,000

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Stages

Phase 1: Feasibility study (4 projects)

- Analysis and evaluation of a project's potential, resources required and prospects for success.
- Stakeholder engagement.
- R&D which will significantly contribute to proving the scientific, technical & commercial feasibility of the proposed project.
- End report outlines proposal for Phase 2.
- Phase 1 results determine whether the solution should go on to Phase 2.

Phase 2: Product development (2 projects)

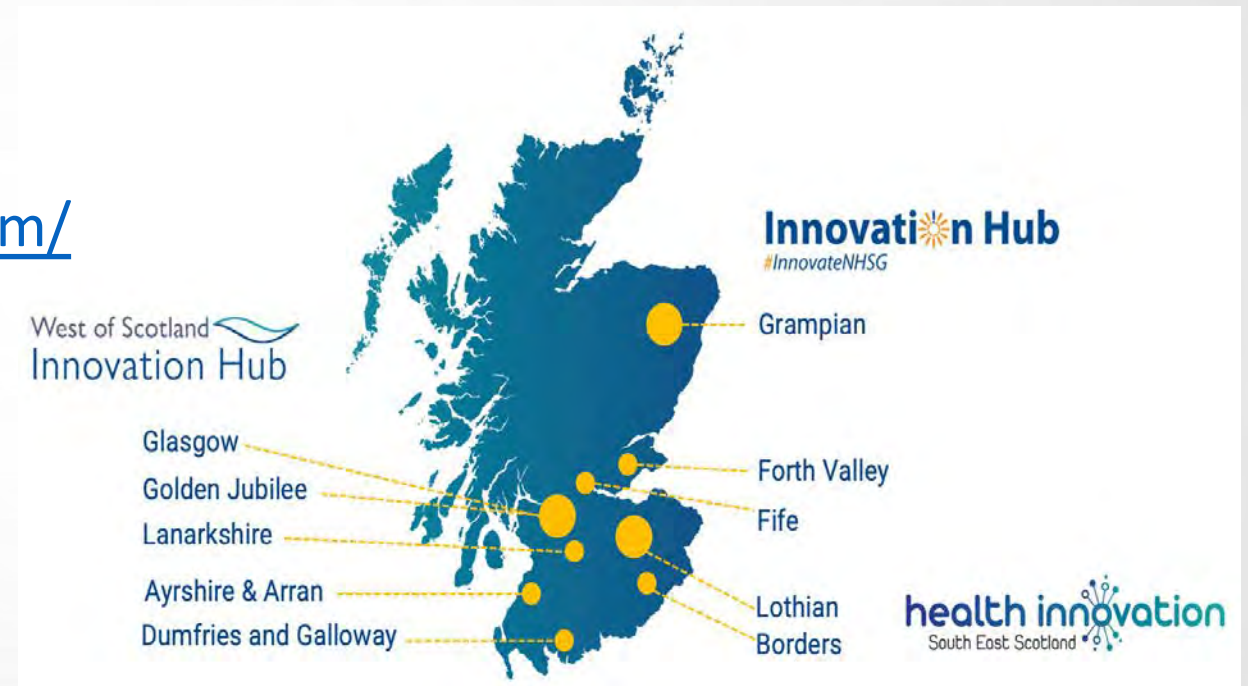
- Development and testing of a solution or prototype
- Evaluation and validation facilitated through the test beds.
- Co-design with clinical services and digital colleagues with the ambition to produce a well-defined prototype.
- At the end of Phase 2 it is intended that what has been developed will be manufactured and marketed as a way of fulfilling requirements.

NHS Scotland Test Beds

Regional Innovation Hubs/Test Beds

- Health Innovation South East Scotland
 - innovations@nhslothian.scot.nhs.uk
 - <https://hises.edinburghbioquarter.com/>
- North of Scotland Innovation Hub
 - gram.nosinnovationtestbed@nhs.scot
- West of Scotland Innovation Hub
 - innovation@ggc.scot.nhs.uk
 - <https://www.woshealthinnovation.scot/>

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Key Information



Apply via Innovation UK

<https://apply-for-innovation-funding.service.gov.uk/competition/1504/overview/8c38021b-df63-4e22-9c5f-ea877d15b855>

Sign up for the briefing event on 12.30 – 14.30 on 10th March

<https://book.shsc.scot/medicinesanddementia>

Questions – email gram.nosinnovationtestbed@nhs.scot

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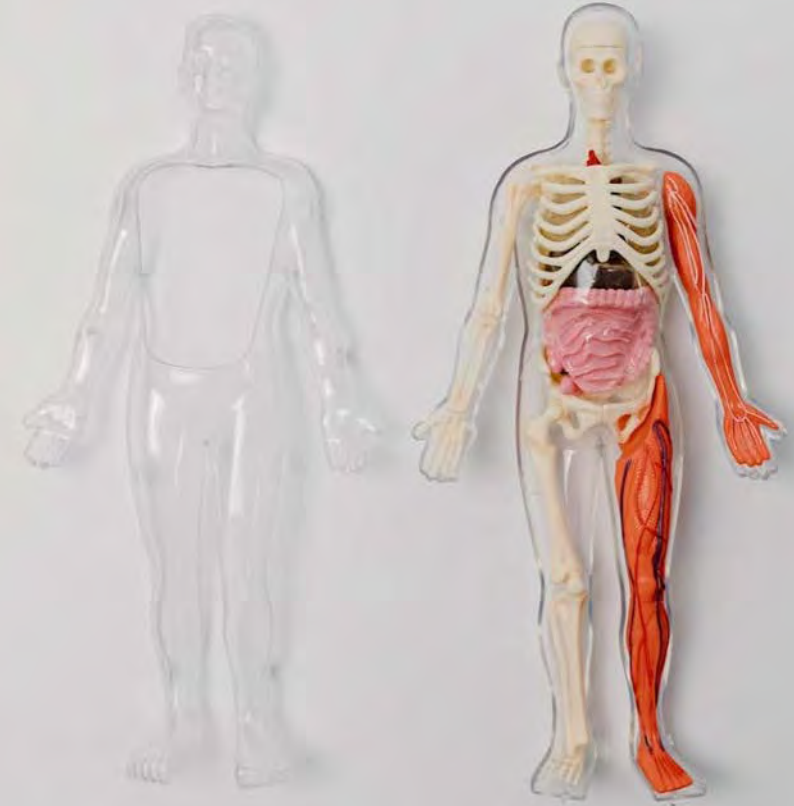
National Frailty Challenge

Louise Mushet & Katherine Snow

Presentation

Frailty Innovation Living Lab Challenge Design

HAIC event



Project team

Introduction to the Health Innovation South East Scotland project team



Louise Mushet
Project co-lead & Senior
Service Designer



Katherine Snow
Project co-lead & Senior
Service Designer



Michael Gray
Implementation
Lead



Atul Anand
Clinical academic - clinical
service lead



Susan Shenkin
Clinical academic -
clinical service lead for
Usher



Grahame Cumming
Innovation champion
for NHS Lothian



Veronica Arias
Innovation project team



Objectives

Why are we doing this?

One.

To design a health and social care innovation pathway that is collaborative and inclusive.

Two.

To evaluate whether an idea has potential.

Three.

To support companies to validate their innovations through data.

Four.

To connect companies to the NHS and have their innovations rolled out across the nation.

Five.

To build an ecosystem to help continue the cycle of innovation and medical technology development in Scotland.

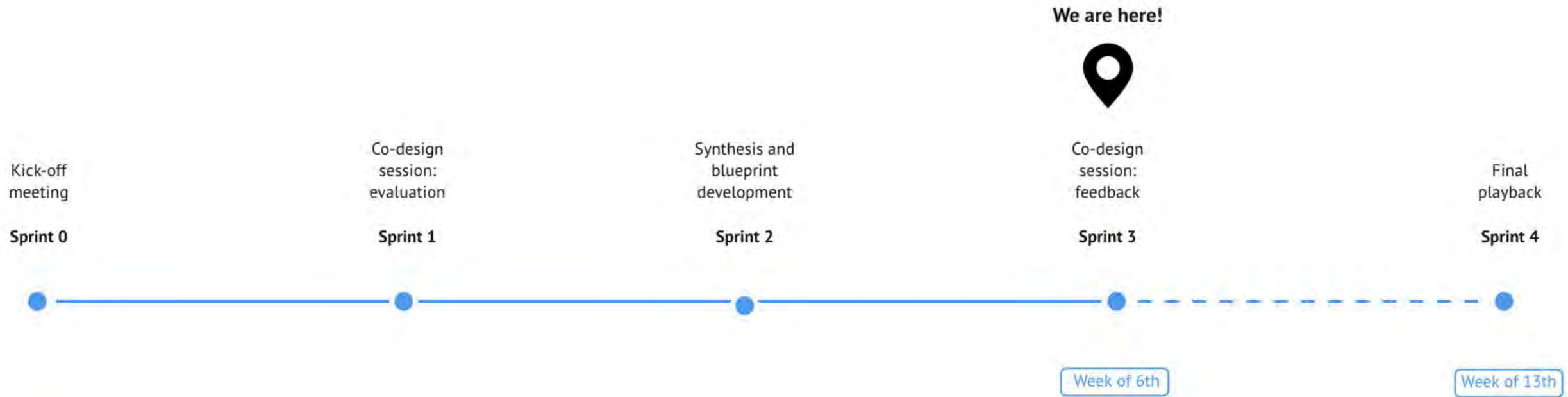
The power of data

What makes this pathway exciting?



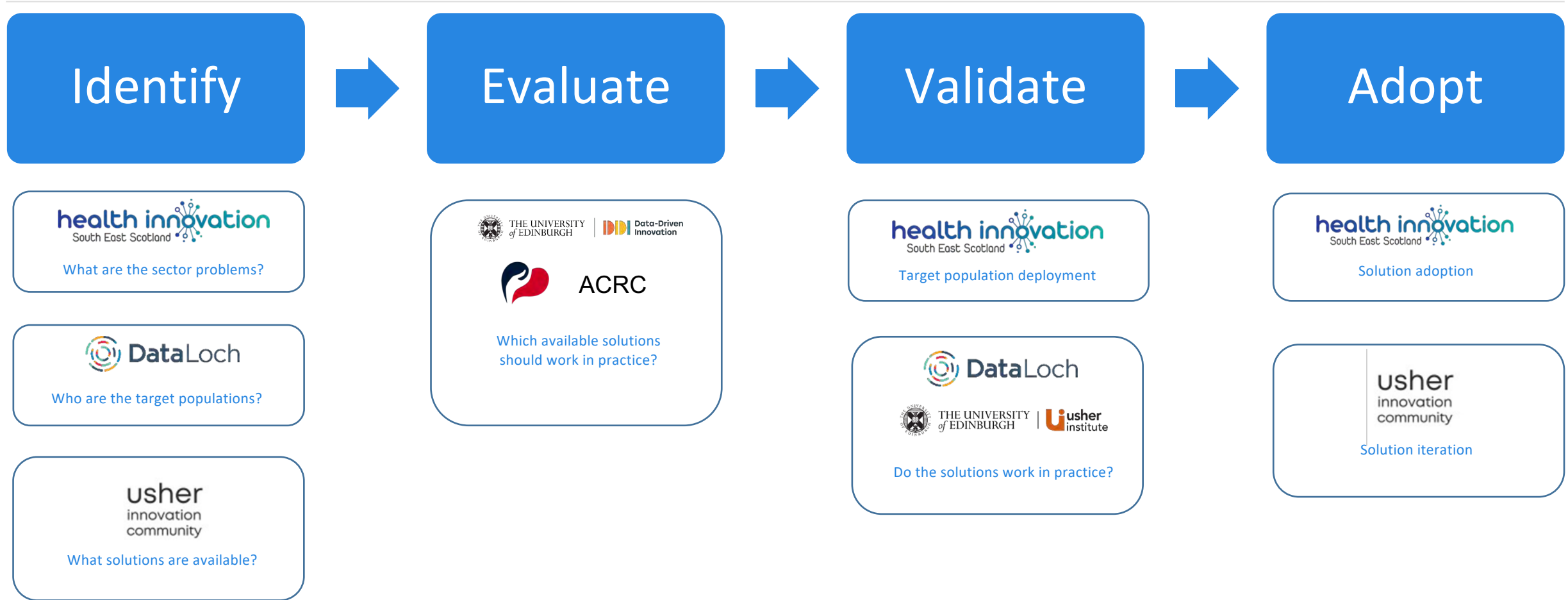
Key milestones

What have we been doing so far?



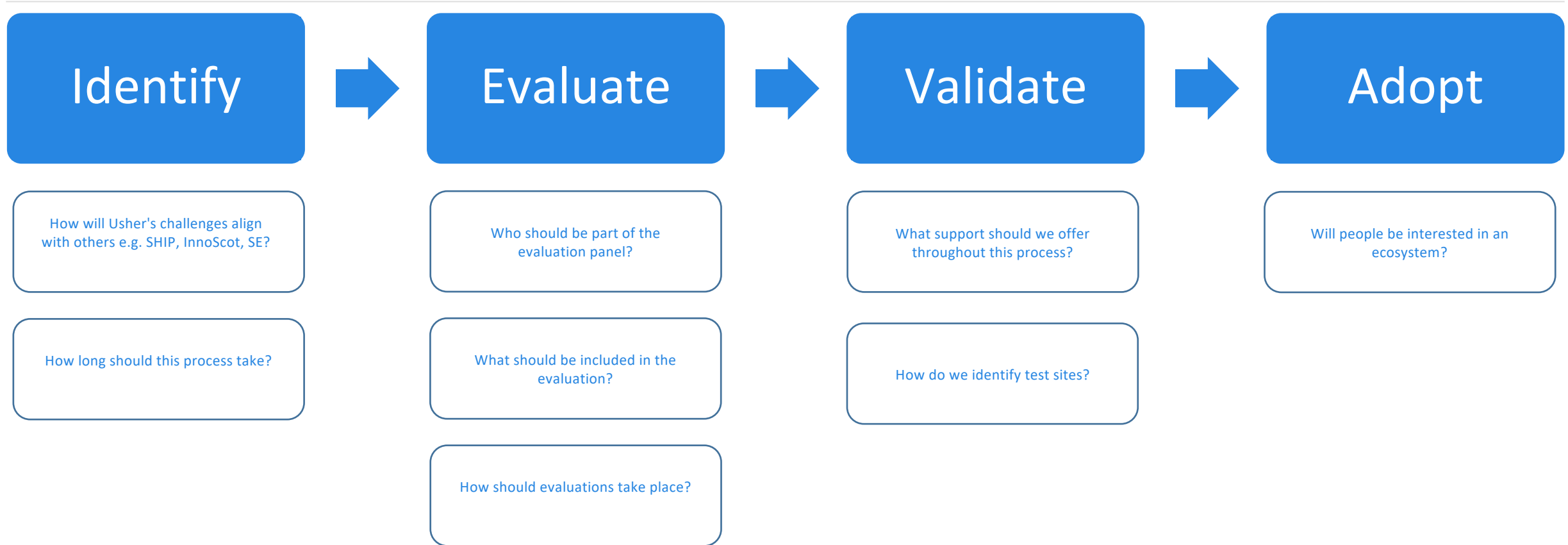
Structure

The key stages of the pathway



Key questions

Across the key stages of the pathway



We need your thoughts to understand if the design of the pathway is realistic and appealing.



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hello@nilehq.com

nilehq.com



Alzheimer Scotland

Codesign, Dementia Circle, ADAM, Purple Alert, Virtual Reality

Fiona Corner



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Action on Dementia

Prevent.
Care.
Cure.

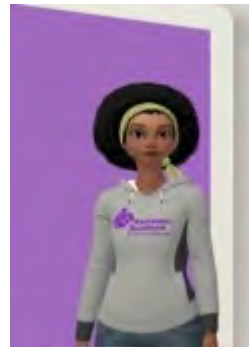
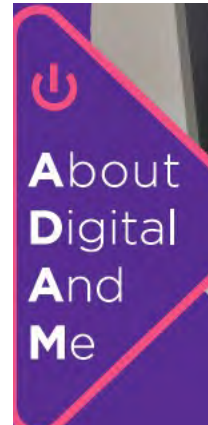
Co-design: families at the heart

Fiona Corner
Head of Development & Innovation
fcorner@alzscot.org

Making sure nobody faces dementia alone.



What we do: innovating digital services and solutions



Bringing co-design to life

- Dementia Circle
- Purple Alert
- ADAM
- Virtual Reality
- Questions





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Tommy Petillo
Purple Alert Coordinator
tpetillo@alzscot.org



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Dementia Circle

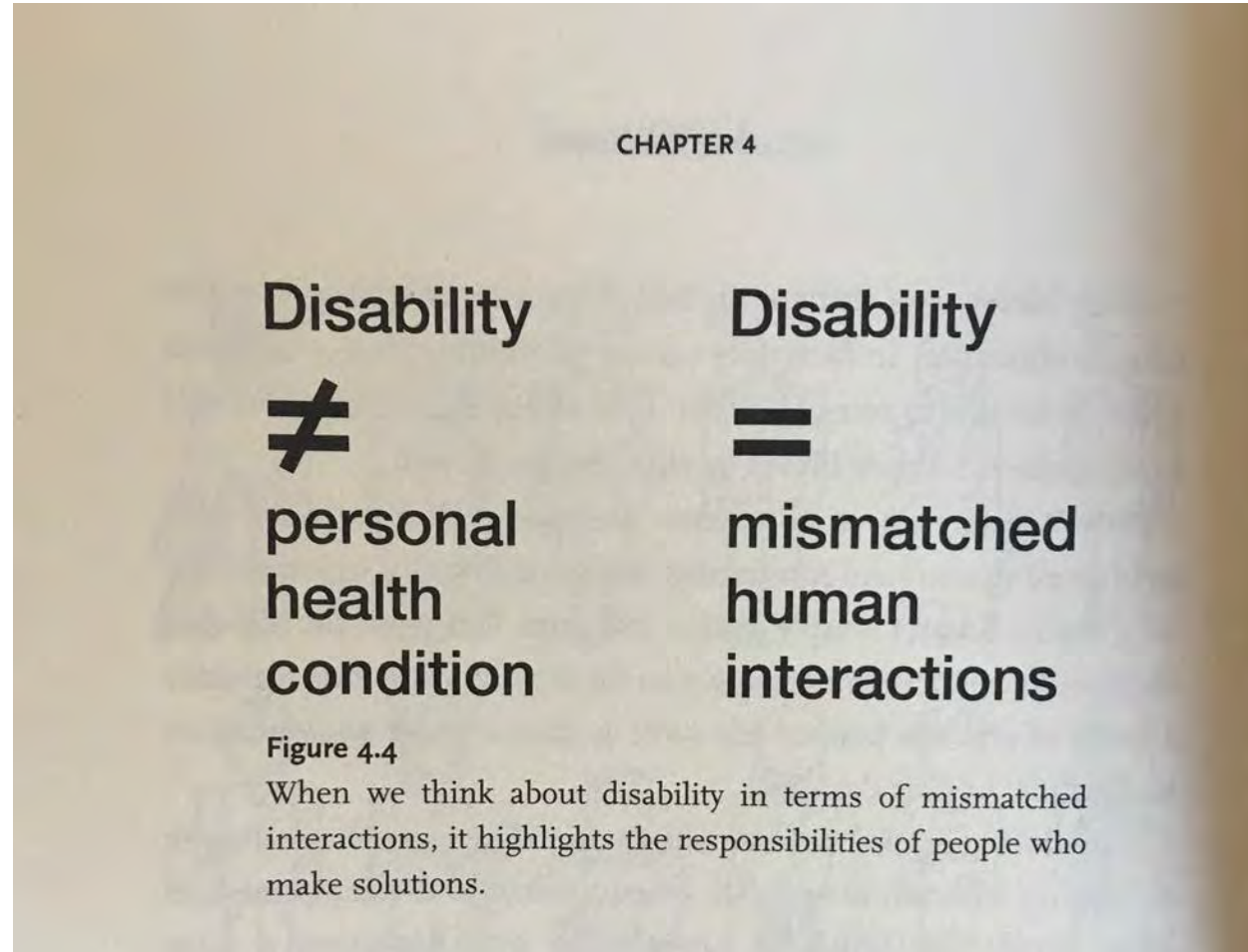


Inclusive Design is a buzzword.

Inclusive Design is a buzzword.

But it's a very important one.

Kat Holmes, “Mismatch - How Inclusion Shapes Design.”



2009 Google search “Dementia Products”



2019 Google search “Dementia Products”






Café >>
Toilets >>



Toilets
Male

Toilets
Female
Accessible



a
guid
wee
cuppa

Spot the difference....



Designing with, not for.



Designing with, not for.



Designing with, not for.



Exclusion

+

Hacks

=

Insight towards inclusivity



**It's all about
the why**



It's transparent.

It has a blue light.

Fancy, but why is it better than another kettle?



~~It's transparent.~~

**I can see if there is water inside
or if it's empty.**

~~It has a blue light.~~

I can see if it's on or off.

**I can see when the water has
finished boiling .**



Black button on white handle. I can see it right away.

Black base on a contrasting worktop. I can see where to place the kettle when I'm done.





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Always work with your user group.

Ask why? (X 3)

Understand why.

Design, evaluate, redesign. Repeat.



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Purple Alert

Looking out for you

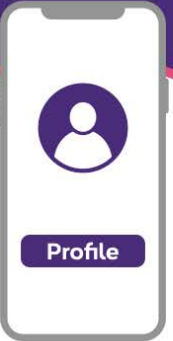


1




Download Purple Alert for free

2



Create your profile. This will be private

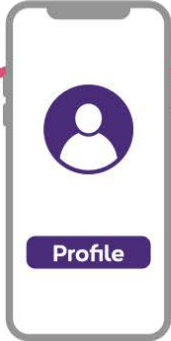
3



Ask your family and friends to download the app

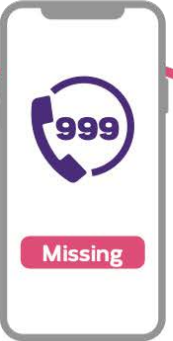
Carers only

4




Create a profile for the person living with dementia

5



If the person with dementia goes missing call 999

6



After you have alerted the police raise a Purple Alert

2015 international context



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2015 national context

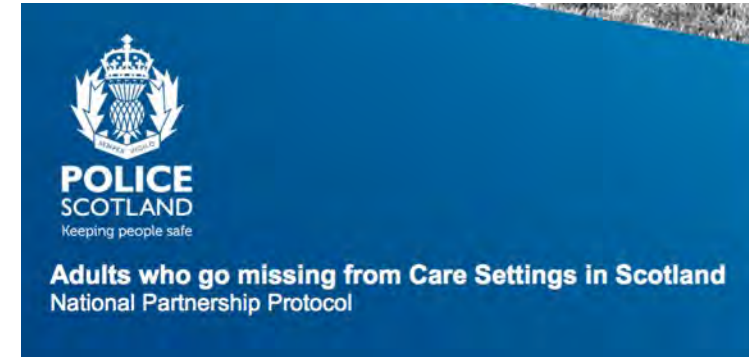


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THE
**HERBERT
PROTOCOL**
Safe & Found



COMMITMENT 11: We will implement the *Technology Charter for People in Scotland with Dementia*, ensuring that everyone with a diagnosis of dementia and those who care for them are aware of, and have access to, a range of proven technologies to enable people living with dementia to live safely and independently. We will continue to explore innovative ways in which technology can be used and adapted for people living with dementia.

2015 co-production team



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POLICE SCOTLAND



**Dementia
Friends**



**Renfrewshire
Council**



**The Scottish
Government**

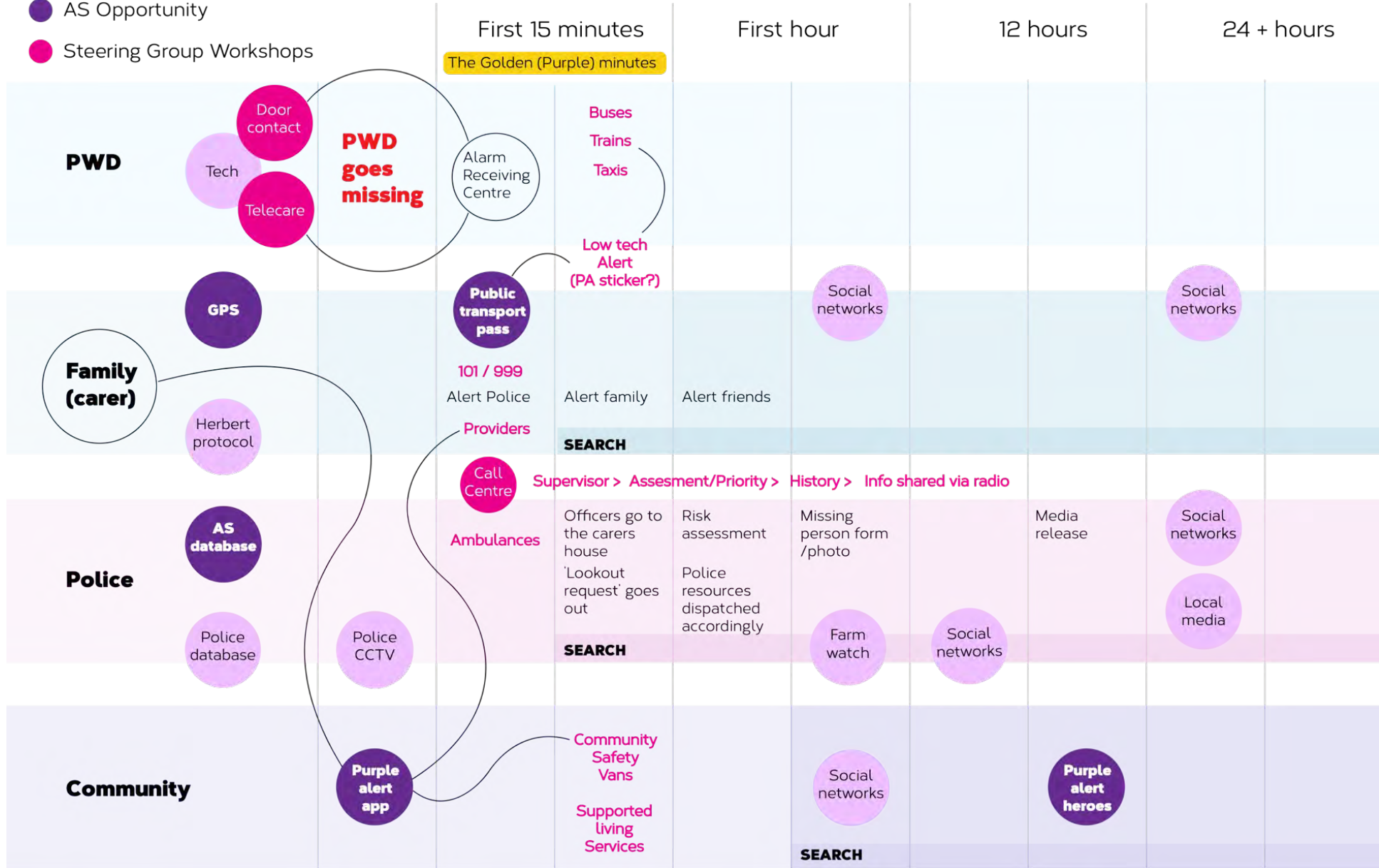


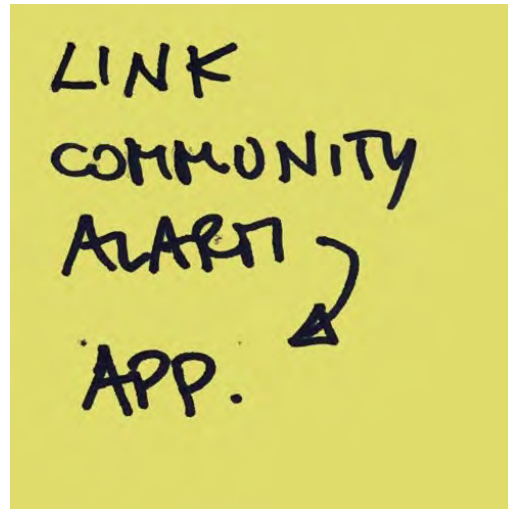
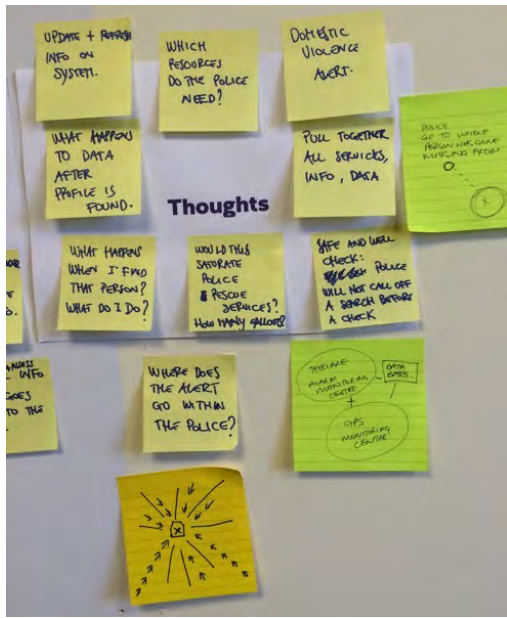
● Existing Services

● AS Opportunity

| | | | First 15 minutes | First hour | 12 hours | 24 + hours | |
|------------------|------------------|-------------------------|---|--|----------------------------|---------------------|-------------|
| PWD | Tech | PWD goes missing | | | | | |
| Family | GPS | | Public transport pass | Social networks | | Social networks | |
| | Herbert protocol | | Alert Police | Alert family | | | |
| | | | | Alert friends | | | |
| | | | | | | | |
| Police | AS database | | | | | Social networks | |
| | Police database | Police CCTV | Officers go to the carers house 'Lookout request' goes out | Risk assessment Police resources dispatched accordingly | Missing person form /photo | Media release | Local media |
| | | | | | Farm watch | Social networks | |
| Community | | Purple alert app | | | Social networks | Purple alert heroes | |
| | | | | | | | |

- Existing Services
- AS Opportunity
- Steering Group Workshops





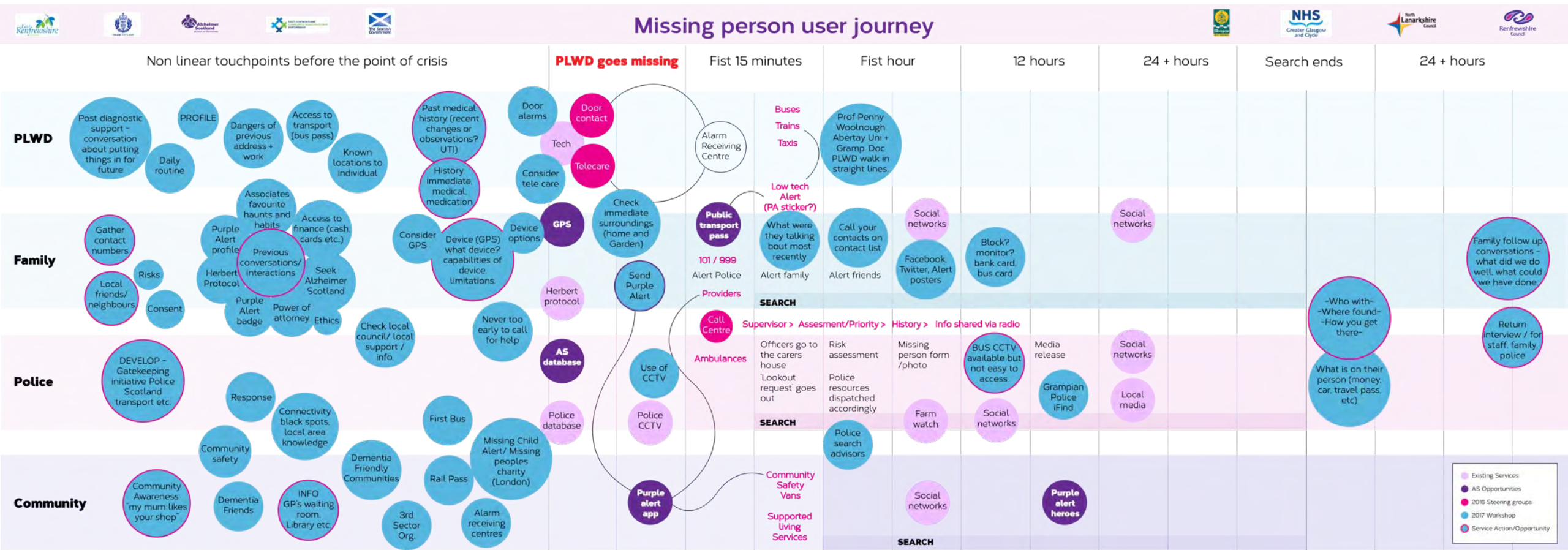


2017 Product & Service Design



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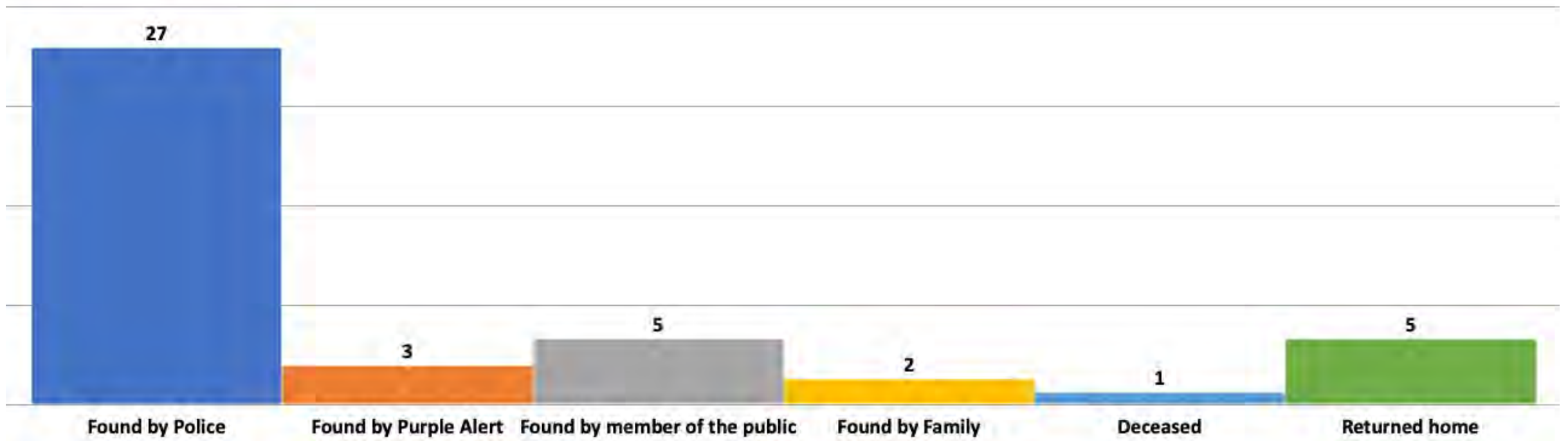
Prevent. Care. Cure.



42 Purple Alerts since 2017

“I can’t praise you and any others enough for creating the Purple Alert app as this was an example of how vital it is and I have been advising friends and relatives to download it too.”

James, Carer.



Return Discussions Pilot



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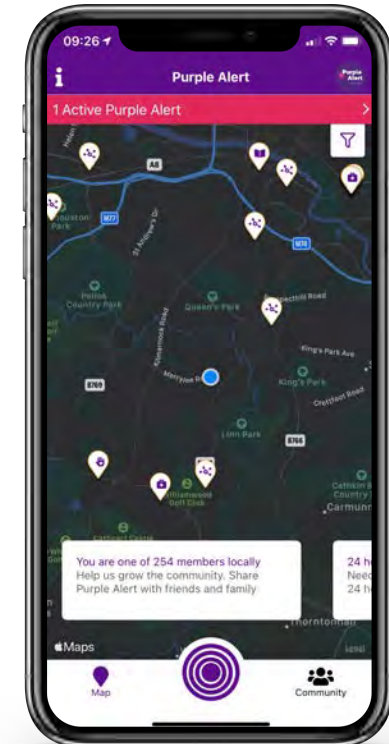
THE
RS MACDONALD
CHARITABLE TRUST



**POLICE
SCOTLAND**



*Kirkwood
Memorial Fund*



April 2022 - Edinburgh Return Discussions start



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Dementia Safeguarding Scheme Pilot



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“Tap me on
your phone to
get me home”

(Argyll & Bute only)





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Rachel McLauchlin
Digital Dementia Advisor
rmclauchlan@alzscot.org



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ADAM: About Digital And Me



ADAM and Co-Design

- Original Idea came from a need within the community
- Families interested in technology, but didn't know where to seek honest and reliable information.

*“Technology is a real enabler & something we don't fully explore. Especially if you don't know about it,”
– person living with dementia*



Meet Kay and Tom

Finding Tech on the internet:

“I spent hours going onto this website, that website, the next website, and I was exhausted by it.”

On ADAM:

“It gives you an idea on how easy it is to set up, or how expensive it would be, or what it might help with.”

Helping you find the technology you need

Discover what's out there

Select a tag

- Having a purpose in your day
- Having a safe and happy home
- Staying connected and in touch
- Feeling on top of being a carer
- Getting out and about confidently
- Looking after yourself and feeling resilient
- Having fun and filling the day



This old-style handset plugs into a mobile phone, and helps to provide a familiar experience for listening and speaking during calls.

OPIS
60s Micro Headset

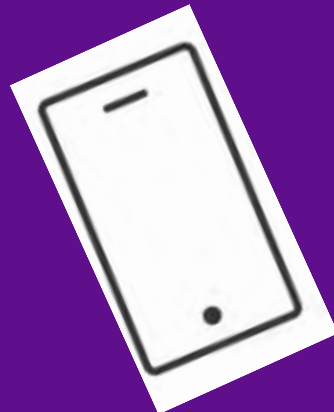
[Find out more](#)



Alzheimer Scotland App, letting you know what's going on Nationally and also in your own area.

ALZHEIMER SCOTLAND
Alzheimer Scotland App

[Find out more](#)



Product Slides



OTIOM Otiom

Otiom is a monitoring device that connects to the Otiom app for caregivers or relatives. The Otiom tag can be managed using the app and a safety zone can be set outside your personal home. If the tag leaves the safety zone, an alarm will be triggered through the app and will show the current location, allowing you to quickly respond and ensure safety is maintained. The starter kit includes the Otiom tag, charger, and bluetooth home base device. No monthly subscription required.

EASE OF USE

Easy to medium

Additional support may be required for set up. Please contact Pentland Medical for customer support on 0131 467 5764 or visit their website at <https://www.pentlandmedical.co.uk>

SET-UP TIME

30-90 minutes

Set up time may vary.

PRICE

£300

Price starting from. Monthly Rental option starting from £30.
<https://www.pentlandmedical.co.uk/>

Other uses

Location alerts activated through Otiom app. Alerts sent to all registered responders on the app. Location can be checked at any time by app.

Safety Zone can be set up around agreed local area. The safety zone can be changed at anytime through the app to reflect changing circumstances.

Good to know

Up to one month battery life (depending on device usage)

Can be disinfected and machine-washed at 60 degrees

At least one responder is required to live nearby person with the Otiom device to react to alert

Does not include an SOS button but caregiver can activate location at any time using the Otiom app

More than one caregiver can have access to the app so that care role can be shared

You may need more than one bluetooth receiver depending on the layout of your home

Product Recommendations

- About Me >
- Getting out and about confidently >
- Staying connected and in touch >
- Having a safe and happy home >
- Looking after yourself and feeling resilient >
- Having fun and filling the day >
- Having a purpose in your day >
- Feeling on top of being a carer >


Hello, I'm Adam, pleased to meet you!


You may be interested to know that I am Scottish and if you could hear me speak I would have a Glaswegian accent, even though I've spent a lot of time in Edinburgh. I'm a dog lover and I hope to get my own virtual pet one day!

[Next](#)

Thanks for helping me get to know you

I have 7 recommendations for you, based on what you said you'd like help with. Let me show you.





ALZHEIMER SCOTLAND
Purple alert

[Find out more](#)

You said

When I go out, I mostly go out alone

Adam says

If someone you care about goes missing, you can quickly raise an alert and have the local Purple Alert community looking out for them

Dementia Circle: User voice integral to ADAM's future



My mum is getting on really well with the new phone. She can answer all the time and can even phone on the odd occasion. It's made a massive positive impact as she can now stay in contact with family at all times. It also makes her feel good about herself as she can now work a phone.

- Ryan



I don't know what I would do without the Ipad now I have one. I play the games all the time and use it to attend my groups. The best thing I like is my daughter sent me an app for colour by numbers. I must have completed hundreds of them. I like to keep my brain active.

- Janette



From a carers point of view, it takes a lot of the pressure away from me. I can say something to Alexa and she can help me. I can't praise it highly enough. It really was a life-saver as when my husband fell, he forgot about his phone, but was able to say "Alexa phone June". Absolutely Brilliant!

- June



Great support, great device and accurate GPS system. I have peace of mind to know that my father can be found so easily when activating the Otiom GPS and I'm so happy with all aspects of it. Great as a keyring to add pictures onto and we've decorated the Otiom tag. My father takes it everywhere now pictures of his mother and father are attached to the tag.

- Tom



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Virtual Reality

Virtual Reality: a brief history

- Successful pitch to the Alzheimer Scotland Lens Entrepreneurship competition
- Conducted 10 focus groups over 18 month period to start initial community-led feedback into safe practice guide for Virtual Reality use
- Headset used was the HTC Vive



VR now: The last 12 months

Testing the Meta Quest 2 (formally Oculus) for ADAM catalogue through Dementia Circle



IT4Anxiety support



Virtually: Anything is Possible

The following video is an excerpt from
the 'Virtuality' Webinar.

“Martin’s Testimonial”

Link to Webinar recording:

<https://vimeo.com/797719562/1218328dbb>



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Presenters:

Martin Robertson: Dementia Circle Reviewer

Janice McGhie: Digital Lead, Alz Scot

Kathy Wiles: Digital Dementia Advisor, Alz Scot

Martin's Top Tips:

Martin's Top Tips for Users

- Don't be afraid to try it
- Take your time within the headset and allow yourself to adjust
- Practice getting to know the buttons on the controllers
- Spend no more than 15-20 minutes in the virtual environment (use a timer as you can lose track of time)
- If you know you get motion sickness, it might be good to sit down while using the headset

Martin's Top Tips for Facilitators

- Don't jump in too quickly to help. Allow the person time to adjust to the new experience
- Communicate clearly what you are about to do (i.e. putting on the headset) and where you will be in the room
- Let the person do it on their own if they can and allow them to explore the virtual world independently
- Facilitate in a quiet space because it will allow the experience to be more immersive and free from other distractions

Virtual Reality: what next?

Collaboration
with DHI,
Abertay &
Hampden Park
Museum
football
reminiscence

Creation of
Safe Practice
Guide for Virtual
Reality use for
People living
with Dementia
and carers

Co-designed
Nature-based
Virtual
Experiences
in partnership
with our Outdoor
Resource
Centre

Meta Quest
Headset to be
available in our
26 Brain Health
and Dementia
Resource
Centres in
Scotland



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Co-design in VR: making it happen



Digital Health & Care
Innovation Centre

SCOTTISH
FOOTBALL
MUSEUM
HAMPDEN



**Alzheimer
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Action on Dementia



**Abertay
University**

1 - Snippet (Henry Simons).mp4



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**Thank you
Questions?**

**Get in touch:
digital@alzscot.org**

Care fit support for Carers

Dr Kieren Egan



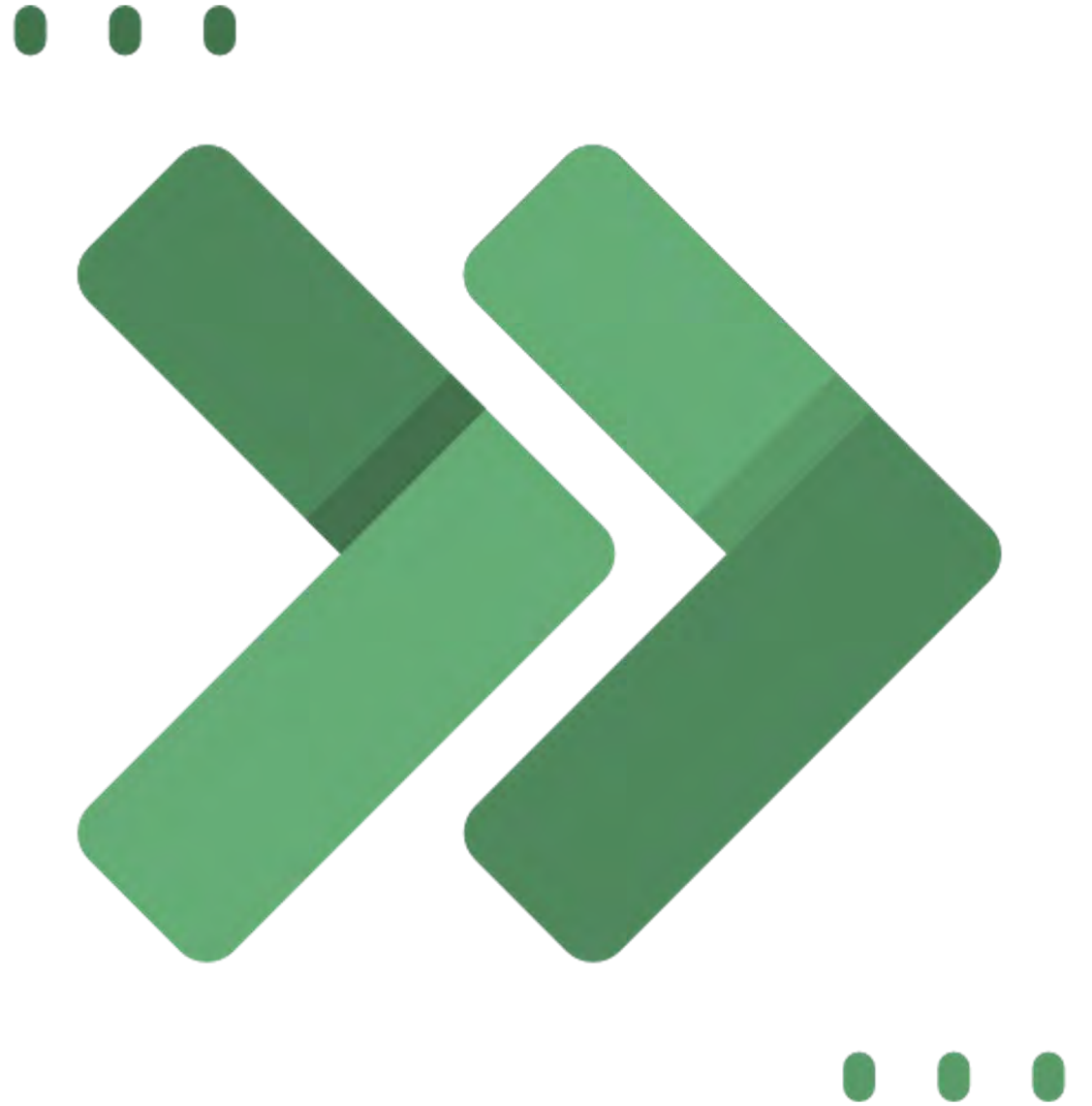
The codesign and evaluation of a novel physical activity app for caregivers “CareFit” including dementia carers

Dr Kieren Egan

Kieren.egan@strath.ac.uk

Twitter: Drkjegan

Context and Background





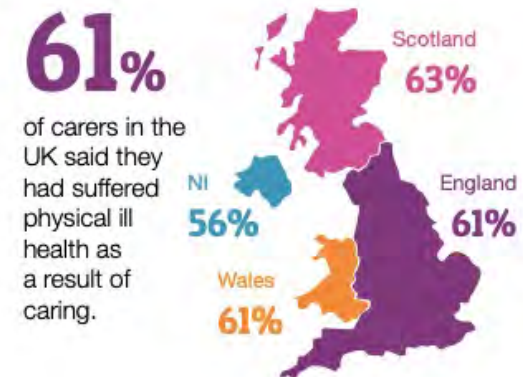
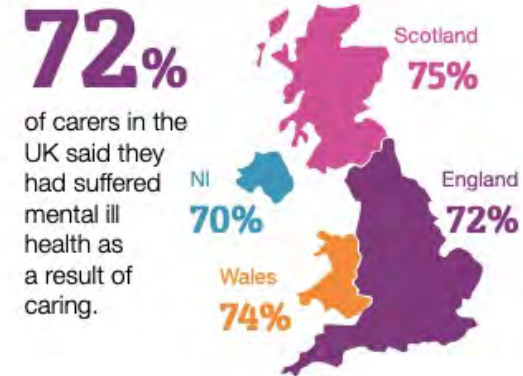
Context & background



carersuk.org/stateofcaring

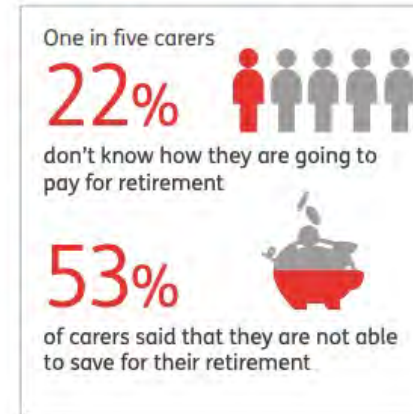
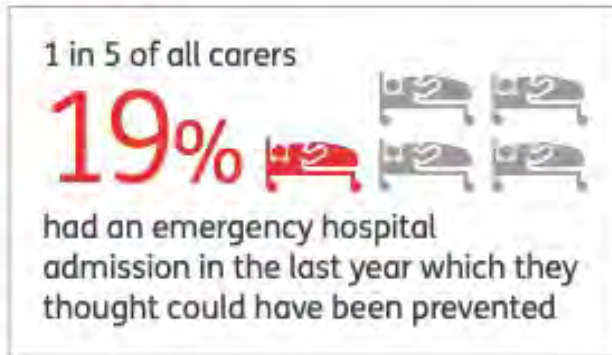
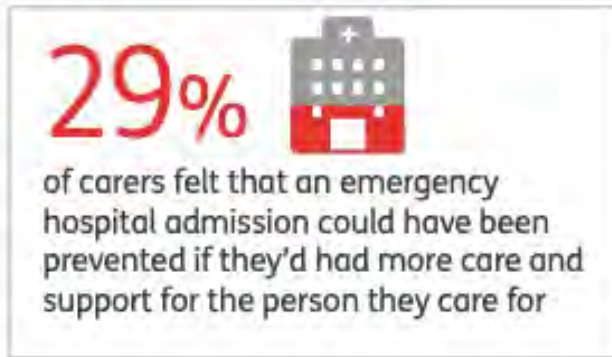
State of Caring

A snapshot of unpaid care in the UK





Context & background





Context & background

4 in 5 unpaid carers (81%) were providing more care than before lockdown.

More than three quarters (78%) of carers reported that the needs of the person they care for have increased recently.



Isolation
Pressure on individuals and healthcare service
Becoming the “face” of rules and measures

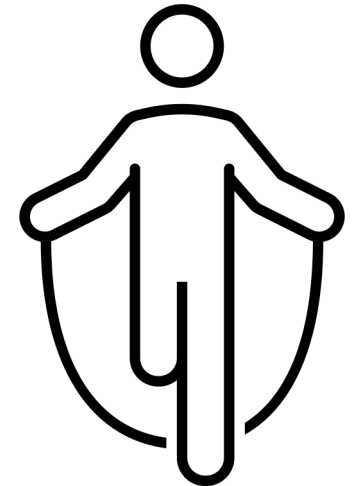


Empowering tools support self-management
Increase carer health and wellbeing



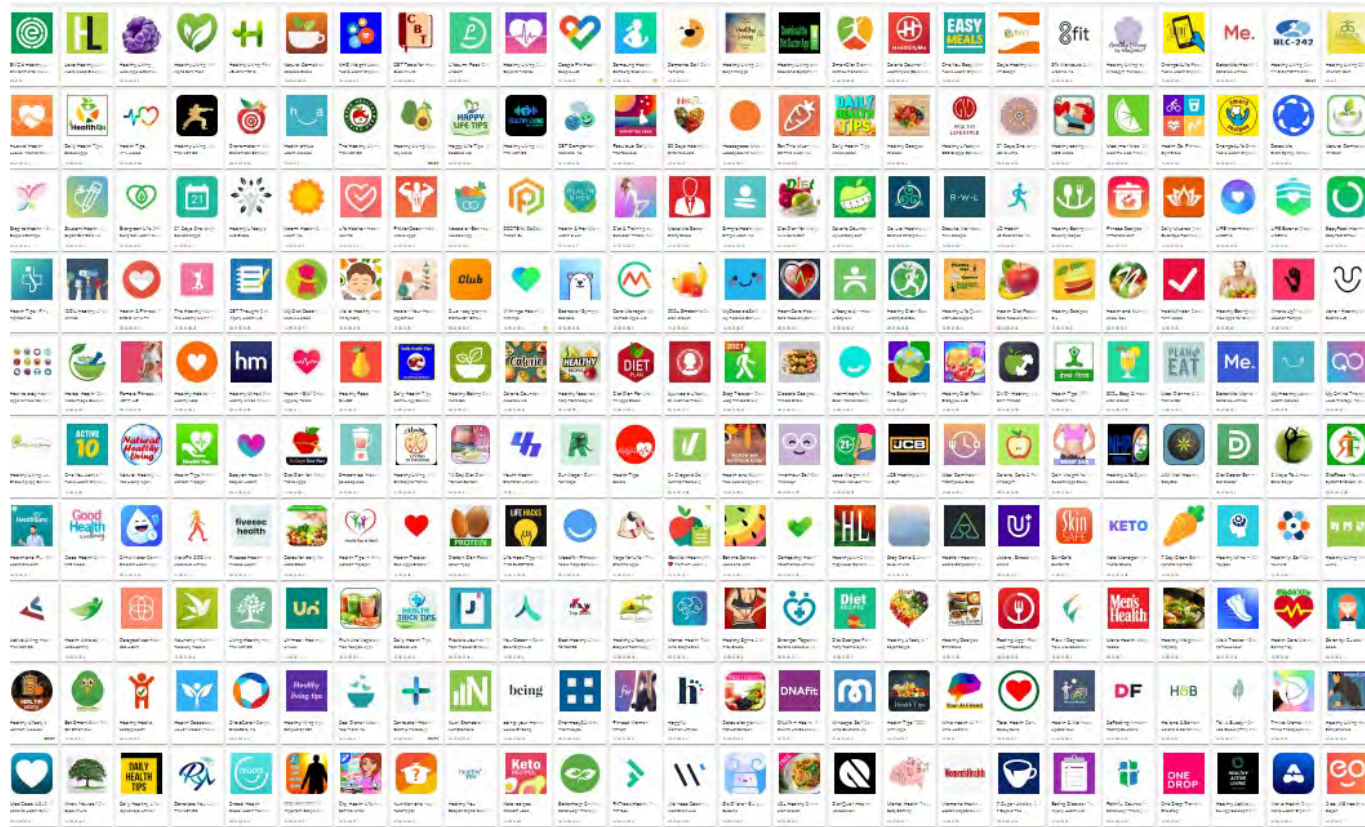
Context & background

- The 2019 State of Caring survey (Carers UK) found that 81% of carers of all ages are not able to do as much physical activity as they would like.
- Systematic review work in this area identified only 14 studies to date with interventions mainly delivered face to face and/or by telephone-based approaches. Across these studies, improvements were observed in physical activity levels, distress, well-being, quality of life, and sleep quality. Such targeted solutions are yet to make the “leap” into the digital spectrum and mass impact potential of smartphone apps.
- U.K. National statistics report that four in five carers use digital technologies.





Context & background





We need an approach that...



can be personalised to an individual caregivers needs that carers would want to use



does not require specialist equipment

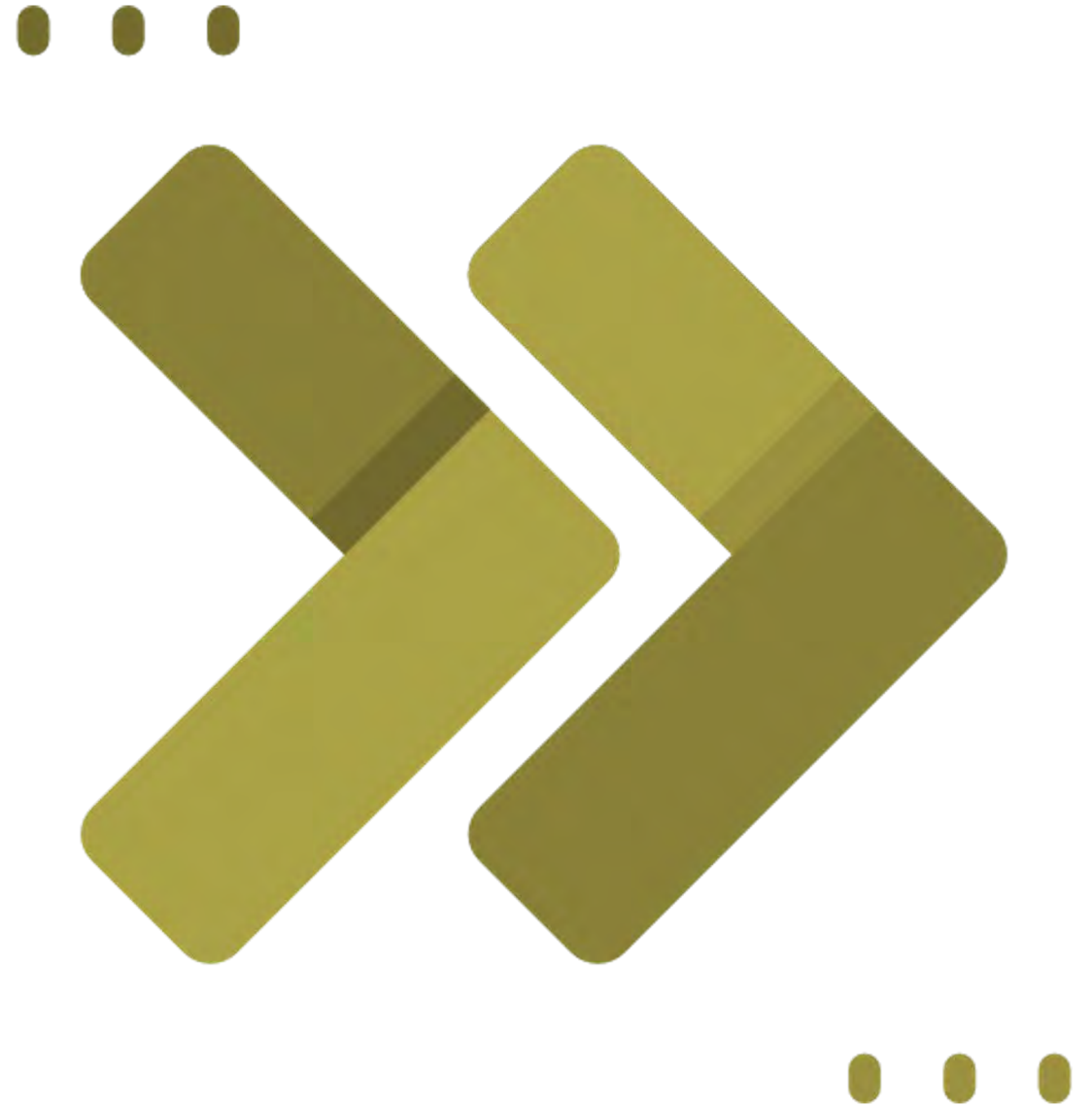


is evidence based and safe to use



recognises that caregivers are likely to relapse and stop making progress due to the care that they are delivering

Developing an Academic prototype





Research aims- stage 1



1. To co-design and develop a novel (evidence based) mobile app to educate and support carers in the undertaking of regular physical activity (for a period of 3 weeks) at home during and beyond COVID-19 restrictions?
2. To evaluate whether the approach developed is: feasible, acceptable and usable to our user group?

CSO rapid response call to COVID-19 pandemic

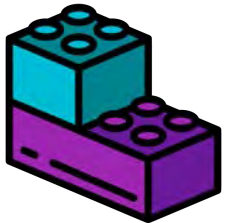


Work to date- academic prototype



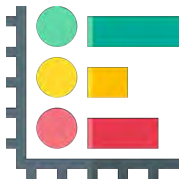
1. Collate knowledge and identify needs

- Examine relevant behavioural change literature and activity guidelines
- Establish an expert group (including carers) to establish how to deliver current scientific knowledge around physical activity to carers (e.g. using U.K. physical activity guidelines). Key themes were identified through exploring follow up questionnaire feedback.



2. Build it

An “android” smartphone-based application, ‘CareFit’, instructed by the needs of carers and carer professionals, that could support caregiver physical wellbeing on a regular basis both during and beyond the COVID-19 pandemic.



3. Test it

The codesigned developed smartphone app for a period of 3 weeks across Scotland to understand whether the concept could work in practice, and examine to whether caregivers could accept and see value in the overall approach.



Collating knowledge



Physical activity for adults and older adults

| | |
|--------------------------|---------------------------------|
| Benefits health | Type II Diabetes -40% |
| Improves sleep | Cardiovascular disease -35% |
| Maintains healthy weight | Falls, depression etc. -30% |
| Manages stress | Joint and back pain -25% |
| Improves quality of life | Cancers (colon and breast) -20% |

Some is good, more is better | Make a start today: it's never too late | Every minute counts

Be active

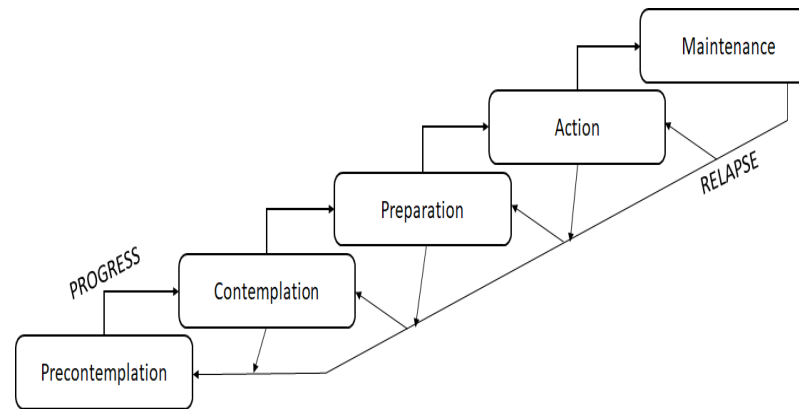
at least **150** minutes moderate intensity per week **OR** at least **75** minutes vigorous intensity per week

Build strength on at least 2 days a week

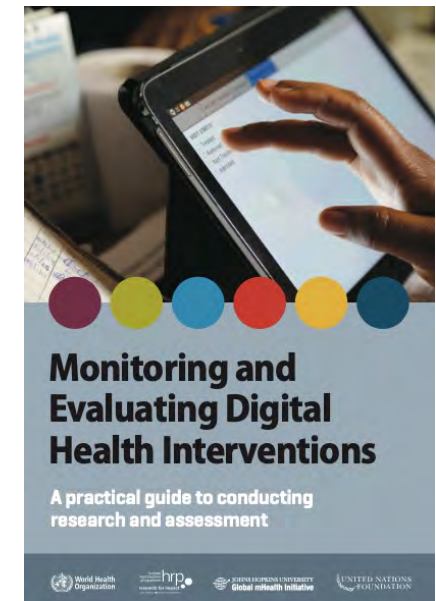
Minimise sedentary time Break up periods of inactivity

Improve balance 2 days a week

Physical activity guidelines

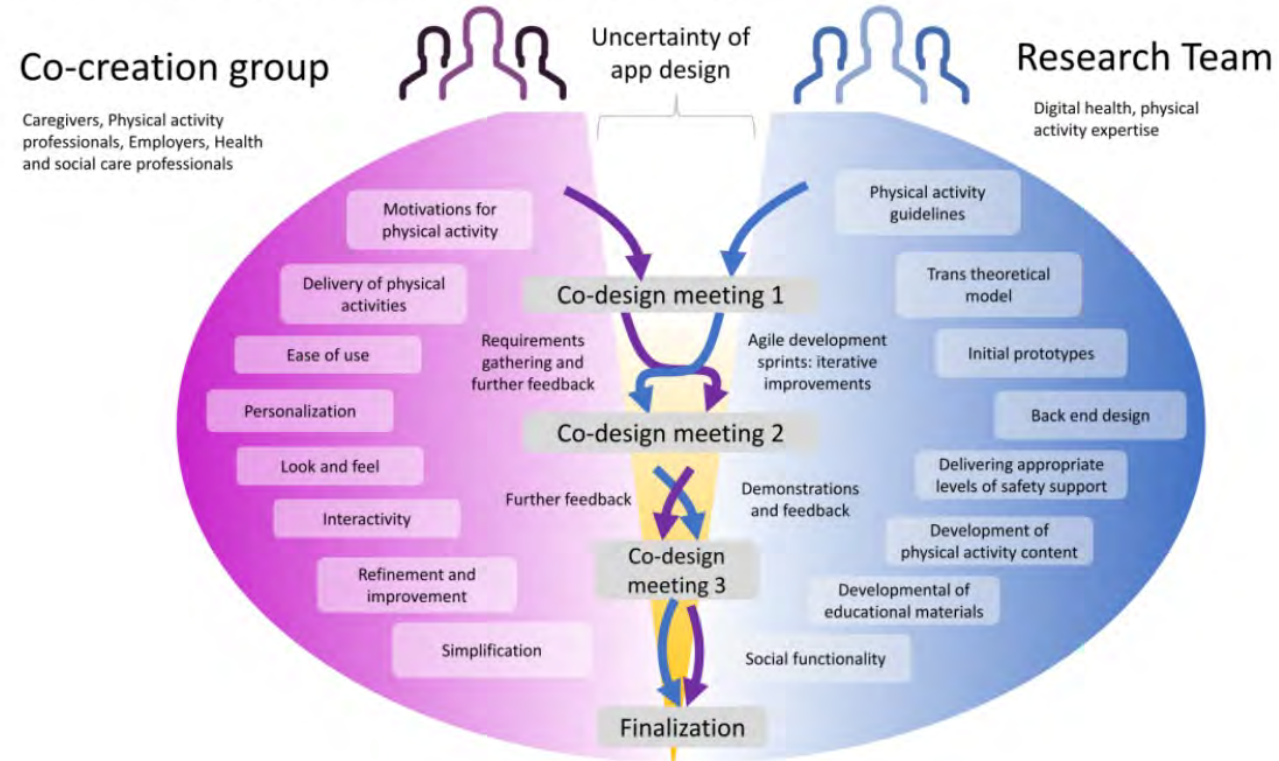


Transtheoretical Model



Frameworks for the development of Digital Health Interventions

Strong focus on codesign



A strong emphasis on codesign

First academic prototype

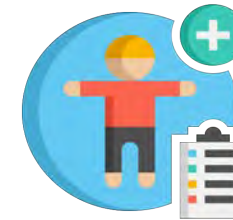
7 Carers & Care professionals involved in the design of the app



8 Carer focused Educational sections developed

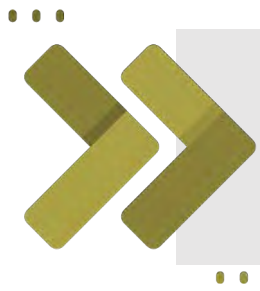


9 Carer focused Physical activity sections



Our final prototype was therefore designed for use across 3 weeks including:

- A main menu screen with 4 different navigation options: planner, education, reminders, share progress and user guide.
- 8 educational “stages”: (1) Welcome and Introduction (2) Physical activity: Beginners Guide” (3) “Relationships and” Physical Activity”, (4) “Managing time”, (5)“Goals and Rewards”, (6) “Physical activity and consequences” , (7) “The Mind and body” and (8) “Knowledge Quiz”
 - Cardiovascular activities (Step workout, squat workout, march workout that have three levels of intensity of low medium and high) plus daily activities option where activity took place outside the app delivered elements.
 - Muscle and balance activities (Three different videos working a variety of muscle groups where the user could choose from low medium and high intensity levels)
 - Three sedentary breaker activities (Fast March, Supported sit to Stand, and hold movement) that users were free to choose from.



Evaluation of first prototype

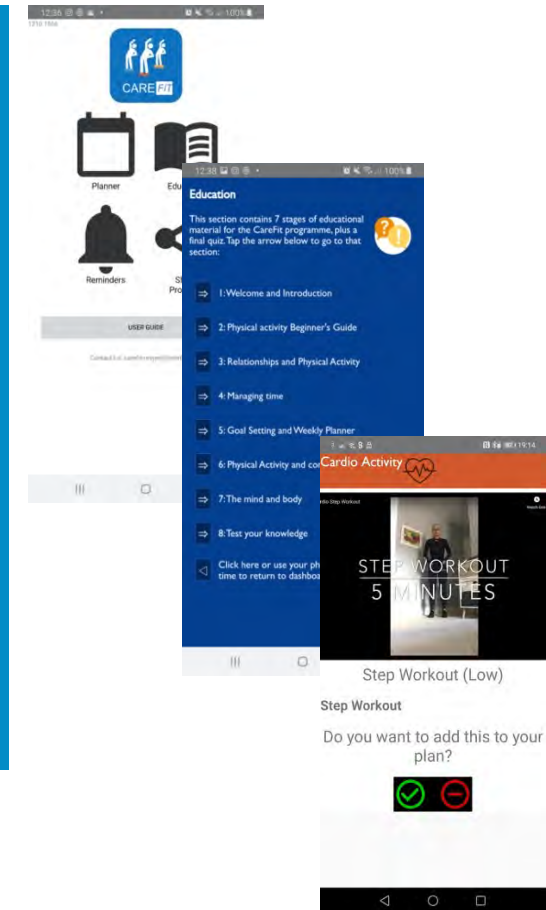


“The app was gently telling me to look after myself. I loved the instructor she just cared.”

“The education part lifted me to feeling I needed this and deserved this. Love the Schedule and the programming”

“I have been trying to lose weight and this app has got me thinking about not only exercise but my diet”

Example quotes from participants



Development

JMIR FORMATIVE RESEARCH

Egan et al

Original Paper

A Novel Mobile App (“CareFit”) to Support Informal Caregivers to Undertake Regular Physical Activity From Home During and Beyond COVID-19 Restrictions: Co-design and Prototype Development Study

Kieren J Egan¹, BSc, PhD; William Hodgson², BSc; Mark D Dunlop¹, BSc, PhD; Gennaro Imperatore¹, BSc, PhD; Alison Kirk², BSc, PhD; Roma Maguire¹, BN, MSc, PhD

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Abstract

Background: Informal caregivers, or carers (unpaid family members and friends), are instrumental to millions worldwide for the ongoing delivery of health and well-being needs. The risk of crisis points (eg, hospitalizations) for caregivers increases with the absence of physical activity. The COVID-19 pandemic is highly likely to have increased the risk of crisis points for caregivers by increasing the amount of time spent indoors due to shielding and lockdown restrictions. Thus, accessible evidence-based tools to facilitate physical activity for caregivers indoors are urgently needed.

Objective: The aim of this study was to co-design and develop a novel mobile app to educate and support carers in the undertaking of regular physical activity at home during and beyond COVID-19 restrictions via integration of the transtheoretical model of behavior change and UK physical activity guidelines.

Methods: We co-designed a mobile app, “CareFit,” by directly involving caregivers, health care professionals, and social care professionals in the requirements, capturing, and evaluation phases of three Agile Scrum design and development sprints. Seven participants representing multistakeholder views took part in three co-design sessions, each of which was followed by a development sprint. Requirements for CareFit were grounded in a combination of behavioral change science and UK government guidelines for physical activity.

Results: Participants identified different barriers and enablers to physical activity, such as a lack of time, recognition of existing activities, and concerns regarding safely undertaking physical activity. Requirements analysis highlighted the importance of simplicity in design and a need to anchor development around the everyday needs of caregivers (eg, easy-to-use video instructions). Our final prototype app integrated guidance for undertaking physical activity at home through educational, physical activity, and communication components.

Conclusions: Integrating government guidelines with models of behavioral change into a mobile app to support the physical activity of carers is novel. We found that integrating core physical activity guidelines into a co-designed smartphone app with functionality such as a weekly planner and educational material for users is feasible. This work holds promise to fill the gap of effective physical activity solutions for caregivers both during and beyond the COVID-19 pandemic. Further work is now needed to explore the feasibility, acceptability, and usability of the approach in real-world settings.

JMIR Form Res 2021;5(10):e27358 doi: [10.2196/27358](https://doi.org/10.2196/27358)

<https://formative.jmir.org/2021/10/e27358/>

JMIR Form Res 2021 | vol. 5 | iss. 10 | e27358 | p. 1
(page number not for citation purposes)

SL-FO

Evaluation

International Journal of
Environmental Research
and Public Health



Article

Supporting Physical Activity for Informal Caregivers during and beyond COVID-19: Exploring the Feasibility, Usability and Acceptability of a Digital Health Smartphone Application, ‘CareFit’

Kieren J. Egan^{1,*}, William Hodgson², Gennaro Imperatore¹, Mark D. Dunlop¹, Roma Maguire¹ and Alison Kirk²

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Abstract: The COVID-19 pandemic has exposed how our global societies rely upon the care and support of informal (unpaid) caregivers: in the UK alone, there are an estimated 6.5 million informal carers. The caring role is not just precarious, it is often associated with high levels of stress, poor/deteriorating health and crisis points (hospitalizations, worsening of health). Fittingly, there has been much research in recent years focusing on mental health supports. A lesser explored area is physical health and physical activity. To address this, we conducted a real-world feasibility, usability and acceptability study of a novel codesigned digital health app for caregivers to improve levels of physical activity. Our study was designed to test the prototype app use for three weeks, following participants across questionnaires/in app data/qualitative data. Our findings (from 27 caregivers) highlights key knowledge gaps around physical activity—national guidelines were not reaching populations studies and behavioural change techniques hold promise to help support caregivers in the longer term. Our collective results support the acceptability, usability and feasibility of the Carefit app and warrant further investigation.

Keywords: caregivers; innovation; research; co-design; interdisciplinary; digital health; participatory design; collaboration at distance



Citation: Egan, K.J.; Hodgson, W.; Imperatore, G.; Dunlop, M.D.; Maguire, R.; Kirk, A. Supporting Physical Activity for Informal Caregivers during and beyond COVID-19: Exploring the Feasibility, Usability and Acceptability of a Digital Health Smartphone Application, ‘CareFit’. *Int. J. Environ. Res. Public Health* **2021**, *18*, 12506. <https://doi.org/10.3390/ijerph191912506>

Academic Editor: Paul B. Kitchener

Received: 31 July 2021

Accepted: 23 September 2021

Published: 30 September 2021

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1. Introduction

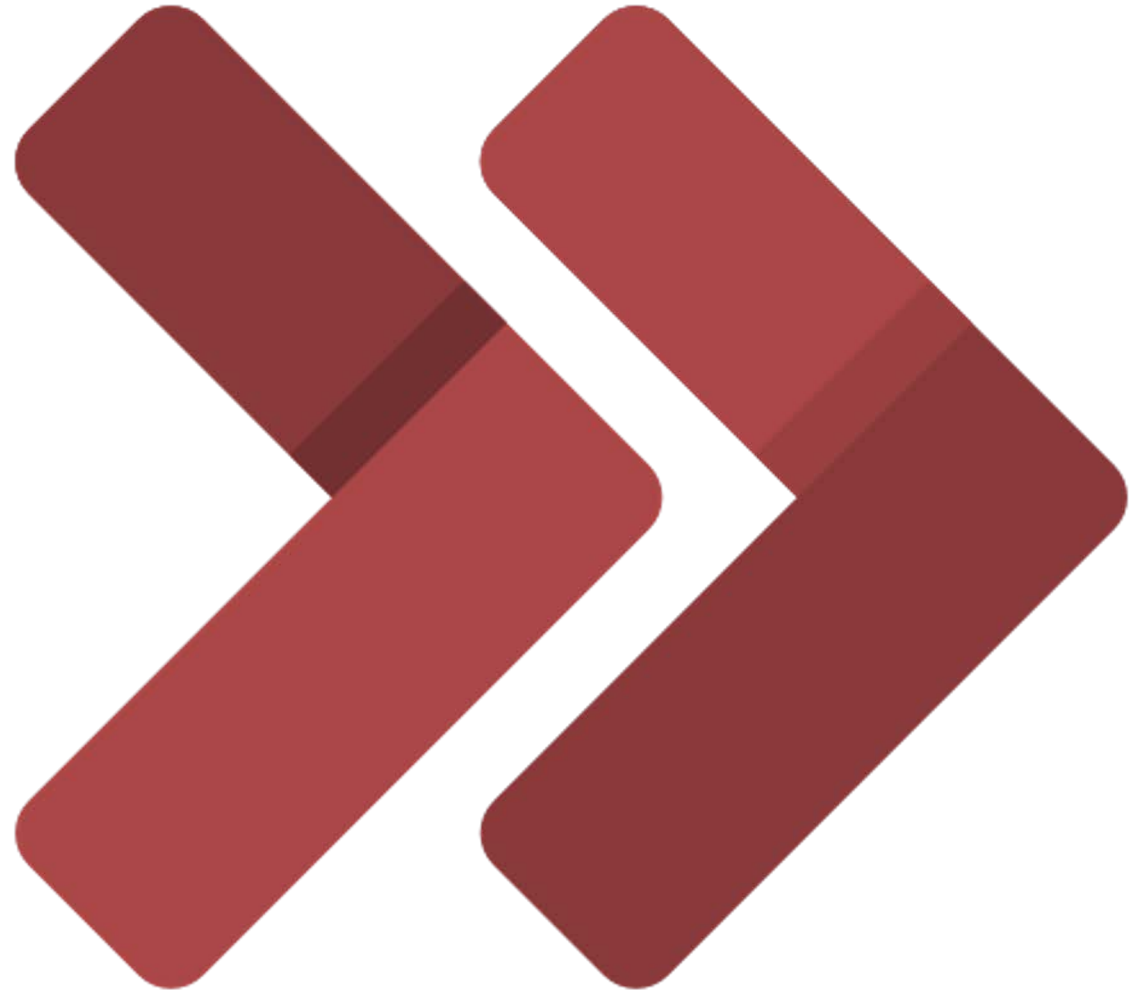
The world population is ageing. By 2050 we can expect 2.1 billion individuals aged 60 years and over: a projected rise of 1 billion people (WHO, 2022). While increases in longevity need to be celebrated, they also pose societal issues for both achieving quality of life and delivering long term care. Around the world, much of our health and social care is delivered not by trained specialists, but by family and friends—informal carers [1,2]. Delivering care can be beneficial for informal carers (e.g., supporting community living, personal growth, resilience and altruism) but for many caregivers it contradicts societal ideals of healthy ageing [3,4]. For example, caregiving is associated with a wide array of negative short and long term consequences—many of which exacerbated by the COVID-19 pandemic [5]. Carers can be left feeling isolated, overworked and burnt out after delivering care for many years and/or many hours a week (including around the clock care). As the immediate impacts of the pandemic subside, critical questions are coming to the floor about how we build resilience in health and social care—including supporting caregivers [6,7].

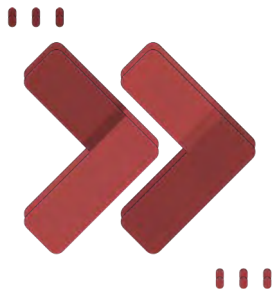
While caregiving has been a topic of research interest for decades [8], the pandemic offers all in society a glimpse of the true value of care. The precise impact of the COVID-19 pandemic on caregivers may never be truly known. Prior to the pandemic, national U.K survey data suggested that 72% of carers experience mental ill health and 61% experience

Int. J. Environ. Res. Public Health **2021**, *18*, 12506. <https://doi.org/10.3390/ijerph191912506>

<https://www.mdpi.com/journal/ijerph>

Phase 2- Professional app development including stronger engagement with key stakeholders for long term implementation





Research aims- stage 2

1. To extend “Carefit” from a 3 week intervention to an 8 week intervention with an NHSx compliant high quality app, and to support longer behavioural change around physical activity in Caregivers of people with dementia
2. To map the social care pathway to explore the feasibility of recruitment across different sites? Who would be willing to recommend an app such as “CareFit” to caregivers? What added value could it bring for their working role? How could it link best to existing infrastructure and services?
3. Build evidence and impact to improve our understanding of:
 - Acceptability, usability and feasibility of the new version of the app
 - Understand how to regularly measure physical activity within caregivers (e.g. self report)
 - Link to an existing dementia resource developed by the World Health Organization (iSupport)
 - Explore unexpected benefits
 - Explore key recruitment uncertainties (i.e. how do we find caregivers who are in need of using the app?)

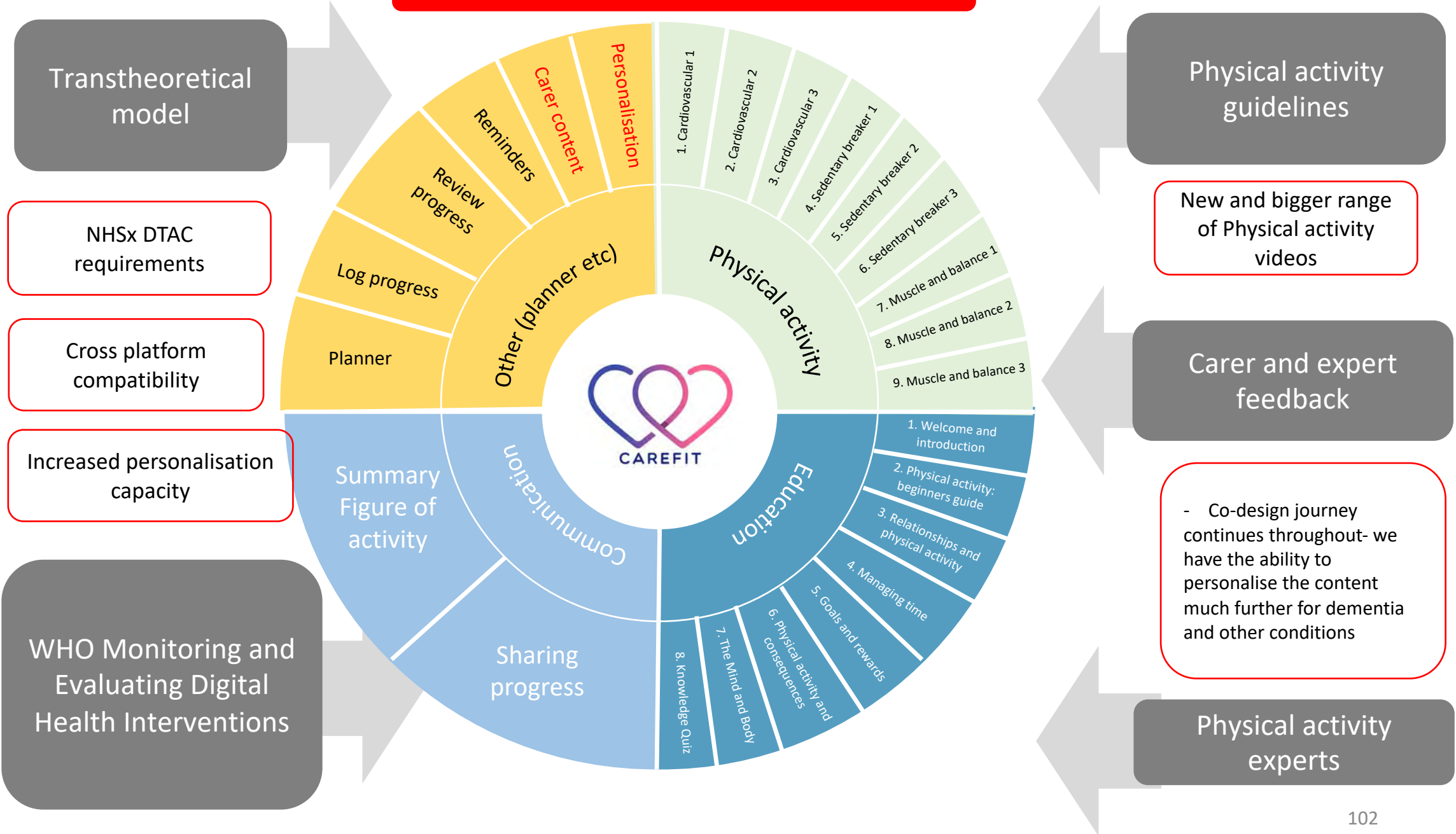


Sep 2022 to Dec 2023

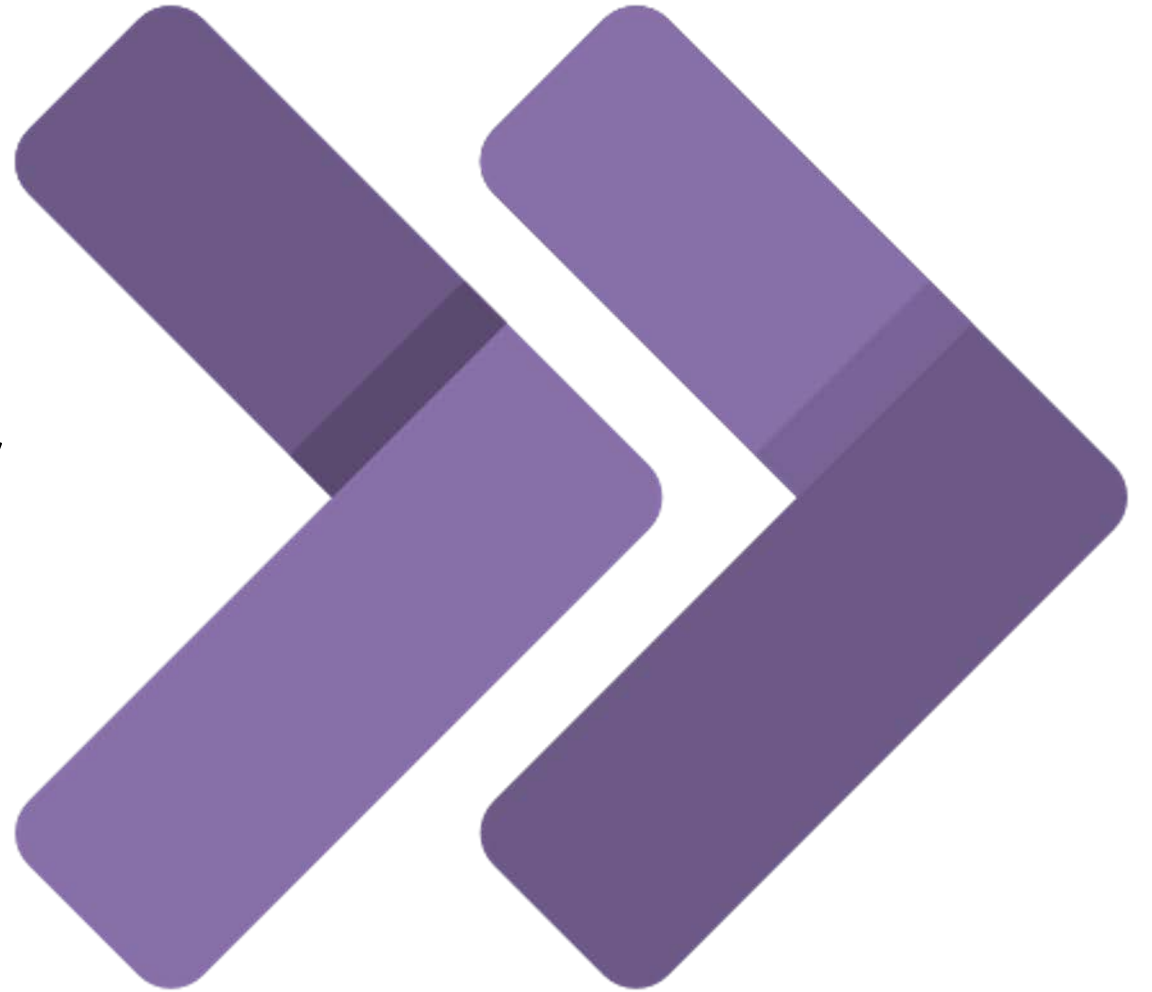
- Codesigning the app for carers of people with dementia
- **Development sprints including new videos and “learn” content-finalising new app**
- Testing the app with 50 carers of people with dementia across Scotland for 8 weeks
- Roundtable Stakeholder meetings-understand opportunities for long term implementation



Additional components

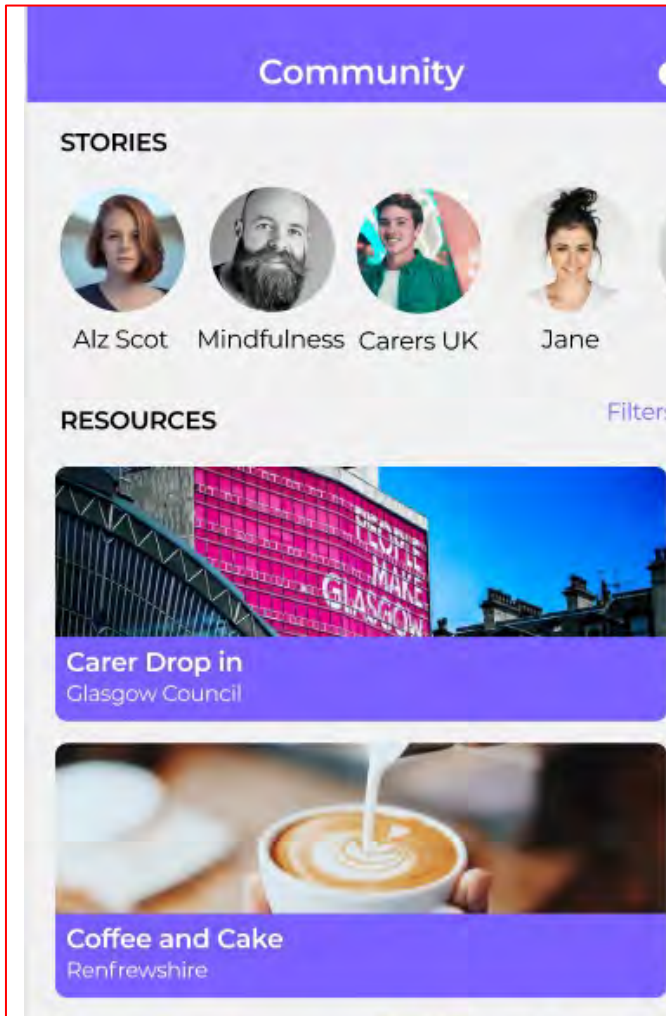


Ongoing
developments and key
questions





Ongoing developments



https://strathsci.qualtrics.com/jfe/form/SV_cZ7RWd0FoZ2jqia

- Are there specific in person or online supports you would like carers of people with dementia to know about in Scotland within the app?
- We can signpost these within the app using the community page.
- We are also experimenting around adding videos/blogs/detail from specific organisations




Building evidence and impact

- Recruitment for the study will begin mid/late March 2023
- Carers will be asked to fill in a pre-post study questionnaires to help us understand the apps impact several outcomes (E.g. Self-efficacy for physical activity and quality of life measures).
- Some carers will also take part in interviews to gain a deeper understanding of app use and unintended consequences of using the app.
- We're asking professional staff to take part in the study for **3 months** but this may be weekly/monthly involvement or take place from time to time
- We also plan round stakeholder meetings at the conclusion of this work in November 2023.



Where next/key questions

- 
- We are currently in the process of setting up a social enterprise to help achieve sustainability for the concept to run currently as we build up the evidence base.
 - We are looking to connect with others here who would be interested to:
 - Connect content to CareFit- we're keen to implement the concept building around existing supports and efforts.
 - Share experiences/ideas as to *how* CareFit can achieve long term sustainability- too few good ideas (both academia and industry) make it to long term sustainability.

What are the biggest challenges you have faced for implementing ideas around digital wellness creation- how did you overcome these?



Thank you and Acknowledgements

- Colleagues in the Strathclyde team:
 - Dr Mark Dunlop, Bill Hodgson, Dr Bradley MacDonald, Dr Alison Kirk, Prof Roma Maguire, Prof Barbara Fawcett
- Project partners/collaborators:
 - Alzheimer Scotland, Alzheimer Society, Carers UK, Glasgow Health and Social Care Partnership and Lanarkshire Health and Social Care partnership, DHI
- Codesigners and participants:
- This work has been funded by:
 - Chief Scientists Office (CSO)
 - National Institute for Health and Care Research
 - Strathclyde Inspire “GATE” innovation pathway



University of
Strathclyde
Glasgow

Lunch break

Interface

Lorraine Thomson

Enabling Business–Academic Collaborations



Lorraine Thomson, Business Engagement Manager
Lorraine.thomson@interface-online.org.uk

Driving Knowledge Exchange in Scotland



Impartial, free, central point of access connecting businesses and organisations from all regions and sectors to Scotland's Universities, Research Institutes and Colleges

Place-based Approach

Interface's place-based approach

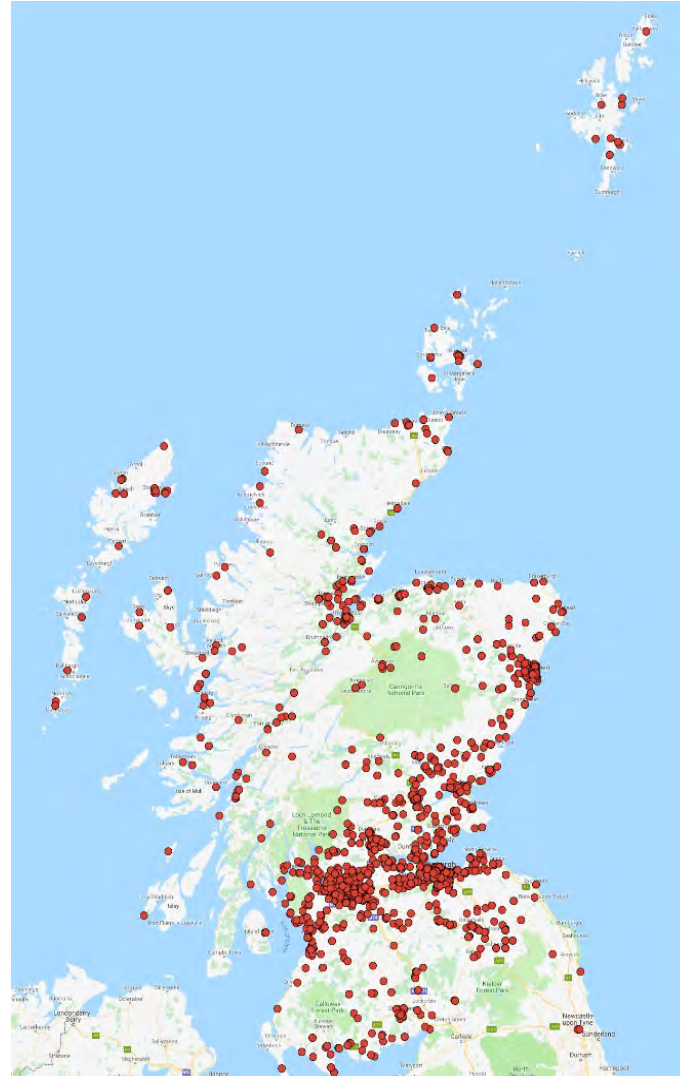
means that all **rural** and **urban** businesses and communities can access innovation support



Facts & figures

Now in its **18th** year Interface is reflected in the following;

- ❖ **Over 6000** project enquiries have been forwarded to academic partners
- ❖ **3500** businesses introduced to academic partners
- ❖ **Nearly 3200** company and university collaborative projects initiated



- ❖ **97%** of businesses said their project would either not have happened or taken longer without support from Interface
- ❖ **92%** of projects - capability and capacity identified within partner Universities / Research Institutes
- ❖ **83%** of businesses recorded reduced operating costs, increased productivity, profits, export, turnover and new or safeguarded employment
- ❖ **71%** involved companies seeking expertise in a discipline different to their own business sector

The Interface service – how it works



Businesses come to Interface directly, or through referrals from business support organisations throughout Scotland, looking to create and develop their ideas or solve a business challenge

INTERFACE WORK
WITH **ALL**
OF SCOTLAND'S
UNIVERSITIES AND
RESEARCH INSTITUTES

The Interface Team work with them to understand their goals and objectives; searching through all of Scotland's higher education and research institutions to find the right partner to address their needs.



Once a match has been made Interface remain on hand to provide continuous support. We can identify numerous funding opportunities to offset the cost of the project.

Interface – the full picture

Raise awareness and promote the benefits and impacts of business and academic collaborations to stimulate demand

Stakeholder engagement including:

- Scottish Funding Council (SFC)
- Scottish Government
- Enterprise agencies
- Innovation Centres
- Scotland Can Do
- Universities Scotland
- Colleges Innovation Working Group



Impartial central point of access connecting businesses and organisations to Scotland's Universities, Research Institutes and Colleges

Supporting groups of businesses in key industry sectors by creating links with academia to encourage growth within the sector

Administration of funding awards to help businesses offset the costs of academic collaborations

Funding options include:

Standard Innovation Vouchers

Up to **£5,000** of funding aimed at encouraging new business and academic partnerships.



- Businesses can apply for a **Product/Process/Service Innovation Voucher** as well as a **Workforce Innovation Voucher**, as long as they are two distinct projects.
- Businesses can also apply together to pool their vouchers to solve a common issue.



Student Placement Innovation Voucher

Up to **£5,000** to fund a PhD or Masters student who will work within your organisation on a clearly defined project.



Advanced Innovation Voucher

Up to **£20,000** of match-funding to encourage sustained relationships with an academic institution, or for those companies who are beginning their collaborative journey.



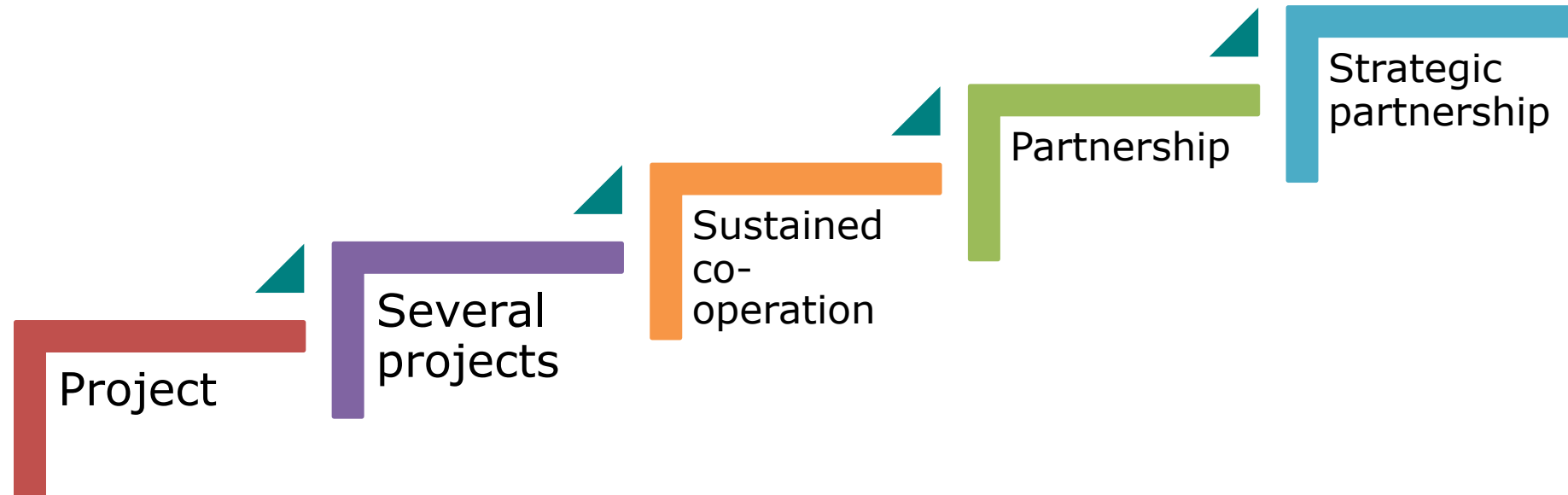
Scottish Inward Investment Catalyst Fund

To support businesses not located in Scotland but seeking to establish stronger ties with academia here, with the intention of landing inward investment.

Healthier Products Innovation Fund for Scotland 2023

To support Scottish businesses in developing healthier products by utilising the world class knowledge base and facilities across Scottish HEIs

Supporting Relationship Building



Reverse Interface

- Developed organically over time as we've built relationships with industry demand and built up relationships with academic partners
- Examples include:
 - Support with **identifying industry partners for large research projects** (ESRC/BBSRC/EPSRC/IAA)
 - Linking in companies for **University outreach events**
 - **Identifying industry partners for student-based projects** (both under and postgraduate) across disciplines including data science, business schools, gaming, design engineering, computing science.

Scottish Government Priorities

Interface delivers right across Scottish Government priorities including:

health

environment

communities

education

young people

international development



Life & Chemical Sciences

CogniCare
A digital companion for
family carers



CogniCare is a digital companion for carers of people with dementia.

- Collaborated with **UHI Institute of Health Research and Innovation** to capture relevant clinical, cognitive, functional and behavioural parameters within CogniCare that could provide key information to both family carers and healthcare professionals
- Funded through an Innovation Voucher
- Further collaboration with the University of Edinburgh Medical School to build a 'soothing' feature within the CogniCare app during Covid-19

"The collaboration supported the development of a prototype of the Monitor & Track feature which is vital to identify early-stage symptoms of dementia"

Pooja Jain, CogniHealth Ltd



Current Health/Snap40 develop wearable medical devices to continuously monitor the health of a patient to detect early warning signs of deterioration

- Collaborated with **UWS Sensors and Imaging Group** to incorporate an ultrasound measurement into their device for monitoring hydration levels in a patient, funded through an Innovation Voucher
- Project resulted in the first wearable device on the market to monitor hydration levels
- Further funding and support from: Digital Health & Care Institute (DHI), Converge Challenge, Scottish Institute of Enterprise, Scottish EDGE and Scottish Enterprise. Snap40 secured £2 million seed funding followed by a £1 million SBRI (Small Business Research Initiative) healthcare development contract from NHS England. They entered the US market in 2019 and In November 2021 joined the Best Buy Health team.

“We have built a great relationship with UWS and have gained access to world class research expertise and are now looking at the potential to integrate a brand new, completely novel sensor into our device that will have real benefits for patients, health services and our company.”

Christopher McGee, Current Health/Snap40

Healthy Ageing project examples

- Housing Society – developed a **suite of Assisted Living Services** to vulnerable residents living in rural affordable housing through Assisted Living Technologies
- Specialist software company - developing **speech and language therapy rehabilitation tools** for adults and children suffering from brain injury
- Provider of care management solutions and market intelligence - created a **mobile platform that supports health care providers** and improves the quality of their service by developing the technology to enable the ability to assess the likelihood of the onset of illness
- Scottish Inward Investment Catalyst Fund - English company developing a **home wellbeing monitoring service** that aims to extend the independence of the vulnerable, particularly the elderly and disabled. Now have a Minimum Viable Product and are currently applying for further funding and both business and academic plan to continue collaborating. Recently partnered with a Housing Association. Strengthening the case for an R&D Base in Scotland and they are currently exploring options.

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InterfaceOnlineUK



Interface - The knowledge



connection for business

Scottish National Investment Bank

Graham Watson



The
Scottish
National
Investment
Bank



The
future
comes
first
Bank

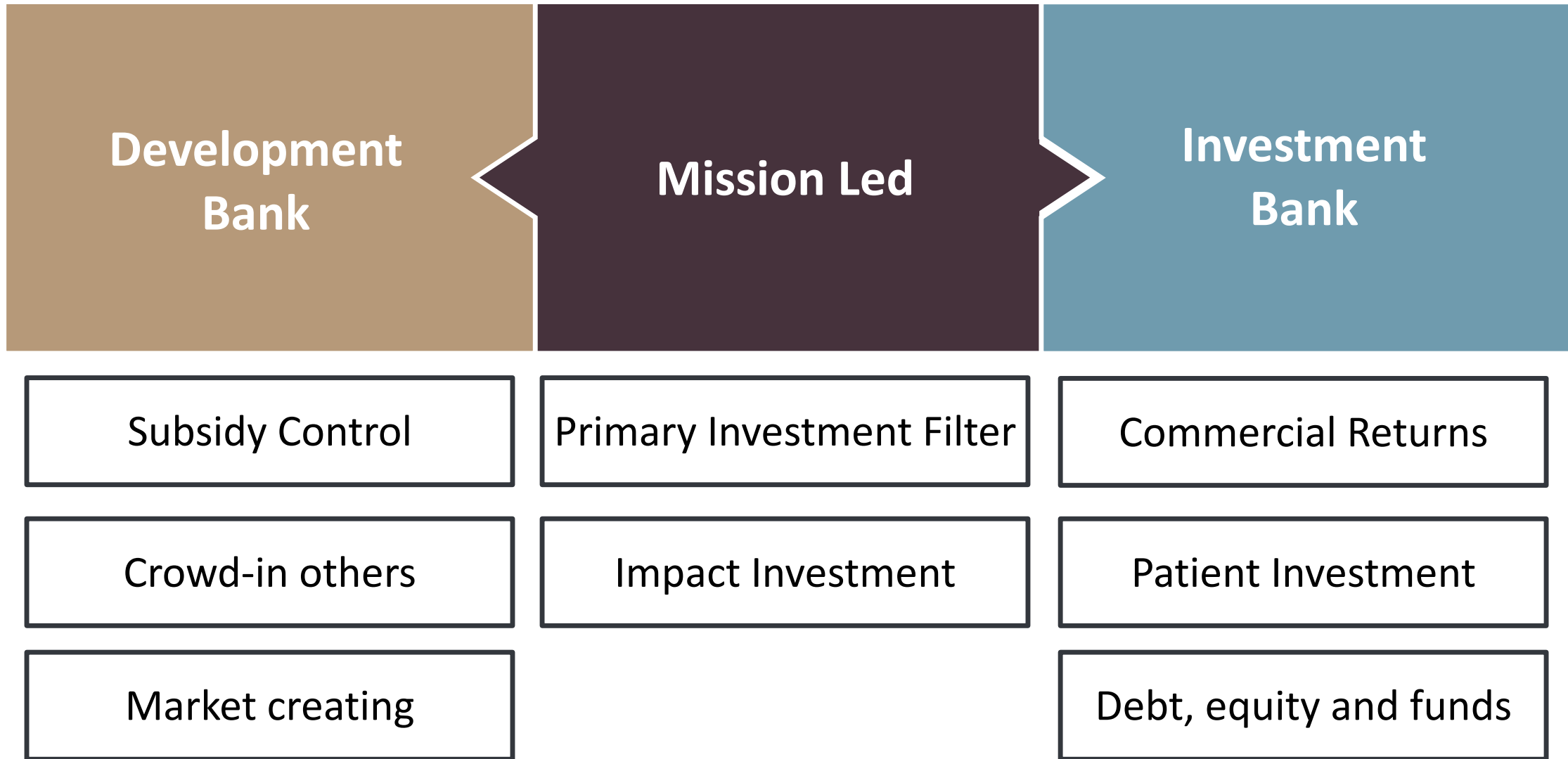
Introduction to
the Bank



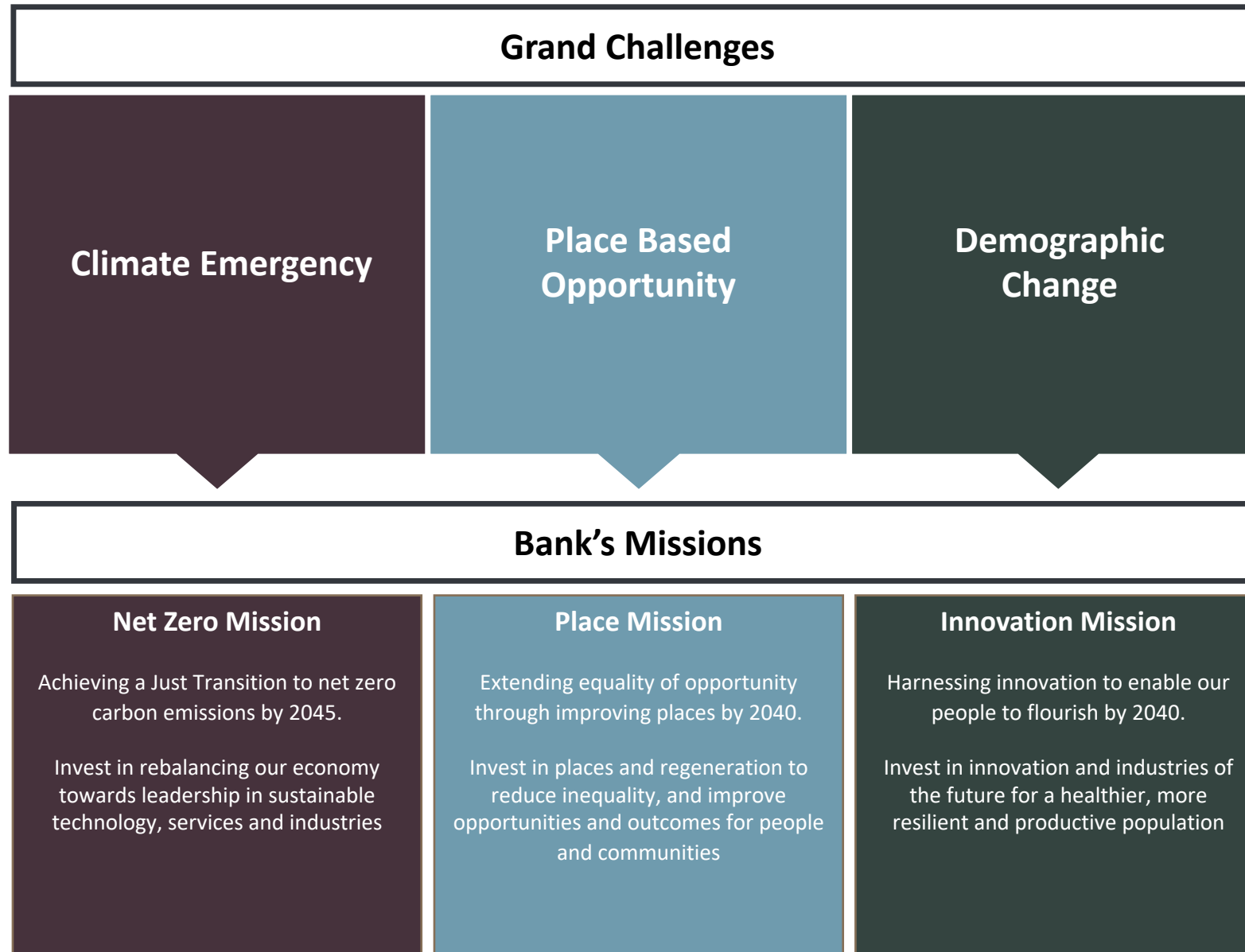
Our Purpose and Vision:

To catalyse economic and societal change and stimulate innovation by investing in a fairer, sustainable and ambitious Scotland.

Our Approach



Our Missions



Our Investment Portfolio

- **24** concluded investments since launch in November 2020
- Ticket sizes from **£1 million** to **£50 million**
- Total committed investment since launch: **£378.2 million**
- Additional investment committed alongside Bank capital: **£650 million**

Example investment types:

- **Equity**

- £16 million investment in heat battery manufacturer, Sunamp, via CLN to support subsequent fundraising round.
- £12.5 million equity and debt investment in laser manufacturer M Squared, alongside £20 million debt facility from Santander to fund BGF exit.

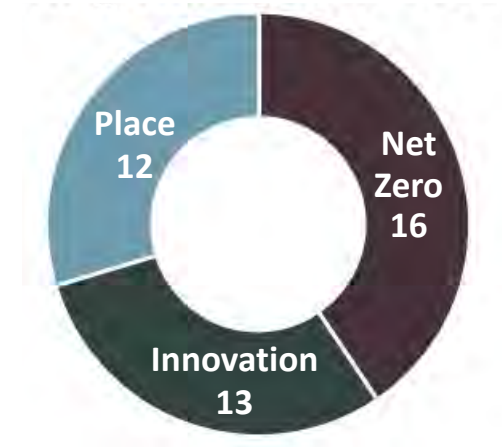
- **Debt**

- £35 million loan to Port of Aberdeen for South Harbour development, also funded by the European Investment Bank, Scottish Enterprise, and the Aberdeen City Deal.

- **Fund**

- £50 million cornerstone commitment to new Gresham House fund for forestry creation, facilitating a total raise of more than £150 million.

Numbers of investment by mission alignment (primary and secondary):



Our Investment Portfolio – continued...



Harnessing Innovation

M Squared

£12.5 million investment of growth capital to support the scale up of a high tech SME



Building Communities

PfP Capital

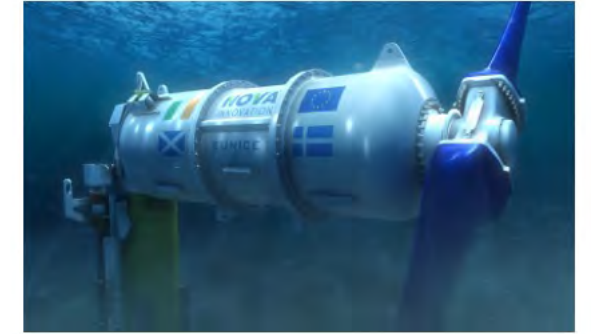
£40 million commitment to a mid-market rent housing fund



Harnessing Innovation

Krucial (formerly R3 IoT)

£1 million investment in a growing tech firm, alongside US VC investment



Net Zero

Nova Innovation

£6.4 million investment in a tidal turbine manufacturer



Net Zero

Forev

£12 million investment to support planned roll out of EV charging points



Net Zero

IndiNature

£5 million investment in a natural fibre insulation manufacturer, to open a new manufacturing facility in Jedburgh



Net Zero

Gresham House Forestry Fund

£50 million commitment to a forestry fund focussed on new planting and forest expansion



Net Zero

Sunamp

£16 million investment to support the scale up of East Lothian-based heat battery manufacturer that is exporting globally

Our Investment Portfolio – continued...



Net Zero

Iona Wind Partnership

£13 million commitment to an onshore wind development fund



Building Communities

Strathcarron Homes

£3 million investment that will deliver 25 high quality family homes for local social housing tenants and first-time buyers in Nitshill



Building Communities

Lothian Broadband Group

£20 million cornerstone investment to extend digital infrastructure to rural communities and small towns across Scotland



Building Communities

Highland Coast Hotels

£6.95m loan to upgrade hotels along the North Coast 500 route



Net Zero

Aberdeen Harbour

£35m loan for the expansion of Aberdeen Harbour, the largest marine infrastructure project in the UK



Harnessing Innovation

Travelnest

£7.5 million investment in a travel tech business to allow the company to target new markets



Net Zero

Circularity Scotland

£9million investment to fund the development of Scotland's Deposit Return Scheme



Harnessing Innovation

Elasmogen

£3.5 million investment in an Aberdeen-based biologics company

Our Investment Portfolio – continued...



Net Zero
Orbital Marine Power

£4m project finance for tidal power project off the Orkney with the capability to power 1,700 homes.



Harnessing Innovation
pureLiFi

£10m investment in Edinburgh-based global tech leader developing ultra high speed data transmission using the light spectrum



Improving Places
Lost Shore

£26m investment to develop new country park and world-class on-land surfing facility on previous brownfield site, as part of a £50m+ package of investment.



Net Zero
Trojan Energy

£9m investment to support scale-up of innovative EV charging business



Harnessing Innovation
Orbex

£17.8m investment in Forres-based low-cost orbital launch business, which uses renewable bio-fuel to reduce launch emissions by up to 90%



Improving Places
Social and Sustainable Housing Fund

£15m investment in fund which will allow charities and communities to buy properties they would not otherwise be able to attain



Net Zero
North Star Renewables

£50m investment to build service operations vessels to support the renewable energy sector



Harnessing Innovation
PneumoWave

£5.2m investment to continue clinical trials of biosensor technology that monitors potential fatal respiratory changes.

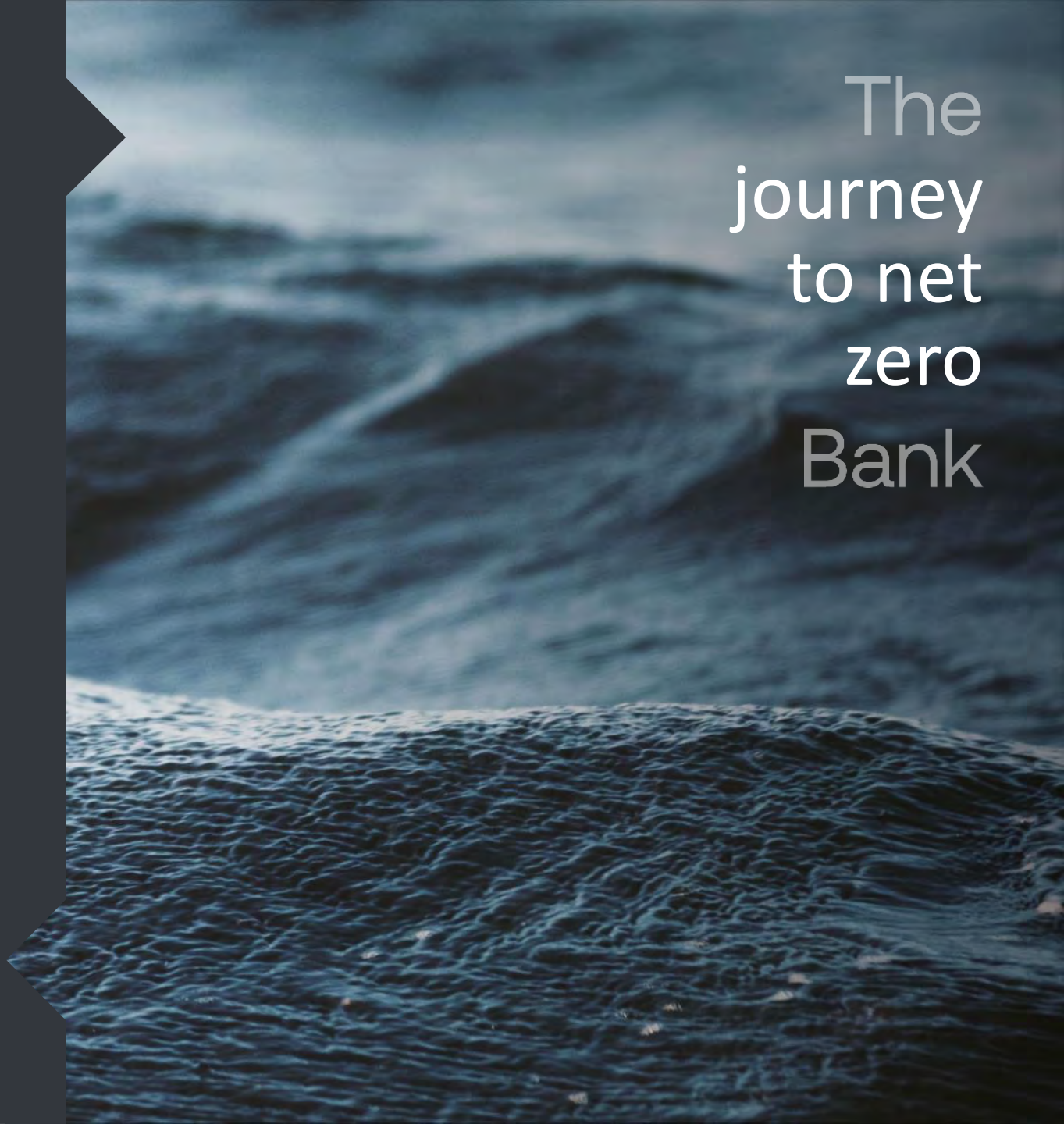
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The
Scottish
National
Investment
Bank

The
journey
to net
zero
Bank



Our early Investments – Client Feedback

◇ The Scottish National Investment Bank

“We have been successfully powering homes, businesses, and the grid in Shetland for over five years. We now look forward to delivering our product to new markets around the world.

We would like to thank the Scottish National Investment Bank for this significant investment in mass manufacturing and distribution of Nova’s tidal energy technology – supporting Scotland’s transition to net zero and tackling the climate emergency.”

Simon Forrest
CEO of Nova Innovation



Our early Investments – Client Feedback

◊ The Scottish National Investment Bank

“We couldn't be happier having The Scottish National Investment Bank back us – it's a strong mission fit.

“It feels great that we can move forward to create local Borders jobs and make insulation on scale in Scotland – insulation that's good for people's health and the planet.”

Scott Simpson,
Co-founder & CEO of IndiNature



Neuromotor Pen

Manus NeuroDynamica

Dr Rutger Zietsma

manus

NEURODYNAMICA



neuromotor
pen





Revolutionising neuromotor disease detection and monitoring

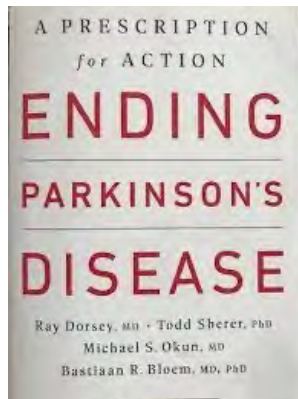
Novel sensor & AI technology – digital biomarker recording

Wide applicability across the spectrum of neurological impairments

FDA "*Breakthrough Device designation*" for Parkinson's & tremor diagnosis

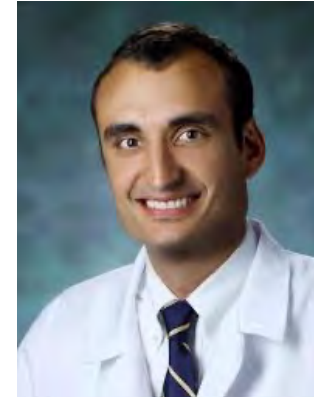
The neuromotor opportunity

Revolutionising neuromotor disease diagnostics and monitoring



Profs Ray Dorsey, Michael Okun, Bas Bloem:

***“We are the failing Parkinson’s community
- Fundamental restructuring of care is required.”***



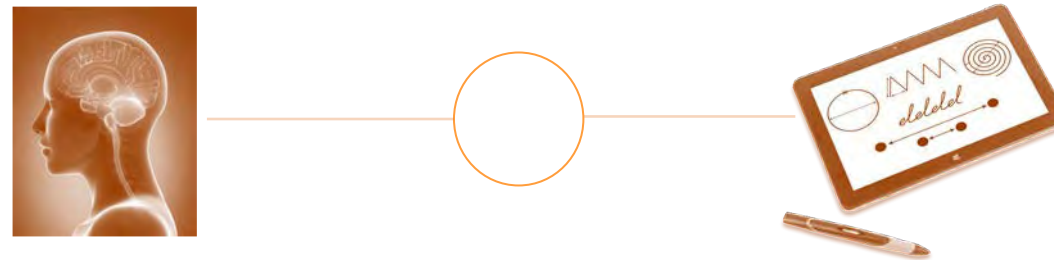
- Critique current *“clinic-centred approach”* & Propose *“patient-centred care”*
- Faster diagnostics, early diagnosis, optimised/individualised treatment
- By implementing digital health- diagnostic & monitoring
- **Manus Mission: Revolutionising neuromotor disease detection and monitoring**

The neuromotor pen opportunity

Revolutionising neuromotor disease diagnostics and monitoring



- Today **distinguishing neurological disorders is difficult & time consuming specialist task**
- Neurodegenerative disease on the rise, EU:
 - By 2037, 1.6 times as many Parkinson's patients as today
 - > 15 m patients with essential tremor
 - 10 m people with Dementia; Only 32% over 65 diagnosed
- Health systems across the world cannot cope with throughput
- **Urgent need to re-engineer patient pathway – serving > 25 million patients in EU**



- Manus **NeuroMotor Pen™** Tech = Unique “Aid to diagnosis” device:
 - Decision support in clinic - aid to measure & interpret not/hardly visible symptoms
 - Making brain-hand connection, non-invasively – instead of brain scan
- **Opportunity to reduce patient suffering, help clinician & reduce expenditure**

The Solution

The NeuroMotor Pen™ (NMP) platform



neuromotor
pen 



BLE Connection



Cloud Computing,
AI interpretation



Tremor differential
diagnosis



Accurate fine motor skill
quantification



Quantifies 50 unique
neuromotor biomarkers



Short, 15 minute
handwriting test using
NMP

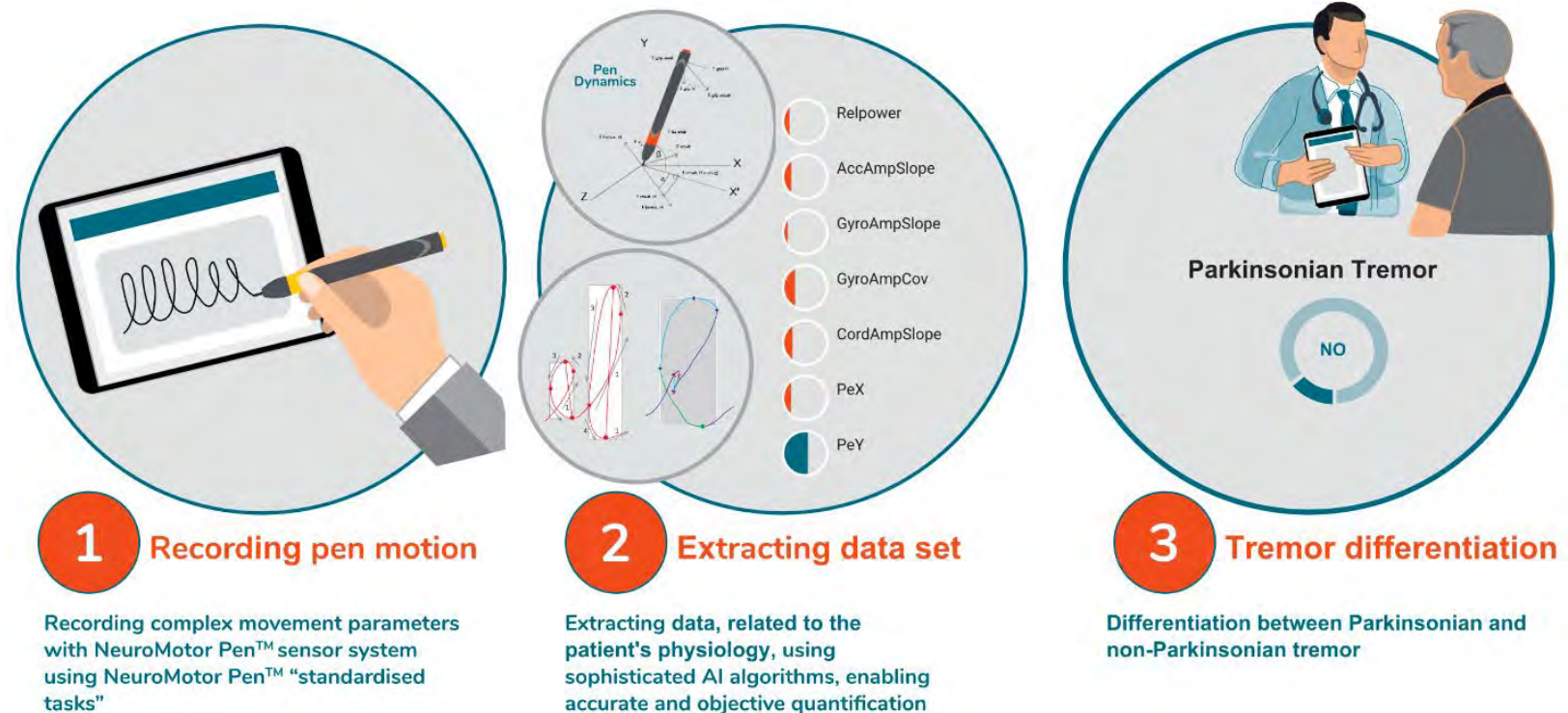


Tremor vs Parkinson's probability result

Available - anywhere & time it's needed



Quantifying subtle symptoms not visible to the naked eye:

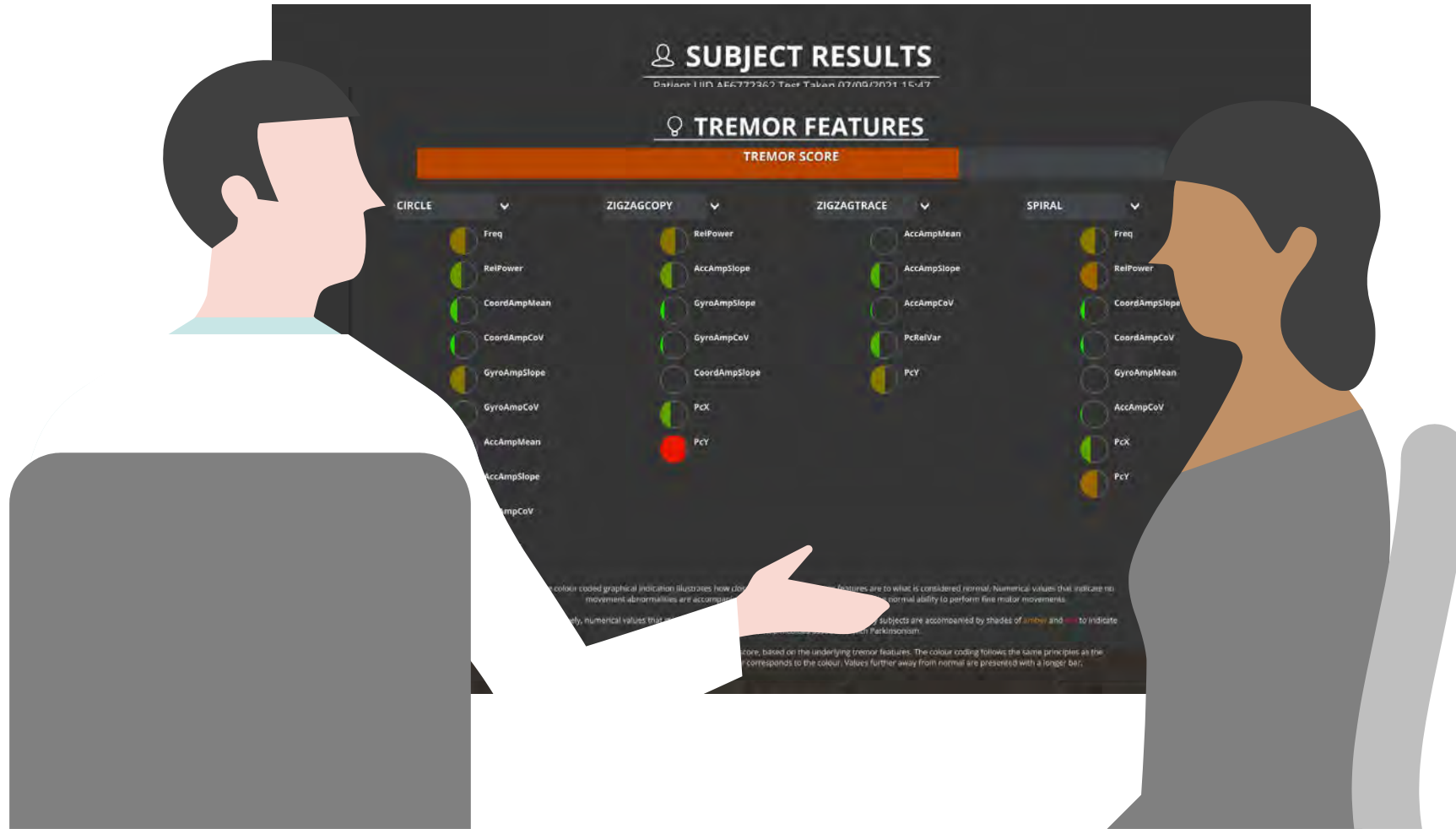


For example:

patient A (ET) and Patient B (PD) exhibit similar symptoms: NMP can differentiate

Easier for clinician and patient

Proprietary hard- and software for movement symptom rating



Tremor vs Parkinson's probability result

Available - anywhere & anytime needed



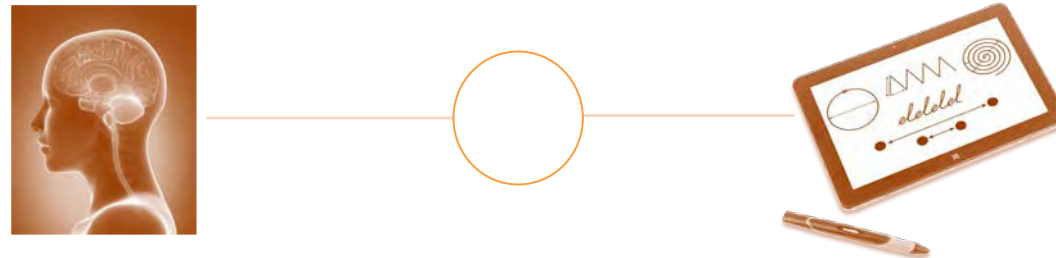
NMP digital biomarkers:

Non-invasive quantification of Physiological characteristics

& Subtle pathological changes

- not visible to naked eye

= Test of Extra Pyramidal System of the Brain



The neuromotor pen opportunity

NMP benefits in Parkinson's: Clinical, Operational & Financial



**Signs & symptoms can be difficult to interpret
for 50% referrals at first appointment**



- Provides the same accuracy in community/primary care settings as today only available in specialist centers and helps triage to specialist
- Reduces the time to diagnosis & increases first visit diagnostic accuracy Without the need for a DaTSCAN

Utility in movement disorders – PD/Tremor

Credibility: successful clinical validation



Published clinical validation studies with neuromotor pen

- NMP **standardised drawing tasks** for assessment [1,2,3,4,5];
- **Accurate quantification** of symptoms and **rating medication effects**, similar to the Purdue pegboard task (reference measure) [1, 3].
- NMP scores **match standard Unified Parkinson's Disease Rating Scale** [1,3].
- **High reproducibility** [2].
- **Accuracy > 80% differential diagnosis** of Parkinson's vs other; **sensitivity 86%** [4,5].
- **Usability: Automated** record keeping; **Can be used at home by non-experts** [3,5]

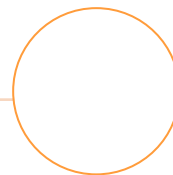
NMP Utilities beyond Parkinson's

Ongoing clinical studies



R&D & clinical validation studies with **neuromotor pen**

- Schizophrenia: managing anti-psychotic drug treatment – avoiding side effects
- Clinical outcome measurement of surgical nerve repair
- Neurotoxicity in cancer treatment – early detection of side effects
- Supporting detection of dementia



NMP Utility in detection of dementia



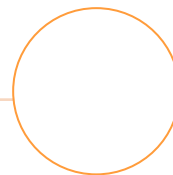
Ongoing Innovate UK sponsored R&D with clinical study

Background:

- Movement abnormalities associated with dementia: myoclonus, paratonia and dyskinesia [6].
- Seen in LBD & vascular/frontotemporal dementia [7]

NMP:

- generic tool for quantifying motor deficits (validated)
- cognitive impairment (being developed/validated)
- First tool to combine measures of movement abnormalities & cognition
- To aid in the early detection/screening & diagnosis of movement/psychiatric disorders





neuromotor pen

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manus 
NEURODYNAMICA

Appendices:

The following slides provide background information only
and do not form part of presentation

US Tremor Market & Opportunity

Tremor differentiation market – **FDA** conclusion after product review



'**Breakthrough device**' designation from the **FDA** for the **neuromotor pen**  ("Device") Establishes:

- ✓ Device Represents a **breakthrough technology** for the tremor differentiation market
- ✓ NMP availability in the US is in **the best interest of patients**
- ✓ Device offers **significant advantages over existing approved or cleared alternatives**
- ✓ Device provides a **more effective differential diagnosis of tremor** – including 'difficult Parkinson's
- ✓ The **current diagnostic standard of care is inadequate** – time to diagnosis problem & difficulty

The Market Opportunity



Market Segments for **NeuroMotor Pen™ (NMP)** platform.

First market - Tremor disorders & PD

**Differential diagnostic
tremor disorders:**
US: \$1 billion p/a
EU: \$1.4 billion p/a

Parkinson's Monitoring
US: \$340 million p/a
EU: \$240 million p/a

Additional markets

Schizophrenia

Monitored to avoid EPS:
EU: \$500 million p/a
US: \$800 million p/a

Alzheimer's disease

Diagnostic aid:
EU: \$410 million p/a
US: \$480 million p/a

Neurological diseases impact 100 million Americans every year the annual spend on neurological disorders is estimated to be around \$800 billion

* <https://corporatefinance.kpmg.us/insights/2020/neurology-ma-overview.html>

Impact & Value: Northumbria NHS Trust

Same accuracy in primary care settings as previously only in specialist centers
Reducing number of brainscans required in specialist centres



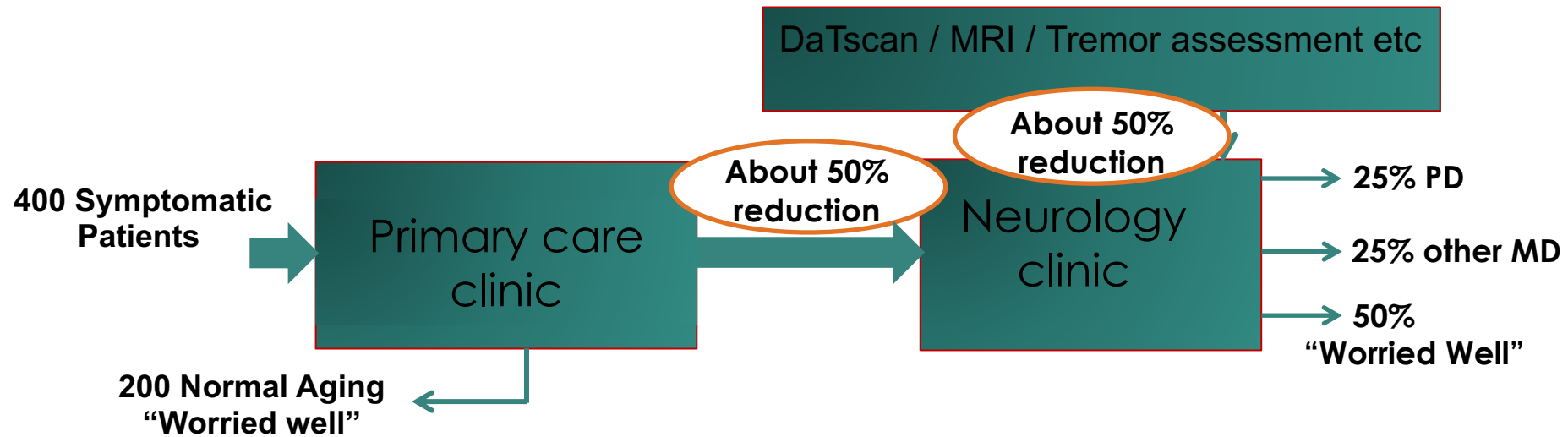
Specialist care:

NMP comparable accuracy as brainscan:
enabling diagnosis at first appointment -
reducing 2nd & 3rd appointment for 200 patients

In primary care:

NMP same level of accuracy as neurologists
- Reducing 200 referrals of worried well

& reducing 100 brainscans



NMP patient monitoring: long term benefits



Clinical & Financial benefits of symptom monitoring

- Enabling to fine tune treatment in early disease stages can prevent escalation
 - Reduce overall costs of PD management over life of patient (extremely high!):
 - 61% patients currently non-compliant after 1 year of treatment; 50% mean cost increase¹
 - Compliant with drug therapy: 18% lower total costs, i.e. per patient \$3,508 p/a ¹²
 - 39% fewer PD-related hospitalizations;
 - 47% lower inpatient costs;
 - Specialists report: NMP enables more accurate motor symptom measurements;
 - Conclusion: NMP supports optimised treatment & therapy compliance;
- deferring patient deterioration and exponential cost increase

1. Davis KL, Edin HM, Allen JK. Prevalence and cost of medication nonadherence in Parkinson's disease: evidence from administrative claims data. *Movement Disorders* 25(4) (2010):474-480
2. Delea TE, Thomas SK, Hagiwara M. The association between adherence to levodopa/carbidopa/entacapone therapy and healthcare utilization and costs among patients with Parkinson's disease: a retrospective claims-based analysis. *CNS Drugs* 25(1) (2011):53-66

Management

The Manus Team



Dr Rutger Zietsma

CEO & Founder

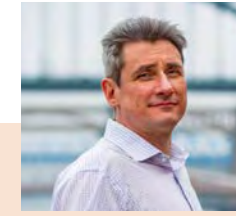
Worked/trained in industry (Philips medical & Cap Gemini), PhD in neuroscience, MBA; Driving force: generated NMP concept, led product development & CE marking, Raised £6.2 m (£3.5 m non-dilutive), Established long term partnerships (Stabilo) & collaborations, established first sales.



Mr Phil Pattison

FD

Experience FD with General Electric, Rolls-Royce, M&S, Royal IHC and healthcare SMEs; floated skincare company on AIM. Identified/developed spin outs to create high growth businesses. Chartered Banker; holds MBA & Black Belt in Six Sigma, business process improvement.



Dr David Bramwell

COO

Experienced technical, product and operations director. Ex-CTO Nonlinear Dynamics Ltd, where he led the development of algorithms for the Progenesis product line. Drives NMP product delivery according to technical, QMS and regulatory requirements and taking responsibility for all associated processes.

Dr Odin Taylor

Chief Systems Architect

Ex-Amplify, Developed Amplify core tech & back end in 2016, which was then taken to market as DataVoyant

Dr Chris Papasavvas

Data Scientists

PhD & Post-doc level research experience, Outstanding computational modelling, AI, ML and data science experience

Dr Sanja Bojic (medic)

Clinical Specialists (sales)

Medical doctor with PhD & Post-doc level research experience, Outstanding interpersonal and negotiation skills

PD Dr med Angela Deutschlander

Clinical Specialist (clinical studies)

Neurology Consultant and Movement Disorder specialist (LMU, Munich and Mayo Clinic, USA. Authored > 80 peer reviewed papers

Mr Michael Zollo

Commercial lead Germany

Senior FMCG marketing director, entrepreneur (automobile electronics, IT, creative industries). As commercial champion drives Germain retail opportunity for NMP.

References



1. Esther Smits, Antti Tolonen, Luc Cluitmans, Mark Van Gils, Bernard Conway, Rutger Zietsma, Klaus Leenders, and Natasha Maurits. Standardized Handwriting to Assess Bradykinesia, Micrographia and Tremor in Parkinson's Disease. PLoS ONE E97614 9.5 (2014).
2. Esther Smits, Antti Tolonen, Luc Cluitmans, Mark Van Gils, Rutger Zietsma, Marina Tijssen, and Natasha Maurits. Reproducibility of Standardized Fine Motor Control Tasks and Age Effects in Healthy Adults. Measurement 114 (2018): 177-84.
3. Esther Smits, Antti Tolonen, Luc Cluitmans, Mark Van Gils, Rutger Zietsma, Robbert Borgemeester, Teus Van Laar, and Natasha Maurits. Graphical Tasks to Measure Upper Limb Function in Patients with Parkinson's Disease: Validity and Response to Dopaminergic Medication. 2015.
4. Esther Smits, Antti Tolonen, Luc Cluitmans, Mark Van Gils, Natasha Maurits, and Rutger Zietsma. Distinguishing Parkinson's Disease from Other Syndromes Causing Tremor Using Automatic Analysis of Writing and Drawing Tasks. Proceedings of 15th International Conference on Bioinformatics and Bioengineering (BIBE), Belgrade, Serbia. 2015.
5. C. Papasavvas, R. Zietsma, S. Dodds, L. Cluitmans, Deutschlandler, R. Walker, Objective and easily performed assessment of fine motor skills to support the differential diagnosis of Parkinson's disease (PD) and other movement disorders, Movement Disorders Conference, Madrid, 2022.
6. Marcelo J. Merello editor, Sergio E. Starkstein editor. Movement disorders in dementias / Marcelo Merello, Sergio E. Starkstein editors. London: Springer, 2014; 2014.
7. Ratnavalli E, Brayne C, Dawson K, Hodges JR. The prevalence of frontotemporal dementia. Neurology. 2002 Jun 11;58(11):1615-21.

Brain Health Special Interest Group

Dr Mario Parra Rodriguez Scottish Dementia Research Consortium



Scottish Dementia
Research Consortium



Digital Health & Care
Innovation Centre



Special Interest Group

Technologies for Brain Health and Dementia Prevention

Dr Mario A Parra

mario.parra-rodriquez@strath.ac.uk



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Brain Health & Dementia



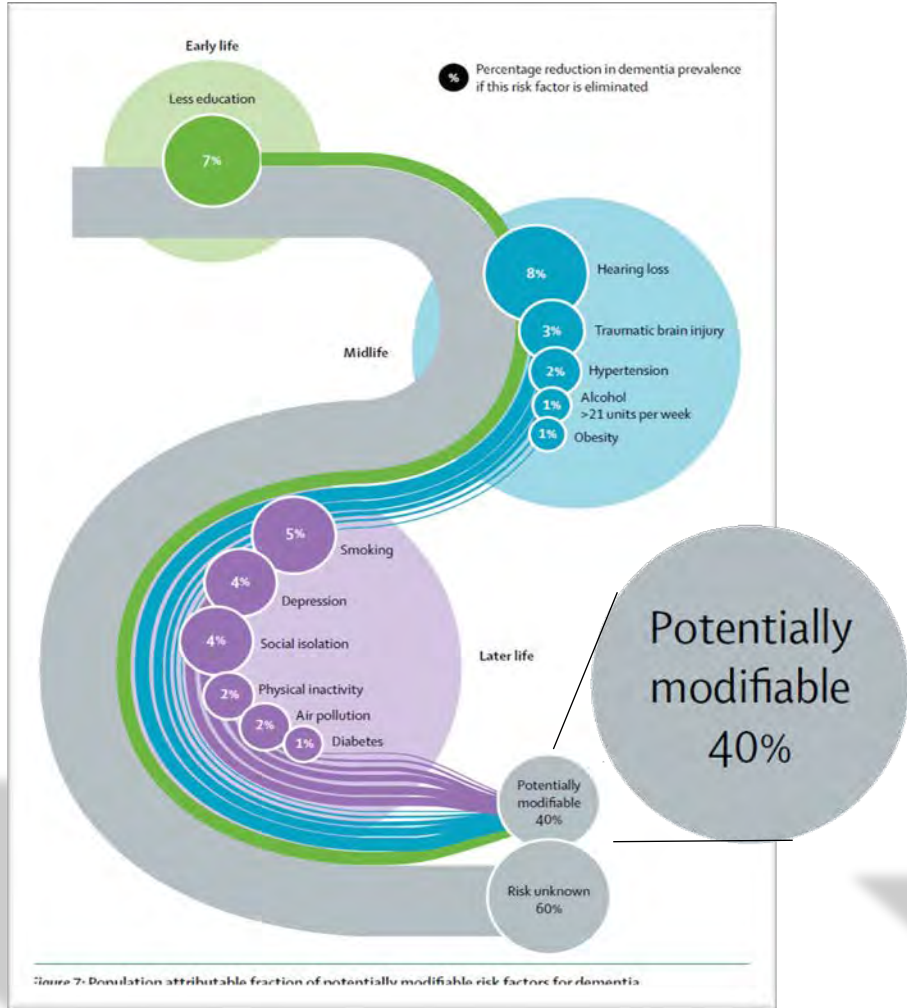
Brain Health is an emerging and growing concept that encompasses neural development, plasticity, functioning, and recovery across the life course.

Good brain health is a state in which every individual can realize their own abilities and optimize their cognitive, emotional, psychological and behavioural functioning to cope with life situations.

1. It involves interconnected social and biological determinants
2. It creates opportunities for promotion and prevention strategies across the life course.
3. They require multisectoral and interdisciplinary collaborations with a holistic person-centred approach
4. They need to involve/engage people with lived experiences, their families, and carers



Brain Health & Dementia Prevention



Livingston et al., 2020

The Lancet Commissions

Dementia prevention, intervention, and care: 2020 report of the Lancet Commission

Bill Livingston, Jonathan Huntley, Andrew Sommerlad, David Ames, Clive Ballard, Sube Banerjee, Carol Brayne, Alistair Burns, Saskia Cohen-Mansfield, Claudia Cooper, Sergi G Costafreda, Armit Dias, Nick Fox, Laura N Gitlin, Robert Howard, Helen C Kales, Mika Kivimaki, Eric B Larson, Adesola Ogundimu, Vasiliki Orgeta, Karen Ritchie, Kenneth Rockwood, Elizabeth L Sampson, Quincy Samus, Lon S Schneider, ...

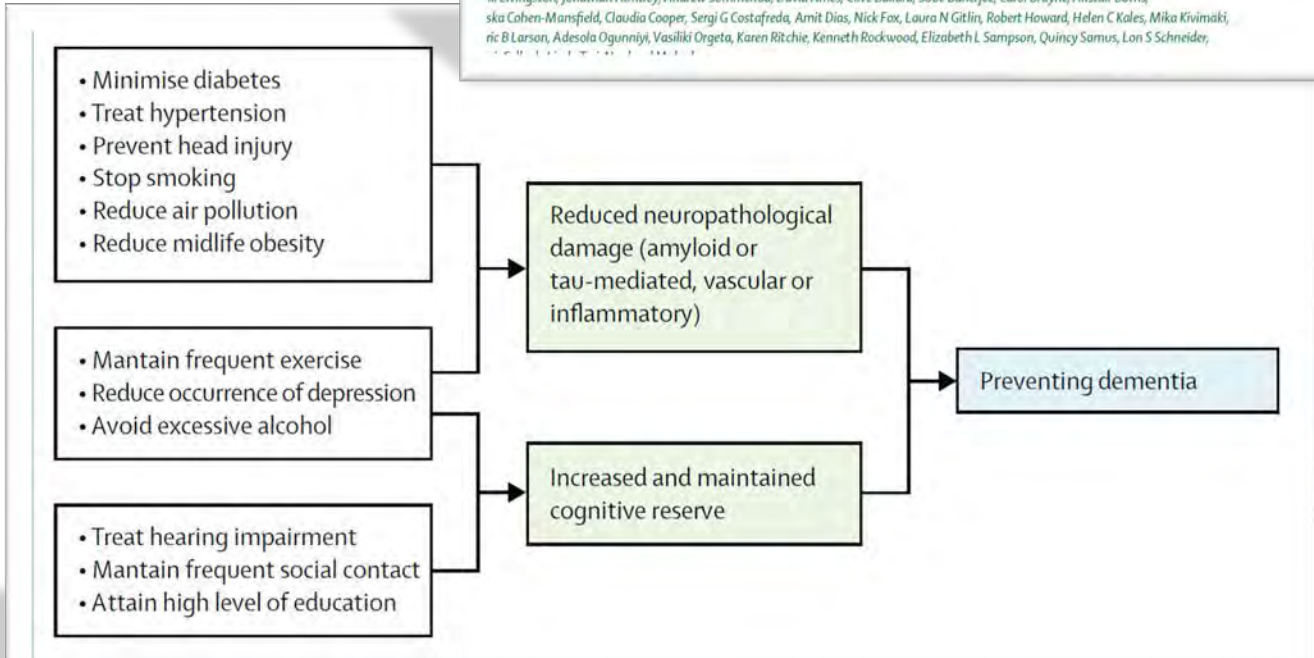


Figure 2: Possible brain mechanisms for enhancing or maintaining cognitive reserve and risk reduction of potentially modifiable risk factors in dementia



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Brain Health & Dementia Prevention in Scotland

Prev Alz Dis 2022;2(9):348-358
Published online December 1, 2021, <http://dx.doi.org/10.14283/jpad.2021.63>

Review

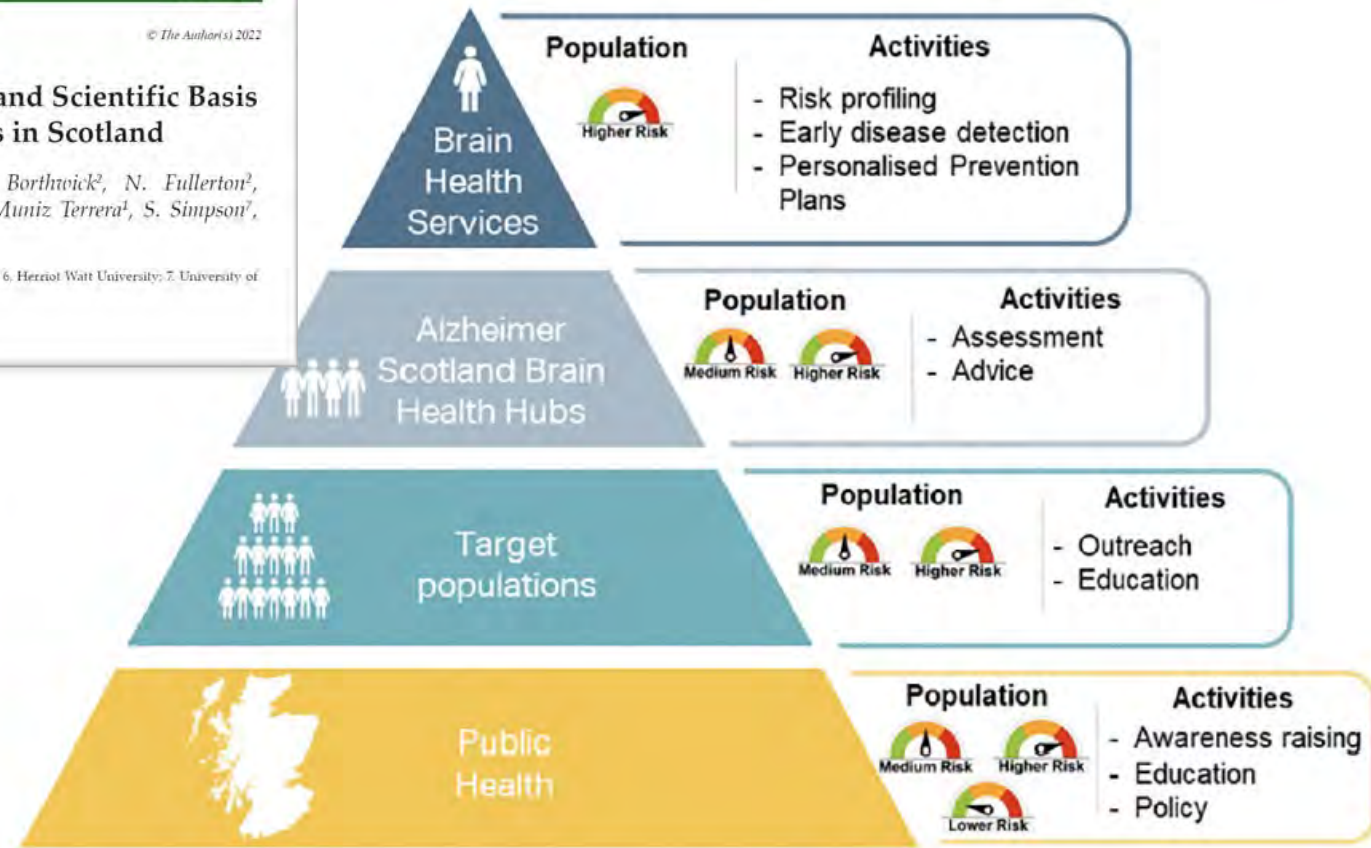
© The Author(s) 2022

The Scottish Brain Health Service Model: Rationale and Scientific Basis for a National Care Pathway of Brain Health Services in Scotland

C.W. Ritchie^{1,2,3}, J.M.J. Waymont^{2,4}, C. Pennington^{1,2,5}, K. Draper², A. Borthwick², N. Fullerton², M. Chantler⁶, M.E. Porteous^{1,5}, S.O. Danso¹, A. Green¹, L. McWhirter¹, G. Muniz Terrera¹, S. Simpson⁷, G. Thompson¹, D. Trépel^{8,9}, T.J. Quinn⁷, A. Kilgour^{1,2}

¹ University of Edinburgh; ² Brain Health Scotland; ³ NHS Lothian; ⁴ University of Aberdeen; ⁵ NHS Forth Valley; ⁶ Herriot Watt University; ⁷ University of Glasgow; ⁸ University of Dublin Trinity College; ⁹ Global Brain Health Institute, United Kingdom

Corresponding Author: Prof. Craig Ritchie, University of Edinburgh, United Kingdom, craig.ritchie@ed.ac.uk



Secondary prevention | High intensity | In person



Primary prevention | Low intensity | Remote/online



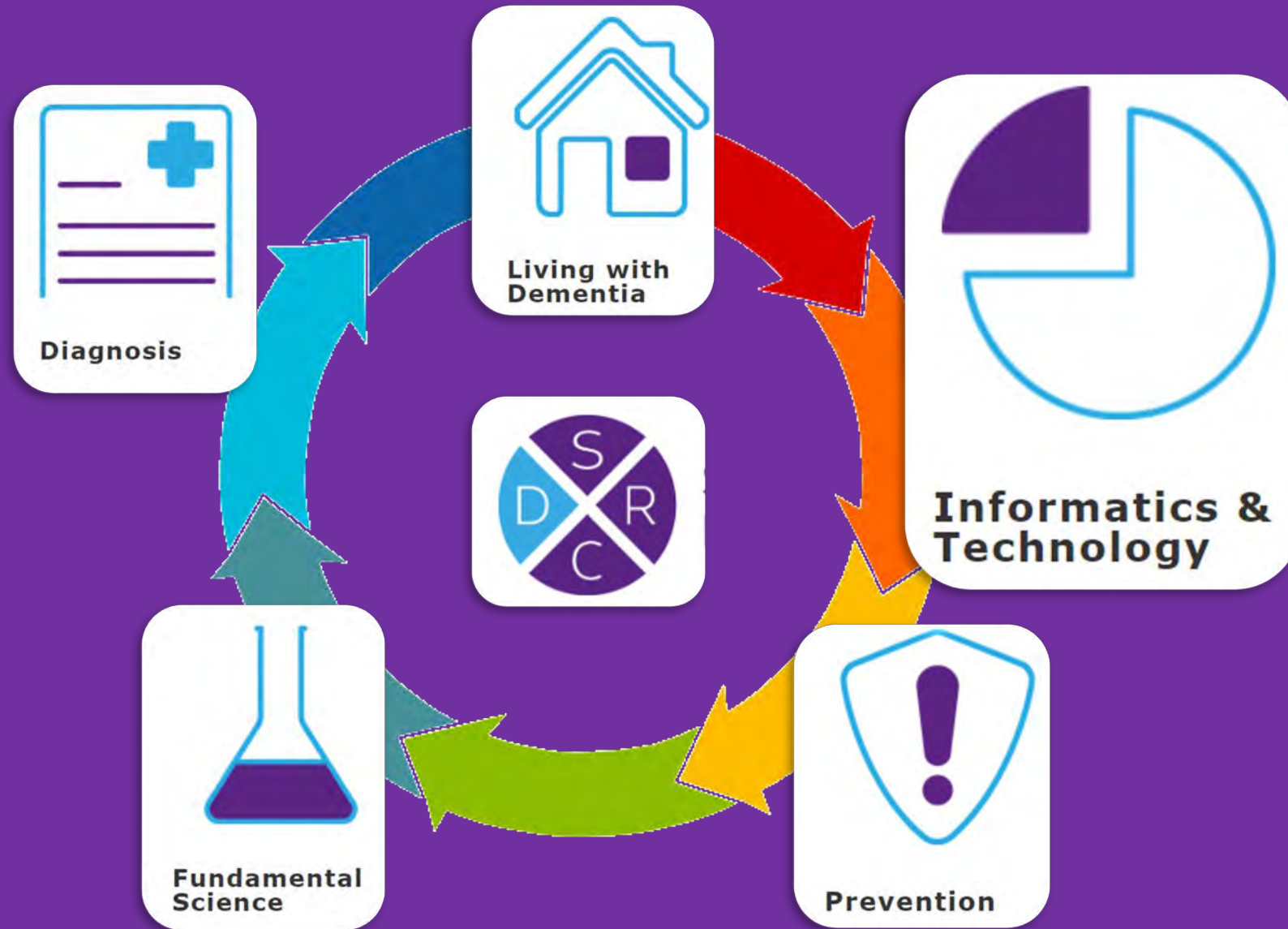
We are all researchers

Scottish Brain Health & Dementia Research Strategy

sdrc.scot/researchstrategy



Scottish Dementia Research Consortium





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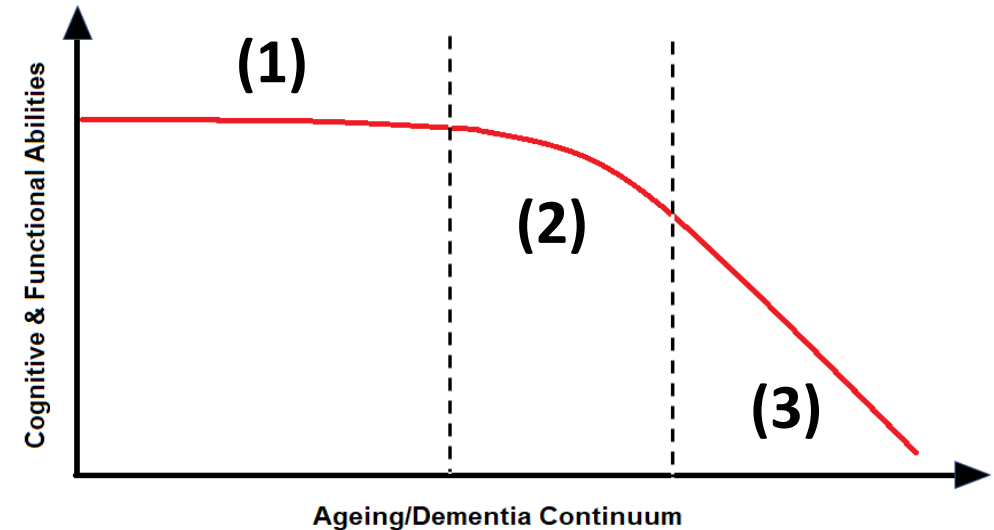


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Technologies for Brain Health and Dementia Prevention

- **(1)** Technologies that can promote brain health (e.g., by encouraging sustainable behavioral changes towards protective factors)
- **(2)** Technologies that can help restore cognitive and functional abilities (e.g., by tapping into spared abilities to maintain cognitive and functional levels)
- **(3)** Technologies that can assist those who cannot longer live independently (e.g., replacing lost cognitive and functional abilities)





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Technologies for Brain Health and Dementia Prevention

June 2022

Technologies for Brain Health and Dementia Prevention Workshop

The Scottish Dementia Research Consortium (SDRC) and the Digital Health & Care Innovation Centre (DHI) hosted a two-day event that encapsulated keynote speakers and interactive workshop sessions, which focused on [technologies for brain health and dementia prevention](#).



Aims

- 1) To provide a space wherein the relevant community could discuss ideas and interests.
- 2) To set up Special Interest Groups (SIG) that works collaboratively with the SDRC.
- 3) To co-produce a white paper (technologies for brain health and dementia prevention in Scotland).



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Technologies for Brain Health and Dementia Prevention

Theme 1: Technologies to enhance brain health. The advent of VR/AR, Wearables/Sensors, Cognitive Prosthetics, Reminiscence Technologies, and other technologies is creating unprecedented opportunities to move assessments and interventions from the lab to the real world.

Theme 2: Adaptive technologies, precision medicine and interventions. This theme focuses on technologies that hold to potential to adapt to the changing needs of those affected by neuro-progressive diseases. These are essential for person-centred assessments and interventions.

Theme 3: Assistive technologies. There is a growing interest in technologies that can support people with disabilities to live safely and independently whether at home or in care facilities. We are witnessing a rapid growth of Ambient Assisted Living, Smart Environments, Living Labs, Tele-presence and Tele-care, Cognitive Robotics, just to mention some key examples.

Theme 4: Co-design and co-production for brain health technologies. The Scottish Brain Health and Dementia Research Strategy aims to encourage a paradigm shift whereby researchers and members of the public come together to become co-designers, co-producers and co-beneficiaries of research.



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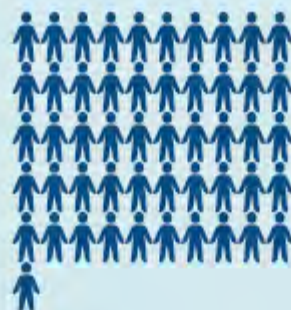


Special Interest Group

**TECHNOLOGY IN
BRAIN HEALTH
AND DEMENTIA
PREVENTION**

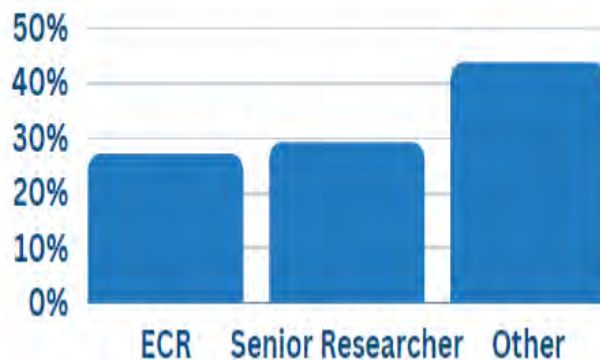
SURVEY REPORT

**TOTAL NUMBER OF
RESPONDENTS**



51

CAREER STAGE OUT OF 48



EXPERTISE OF GROUP

| | |
|---------------------------|----|
| AI | 5 |
| Assistive Technologies | 1 |
| Care Home | 2 |
| Carer | 2 |
| Clinical/social/NHS | 6 |
| Cognition/Neuropsychology | 10 |
| Complex systems | 1 |
| Design | 1 |
| Digital health | 5 |
| Healthy ageing | 4 |
| Industry | 2 |
| Neurobiology | 8 |
| R and D | 6 |
| Robotics | 4 |
| Signal processing | 8 |
| Smart Environments | 2 |
| VR | 3 |
| Wearables | 4 |



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Special Interest Group

Technologies for Brain Health and Dementia Prevention Workshop

| | | | |
|---|--|---|-------------------------------------|
| Exercise 1: Discovering insights | Exercise 2: Opportunities and Impediments | Exercise 3: Mind Mapping Opportunities | Exercise 4: Developing Ideas |
|---|--|---|-------------------------------------|



Aims



To co-produce a white paper that will pave the way towards future technologies for brain health and dementia prevention in Scotland.



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Next Steps

[Home](#) [About](#) [Research](#) [Events](#) [News & Blogs](#) [Become a Member](#)

Special Interest Group Technologies for Brain Health and Dementia Prevention

Innovative technologies to enhance brain health and support people affected by dementia and their caregivers are growing as fast as their rapidly changing needs. Scotland is a hub of technological innovation. We therefore have the knowledge, experience, and expertise among us to leverage this wealth of innovation to support those affected by dementia or are at risk of developing the condition.

This Special Interest Group will bring together stakeholders from a range of experiences to share their knowledge and expertise to discuss innovations to support people living with dementia and those who care for them.

[Click here to find out more about the Special Interest Group's recent activity](#)

[Join our Special Interest Group
https://www.sdrc.scot/technologies-sig](https://www.sdrc.scot/technologies-sig)

Latest News

Attend first SIG Meeting

The first formal meeting of this Special Interest Group will take place in Edinburgh on 25th November 2022.

[Register now](#)

This Special Interest Group is proud to be supported by:



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Scottish Dementia
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Special Interest Group

Technologies for Brain Health and Dementia Prevention

Dr Mario A Parra

mario.parra-rodriquez@strath.ac.uk

Thank You



Scottish Dementia
Research Consortium



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Challenges

- **Lack of theory:** Healthcare technologies, particularly those aiming at supporting brain health and prevent dementia, need to incorporate state of the art knowledge from relevant disciplines.
- **Limited ecological validity:** Available technologies, particularly those aimed at promoting and restoring brain health, do not allow transfer of restored skills and abilities to real-life experiences.
- **Rigid intervention platforms and non-adaptive systems:** most available technologies focus on a one-size-fits-all solution, unsuitable for personalised interventions.
- **Limited access:** Factors such as socioeconomic status, technological literacy, and the remaining digital divide are limiting the scope and impact of healthcare technologies.
- **Ethical issues:** This is perhaps one of the most contentious area of healthcare technologies.

Discussion

Final comments

Joanne Boyle, Digital Health & Care Innovation Centre

Final comments

- Thank you to all our speakers today
- So much information - all recorded and presentations will be made available for further reference on our website

[Healthy Ageing Innovation Cluster \(HAIC\) | Digital Health & Care Innovation Centre \(dhi-scotland.com\)](https://dhi-scotland.com)

- Feedback vital to develop future sessions

Funding Opportunities

- All our current funding opportunities are available on the HAIC webpage: <https://www.dhi-scotland.com/innovation/innovation-clusters/healthy-ageing/>

Contact

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Programme Manager Innovation Collaboration

✉ SHIP@gov.scot

✉ Suzanne.Graham@gov.scot

Next HAIC event

- Wednesday 03 May 2023, 1000-1200, Microsoft Teams
- Currently finalising the agenda which will be added to our Eventbrite booking platform and shared with you ASAP

Take our post event survey

- Scan the QR code →

Or

- Enter:

[https://www.surveymonkey.co.uk/r/Post HAIC Event Survey](https://www.surveymonkey.co.uk/r/Post_HAIC_Event_Survey)



Join our digital health and care network

- Scan the QR code →

Or

- Enter:

www.dhi-scotland.com/join-our-network



Visit our HAIC webpage

- Scan the QR code →

Or

- Enter:

www.dhi-scotland.com/innovation/innovation-clusters/healthy-ageing/



Join our private LinkedIn HAIC Group

- Scan the QR code →

Or

- Enter:

www.linkedin.com/groups/12496744/

