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Co-creation Workshops to Envisage Integration of Design Innovation and Material Science in **Smart Footwear Design Concepts.**



The MATUROLIFE project supporting well-being in older adults



Tiziana C. Callari*, Louise Moody*, Paul Magee*, Danying Yang*, Gulay Ozkan**, Diego Martinez*** (*Coventry University; **GEDS; ***Pitillos)

Background information.

Assistive Technology (AT) can support older adults live independently, and without the need for care for longer. Despite the potential benefits, there are high abandonment rates of AT, and products are often not regarded as being attractive or desirable to the user (Chaiwoo, 2013; Yusif, Soar, & Hafeez-Baig, 2016)

Research Objective.

The aim of the research was to explore the extent to which the independent living needs and priorities identified by older adults could be translated into 'smart' footwear design solutions.

Project framework

The Horizon2020 funded MATUROLIFE project (www. maturolife.eu) aims to use smart materials to provide assistive technology (AT) in a discrete way that is attractive and desirable to the end-user. Through a combination of active involvement of older adults throughout the development process and technological innovation a range of AT-based products (i.e. Clothing, Footwear, and Furniture) will be developed.

The focus of the research described here relates to the development of the footwear solutions.



Methods

A qualitative research strategy approach was adopted to gather participants convergent views, interests and propositions (Ritchie, Lewis, Nicholls, & Ormston, 2014). Data collection involved semi-structured interviews and co-creation activities (Ramaswamy & Ozcan, 2018; Sanders & Stappers, 2008) with older adults. A multi-method approach was used to analyse the emergent qualitative data. This included the (1) Qualitative Content Analysis (QCA) and (2) Thematic Analysis (TA) methods. The data analysis was supported by NVivo (v.11 Pro for Windows, ©QSR International) (Bazeley & Jackson, 2013) and the NVivo 'MATUROLIFE' project supported the use and application of both methods. The research was approved through the Coventry University Ethical Approval process with additional approval was sought as required by the host organisations.

37 Semi-structured interviews

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Explore the personal preferences and experiences associated with older adults' everyday shoes



N=37 older adults, 26 female, 11 male. Average age: 71 years



France, Italy, Poland, Spain, Turkey, United Kingdom

4 Exploratory co-creation workshops

- Prioritise older adults' key threats to Ø independence, review footwear features and advance early concept development for smart footwear
- N=37 older adults, 22 female, 15 male. \mathcal{P} Average age: 69 years



Spain, Italy, Belgium, United Kingdom

2 Product-led/Footwear co-creation workshops



Co-design with the older adults smart footwear solutions



N=19 older adults, 9 female, 10 male Average age: 72 years



United Kingdom, Germany

Findings

My preferences are....



"i have cross toes for rheumatism, hence in summer I can only wear open sandals; in winter it is an issue, I usually wear one size bigger'

"Since I fell and I have scarce mobility, I cannot bend, so I do not use laces, and need shoes easy to put on.!

- 'Proper' shoes are regarded as important for healthy ageing; comfort is prioritised.
- Footwear size may increase by 1-2 sizes, perhaps due to swelling, bunions/hallux valgus, and crossed toes due to rheumatism.
- In terms of fastenings, casual shoes are chosen with and without laces, or with Velcro.
- A gripping/non-slippery sole is prioritised to minimise the risk of slips and falls.

* * * * * * * * * * * *

Initial Product Design Specification (PDS) and Experience Highlights (EH) were formed. This included preferences and a wish-list for future footwear designs as well as emotional aspects of a

My health-related priorities are...

- 1. Inform me about the risk of falling and change in my balance
- 2. Help circulation
- 3. Help maintain a good temperature and not get too hot or cold
- 4. Relieve or adapt to swelling of the feet
- 5. Relieve aches and pains
- 6. Provide information on my vital signs e.g. heart rate, blood pressure
- 7. Help me feel more steady on my feet
- 8. Help me find my way around
- 9. Alert others when I need help

* * * * * * * * * * * *

The participants were then asked to agree on the most important priorities they wanted see



My 'ideal' smart footwear are....

Each priority/functionality was further analysed in terms of embedded technology & style ideas. For example: Inform me about the risk of falling and change in my balance:

Ideas for use of technology	•	A network of pressure sensors in an insole to map foot pressure/ gait Sensors to detect change in ground/floor surface texture and alert the user – fall/slip hazard Hand held device that connects to shoes via Bluetooth to alert user of change in gait or in ground/surface by sounding different types of 'beep' alarms, visual alarm (using different coloured lights for different alerts), and vibration alarms.
Style ideas	• • •	Increased thickness and width of the heel for improved stability/balance. Larger base of the shoe for improved stability. Reduce tripping on uneven surface - if the toe of shoe/front of sole is raised up/curved up slightly A gripping/non-slippery sole to minimise the risk of falls
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product/experience related to the design, feel and aesthetics of a solution.

were then selected



Conclusions

Three products continue to be developed with user input shaping the direction and design decision-making. Despite the complexities of undertaking research and eliciting needs and requirements across 9 countries, MATUROLIFE seeks to embed user involvement throughout the life of the 3 year project through co-creation, iterative testing and a stakeholder panel to ensure our resulting products desirable and usable without the stigma often are associated with assistive technology.



References

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www. maturolife.eu; <u>@maturolife</u>

Co-creation Workshops to Envisage Integration of Design Innovation and Material Science in Smart Footwear Design Concepts

The MATUROLIFE project supporting well-being in older adults

Tiziana C. Callari, Louise Moody, Paul Magee, Danying Yang (Coventry University, UK), Gulay Ozkan (GEDS, TR), Diego Martinez (Pitillos, ES)

Background to MATUROLIFE

Urban areas in Europe are seeing an increasing population of older adults and existing. This enables conductivity and electronic connectivity for integration of electronics and approaches to care for them are becoming unsustainable. Assistive Technology (AT) can sensors into fabrics. The resulting materials will be used to produce smart assistive support older adults live independently, and without the need for care for longer. Despite clothing, footwear, and furniture that are comfortable, and easy to use. To ensure the benefits, products are often regarded as unattractive and stigmatising to the user acceptability of the resulting solutions the research involves active involvement of older (Chaiwoo, 2013; Yusif, Soar, & Hafeez-Baig, 2016). The Horizon2020 funded adults throughout the development process. Here we describe the co-creation activity MATUROLIFE project (Metallisation of Textiles to make Urban living for Older people that is informing the development of smart assistive footwear. The methodology approved more Independent and Fashionable) aims to use smart materials to provide attractive and by Coventry University ethics committee involved interviews and co-creation activities desirable AT. MATUROLIFE has produced an innovative selective metallization process (Lombardo, & Caribbu, 2018; Ramaswamy, & Ozcan, 2018) analysed through Qualitative that utilizes nanotechnology, electrochemistry and materials science to encapsulate fibres Content Analysis (Schreier, 2012) and Thematic Analysis (Boyatzis, 1998). in textiles with metal.

Research Driven Development and Co-Creation

37 Semi-structured interviews

4 Exploratory co-creation workshops

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Explored the personal preferences of older adults and their experiences related to independent ageing. Identified key threats to independence.



Participants: 37 older adults, 26 female, 11 male. Average age: 71 years



In France, Italy, Poland, Spain, Turkey, United Kingdom

Prioritised key threats to independence, reviewed footwear preferences and features, specified requirements

Participants: 37 older adults, 22 female, 15 male. Average age: 69 years

In Spain, Italy, Belgium, United Kingdom

2 Focused co-creation workshops

Co-created smart assistive footwear embedding functionality and exploring styles, material's and fastening

Participants: 19 older adults, 9 female, 10 male Average age: 72 years

In United Kingdom, Germany

An initial Product Design Specification (PDS) and summary of Experience Highlights (EH) were formed. This included a summary of preferences and a design wish-list. participants were asked to agree on their most significant needs to be prioritised through design. Concepts were developed through multidisciplinary team working to combine functionality and styling requirements.





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My needs and preferences are...:

"Since I fell and I have limited mobility, I cannot bend, so I do not use laces, and need shoes easy to put on.!"

- 'Proper' shoes are important for healthy ageing; comfort is prioritised.
- Footwear size may increase by 1-2 sizes
- Casual shoes that are easy to put on and fasten are preferred
- A gripping/non-slippery sole is prioritised to minimise the risk of slips and falls
- Larger base of the shoe for improved stability is important
- toe of shoe/front of sole is raised The up/curved up slightly to reduce trip risk

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My smart assistive footwear could include...

- A network of pressure sensors in an insole to map foot pressure
- Sensors to detect change in ground/floor surface texture and alert to fall/slip hazard
- A system to monitor and alert the user to changes in gait or in ground/surface using different types of alarm
- Increased thickness and width of the heel for improved stability/balance

My priorities:

- Inform me about the risk of falling and changes in my balance
- Help improve my circulation
- Help me maintain a good temperature and not get too hot or cold
- Relieve or adapt to swelling of my feet
- Relieve my aches and pains
- Provide information on my vital signs e.g. heart 6. rate, blood pressure
- Help me feel more steady on my feet
- 8. Help me find my way around
- Alert others when I need help 9.

Conclusions

References

Through the interviews and co-creation workshops our assistive footwear development has become focused on a key fear and priority of older adults across participating countries: balance and falls. A number of concepts are being iteratively developed. When integrating AT into garments through the use of smart textiles, it is important to focus on the user's priorities and needs as opposed to the garments being technology driven. This can be challenging in a large and complex European project that involves 20 partners and significant scientific / technical innovation. Despite the complexities of undertaking research and eliciting needs and requirements across 9 countries, MATUROLIFE seeks to embed user involvement throughout the life of the 3 year project through co-creation, iterative testing and a stakeholder panel to ensure our resulting products are desirable and usable without the stigma often associated with assistive technology.

13th International Conference of the European Academy of Design, Running With Scissors, University of Dundee, 10-12 April 2018. #EAD2019

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