Independent living on WHIMS

**A Product Review of
Wearable Health Information Management for Seniors (WHIMS)**

Deepa Prabhu
PhD student,
Health and Biomedical Informatics Centre (HaBIC),
The University of Melbourne
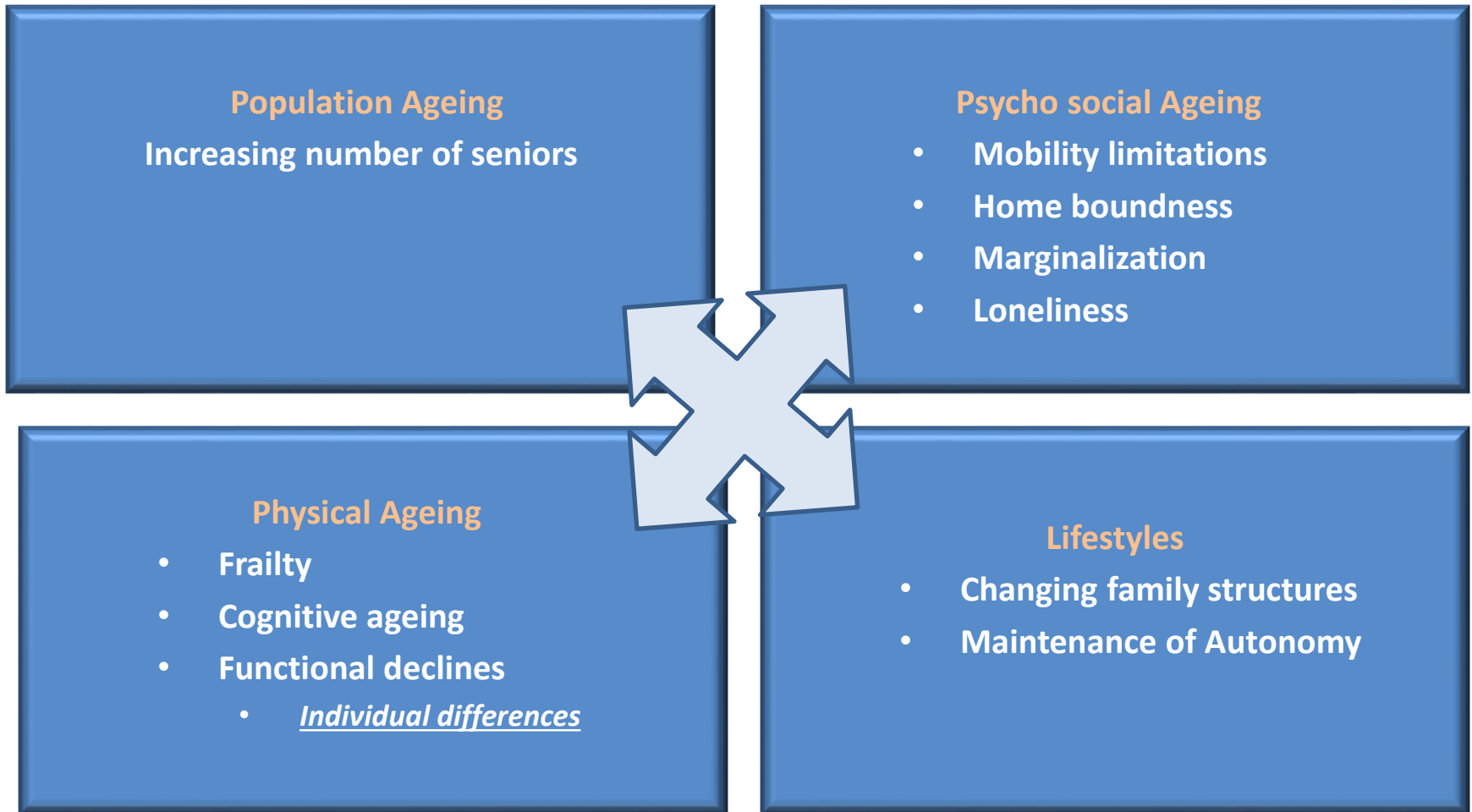*dprabhu@student.unimelb.edu.au*

Authors,
A/Prof. Kathleen Gray, The University of Melbourne
Dr. Ann Borda, The University of Melbourne
Dr. Elizabeth Cyarto, National Ageing Research Institute

HaBIC Health & Biomedical Informatics Centre

THE UNIVERSITY OF MELBOURNE

Outline

- **Background**

- **Hypothesis**

- **Product review consumer wearables for seniors**

- **Importance of the study**

- **References**

Background

Ageing in our society

Population Ageing

Increasing number of seniors

Psycho social Ageing

- **Mobility limitations**
- **Home boundness**
- **Marginalization**
- **Loneliness**

Physical Ageing

- **Frailty**
- **Cognitive ageing**
- **Functional declines**
  - ***Individual differences***

Lifestyles

- **Changing family structures**
- **Maintenance of Autonomy**

Background

Healthy ageing

- **Definition:**

  'the process of developing and maintaining the functional ability that enables wellbeing in older age,' where 'functional ability comprises the health-related attributes that enable people to be and to do what they have reason to value' **(WHO, 2015)**
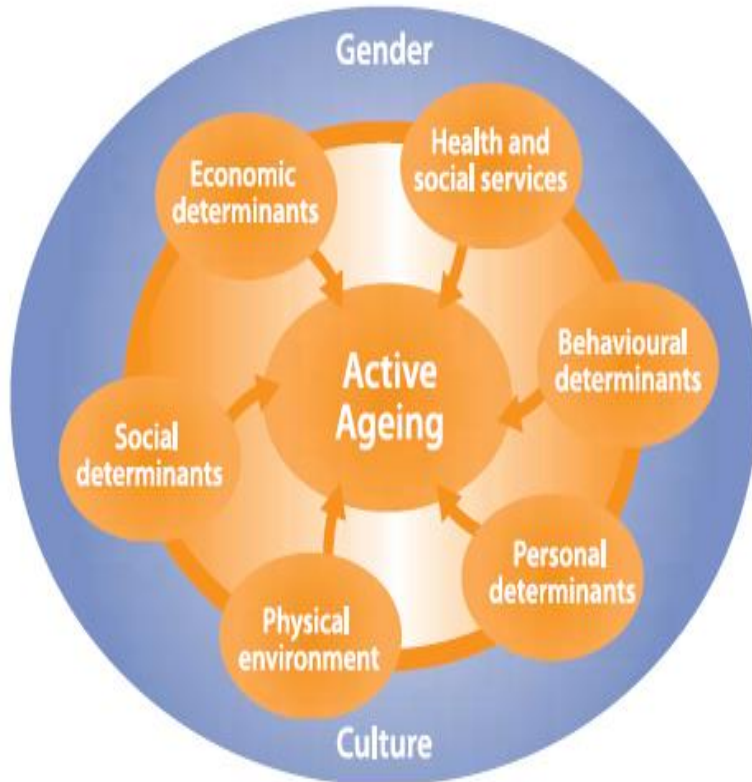
- **Key components:**
  - *surviving to older age*
  - *delaying the onset of age-related chronic diseases*
  - *maintaining optimal functioning for as long as possible at the individual, body system and cellular levels.* **(Bousquet, Jean, et al. 2015)**

  Individual role, active participation

Background

Healthy ageing: Determinants

(WHO, 2002)

Individual control

Behavioural determinants (for example, tobacco use, physical activity, nutrition, alcohol, oral health, medications)
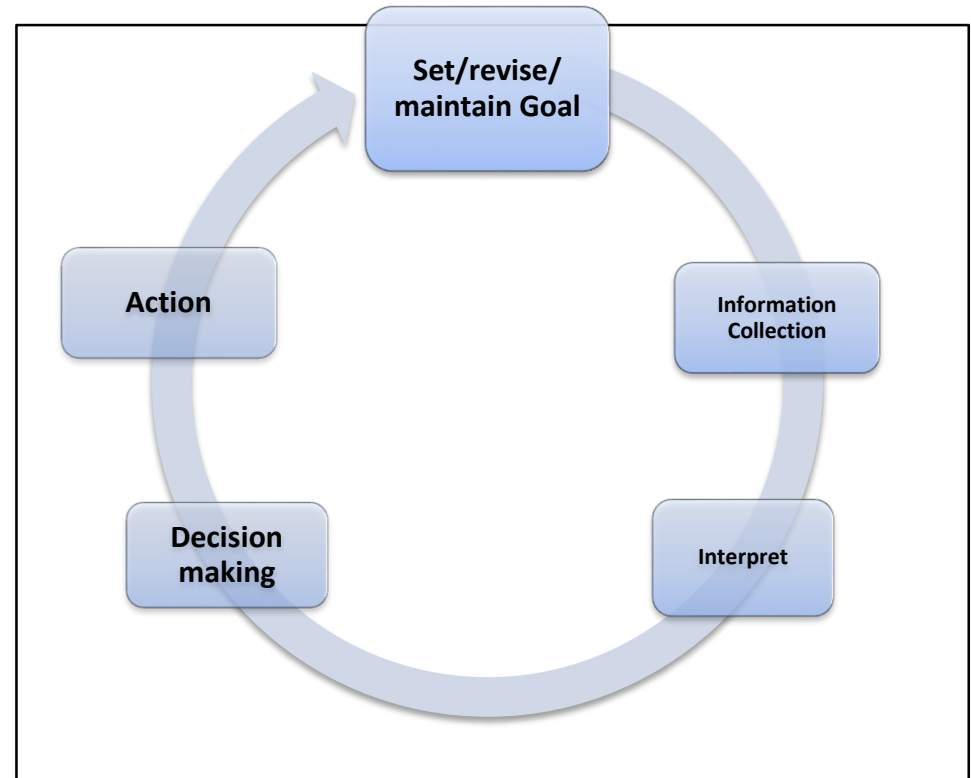
(Renehan, Emma, et al, 2012)

Background

Self-management for Healthy ageing

Activities:

- Adherence to diet
- Following exercise regime
- And/or medication management
- Coordination of care network
- Use of medical technologies

(Mitzner, Tracy L., et al. 2013)

Set/revise/maintain Goal → Information Collection → Interpret → Decision making → Action → Set/revise/maintain Goal

Background

Consumer wearables for Healthy ageing

Wearable:

- Electronic, mobile, context-sensitive system
- Incorporated into items worn on the body of the user
- Operated and accessed without or with very little hindrance to user activity'
- Actually worn on the body and not carried
- Provide either complete or partial automation and do not require manual entering of health data
- Examples of wearable devices include watches, glasses, smart fabrics, pendants etc.
- Invasive forms of wearables: devices implanted in the body such as micro-chips or smart tattoos.

Consumer wearable:

- Consumer wearables, are wearables that are directly marketed to seniors and can be used without requiring a medical intervention.

Tehrani, et. al. 2014

Background

Information from consumer wearables

- Personal Health Information arising from data collected from wearables.

- Collected, controlled and managed by individual

- Uses: Collect, reflect, act, share

- Consists of:

  – Activity data (Steps, walking, running, cycling, swimming etc)

  – Diet

  – Sleep

  – Reminders

  – Location data

  – Medication management

  – Physiological parameters (Body temperature, blood pressure, heart rate, respiration rate, glucose etc)

Hypothesis

- Information from consumer wearables facilitates healthy ageing activities.

- Use of information from consumer wearables affected by individual differences

- Very few consumer wearables to meet seniors requirements

Daisy

85 years old
Lives alone

Health status
Hearing and vision declines
Memory declines
Mobility issues
High Blood Pressure
Diabetes
Insomnia

Health goals
Medication
Diet
Exercise
Regular check up
(to maintain sugar, BP and sleep)

Self Efficacy
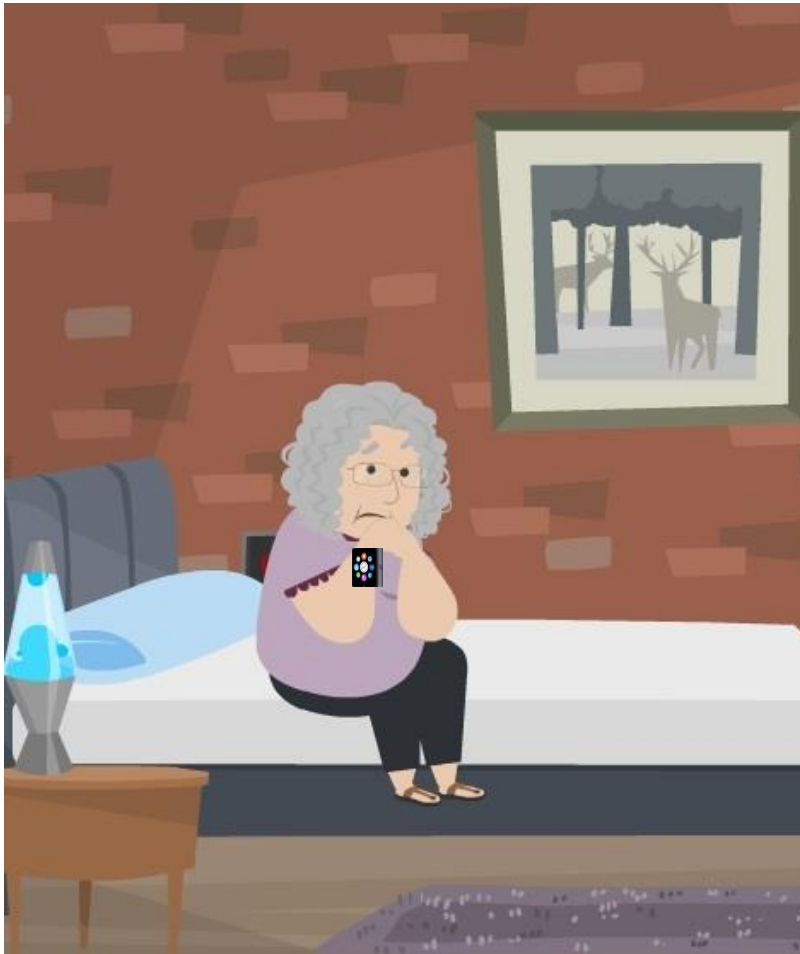Decreasing

My Watch

- **Medication reminders**
- **Blood Pressure**
- **Glucose**
- **Exercise logging & reminders**
- **Heart rate**
- **Steps taken**
- **Oxygen saturation**
- **Diet**
- **Sleep monitoring**
- **Call my family and GP**

My Watch

- **Medication reminders**
- **Blood Pressure**
- **Glucose**
- **Exercise logging and reminders**
- **Heart rate**
- **Steps taken**
- **Oxygen saturation**
- **Diet**
- **Sleep**
- **Call my family and GP**

What I got....

Confused if the data is on the phone or the wearable

Too many graphs and numbers

Too many alerts outside of my goals

I often see steps taken and heart rate Only records my blood sugar and BP values

Share data and/or send alerts to my GP and family without checking with me

Share data on social media without my knowledge

Download the data and run analysis

HaBiC Health & Biomedical Informatics Centre

THE UNIVERSITY OF MELBOURNE

What I wanted....

See data on watch

1 week bar charts

Alerts I can set

See my blood sugar and BP values more often

Check before sharing data and/or send alerts to my GP and family

Do not share data on social media

Analyze data on watch

I also want....

See data on watch and phone

To see the pattern on how my medications are affecting my chronic diseases in the last 6 months

To know the relationship between exercise, medications and sleep or other diseases.

Want my wearable to intelligently learn from what information I use regularly and provide me options to provide it.

Do not share data on social media

I do not want to analyze manually

Product review of consumer wearables for seniors

Objective of this study

- **Review** - Consumer wearables for independent living seniors

- **Analyze** – Features and Health information management aspects

- **Understand** – Role in self-management and care delivery

- **Identify** – Future areas for work

Product review of consumer wearables for seniors

Method

- Data collected from an internet search of products commercially available to consumers.
- A Grounded Theory to analyze wearable products (details, health information management aspects, such as their data collection, handling, storing and sharing features and communication modalities)
- 23 consumer wearable products met the review criteria.

Product review of consumer wearables for seniors

Dataset

(1) 9Solutions gTag Companion

(2) ActiveProtective

(3) Amulyte

(4) Bay Alarm Medical Alert System

(5) BeClose Remote Monitoring System

(6) Care Innovations QTUG

(7) CarePredict Tempo

(8) Comfort Zone

(9) FitBit Health and Fitness Trackers

(10) Great Call Splash

(11) Libiris Numera
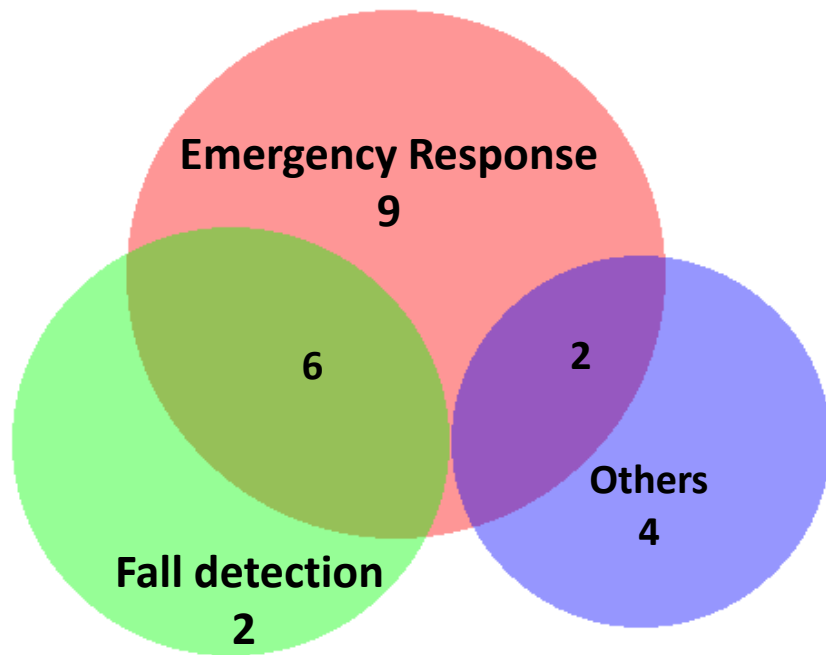
Product review of consumer wearables for seniors

Dataset

(12) Life Alert

(13) LifeFone

(14) Lively

(15) LOK8U Freedom

(16) mCareWatch

(17) Medical Guardian

(18) Go Safe

(19) Preventice BodyGuardian

(20) The Jawbone UP System

(21) TriLOC

(22) Tunstall

(23) UnaliWear Kanega Watch

Product review of consumer wearables for seniors

Results

Classification of wearable products

- Number of products that are commercially available to consumers in this cohort is relatively low.
- Products are unevenly matched with the common disease profiles and health management requirements of independent living seniors

Product review of consumer wearables for seniors

Results

- Majority are focused towards fall detection and emergency response
- Limited information feedback to the user for any type of self-management
- Few adhere to :
  - Guidelines and policies concerning privacy and security aspects of the data.
  - Standards for interoperability and exchange of health information

Survey

Preliminary Results

- **Age range of participants:** 55 - 59 (11), 60 - 69 (16), 70 - 79 (2), 80 - 89 (1)

- **Living arrangements:** Live with spouse/partner (14), Live alone (7), others (9)

- **Chronic disease status:** 24 out of 30

Survey

Preliminary Results

- **Consumer wearables :** Fitbit (21), Garmin (4), others (5)

- **Type of wearable:** Wristband (21), waist belt (4), pendant (1), ankle band(1), others (3)

- **Period of use:** 71% have used it longer than 6 months

- **Parameters monitored:** steps, calories, diet, heart rate, location, sleep

- **Frequency of use:** 61% (all the time), 16% (several times in a day)

- **Format of data:** Numbers (87.5%), Graphs (50.0%), Tables (21.9%), Light indicators (18.8%), Audio/sound indicators (15.6%), Information combined on a dashboard (43.8%), Messages in words/phrases (12.5%), Other (6.3%)

- **Data storage:** On the wearable (56.3%), another device (75.0%), internet (21.9%)

- **Information sharing:** Did not share the information (34%), showed on the device /another device (60%)

- **Usefulness of data (understanding)**: >85 (11)

- **Usefulness of data (Decision making)**: >85 (10)

Importance of the study

- **Contribution to Theory**
- Provide evidence based conceptual understanding of the relationship between ageing, frailty, and use of information from consumer wearables for making independent health decisions for healthy ageing
- **Contribution to practice**
  - Independent seniors who wish to empower themselves
  - Aged care service providers & healthcare service providers who are interested in innovative or novel service delivery models
  - Developers of technology

HaBiC
Health & Biomedical
Informatics Centre

THE UNIVERSITY OF
MELBOURNE

References

- Beard, John R., et al. "The World report on ageing and health: a policy framework for healthy ageing." *The Lancet* 387.10033 (2016): 2145-2154.

- Bousquet, Jean, et al. "Operational definition of Active and Healthy Ageing (AHA): A conceptual framework." *The journal of nutrition, health & aging* 19.9 (2015): 955-960.

- Mitzner, Tracy L., et al. "Self-management of wellness and illness in an aging population." *Reviews of human factors and ergonomics* 8.1 (2013): 277-333.

- Renehan, Emma, et al. "Healthy ageing literature review." Final Report to the Department of Health, Wellbeing, Integrated Care and Ageing Division, July (2012)

- Tehrani, Kiana, and Andrew Michael. "Wearable technology and wearable devices: Everything you need to know." *Wearable Devices Magazine* (2014).

- World Health Organisation. (2002). Active Ageing: A policy framework. Retrieved 15 Aug, 2016, from http://www.who.int/hpr/ageing/ActiveAgeingPolicyFrame.pdf

- WHO (2015) *World report on ageing* sheet Geneva, Switzerland: World Health Organization

Health & Biomedical Informatics Centre

THE UNIVERSITY OF MELBOURNE

Thank you

Contact me
Deepa Prabhu
Health and Biomedical Informatics Centre (HaBIC),
The University of Melbourne
dprabhu@student.unimelb.edu.au

Health & Biomedical
Informatics Centre

THE UNIVERSITY OF
MELBOURNE