

Mobile Health

Claire McCallum

About Me

- Background
 - MA Psychology, UoG
 - **Interest** in technology
- Now: interdisciplinary PhD, UoG
 - LKAS scholarship funds interdisciplinary work
 - Supervisors: Cindy Gray (**Institute of Health & Wellbeing**), John Rooksby, Matthew Chalmers (**Computing Science**)
 - Title of PhD: Evaluating mobile health technologies for physical activity: a “hybrid” approach

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Outline

- What is mHealth?
 - Definitions
 - Technologies
 - Applications in health
- Benefits of mHealth, evidence of effectiveness
- mHealth and Positive Psychology
- The multi-disciplinary nature of mHealth
 - Disciplines involved, methods used
 - Issues in multidisciplinary research
- Being an interdisciplinary PhD student

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What is mhealth? (1)

“...the use of mobile computing and communication technologies in health care and public health” (Free et al., 2013, p. 2)

“Medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices.” (World Health Organisation, p. 6)

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What is mHealth (2)

“...mobile technology is defined as wireless devices and sensors (including mobile phones) that are intended to be worn, carried, or accessed by the person **during normal daily activities...**”

mHealth is the application of these technologies either by **consumers or providers**, for monitoring health status or improving health outcomes....” (Kumar et al., 2013, p 228)

- Ubiquitous
- Range of user categories?



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- Example technologies:
 - SMS/texting
 - Sensors
 - GPS
 - Accelerometer
 - Barometer
 - Etc.....
 - Connectivity
 - Software Applications (apps)



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Applications in Health

- **Medicine**
 - Targets individual
 - Diagnostic
 - Treatment: usually biological
- **Public health:**
 - Targets populations
 - Prevention, health promotion
 - Intervenes at many levels:
 - Individual
 - Social
 - Environmental

Q: Example apps/technologies and features?

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Applications in Health

- **Medicine**
 - Targets individual
 - Diagnostic: **Symptom Checkers, Practitioner remote-contact**
 - Treatment: usually biological **med reminders, drug-identifying, drug-education (e.g. iPharmacy), contraction timers**
- **Public health:**
 - Targets populations
 - Prevention, health promotion, quality of life **PA, diet, mood, sleep...trackers, serious games**
 - Intervenes at many levels:
 - Individual (**self-monitoring, just-in-time, context-awareness**)
 - Social (**connect with peers; competitive, collaborative**)
 - Environmental (**"Smart Cities", public transport**)

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Benefits of mHealth technologies?

- Mass population approach – widely accessible
- Cost-efficient delivery
- Objectivity and accuracy
- Adherence/compliance
- ...effective?



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Evidence of effectiveness

- **Lacking an evidence-base**
 - Are they effective in changing behaviour/attitudes/health?
 - (Are they theoretically based?)
 - How do they work? Who do they work for?
 - Systematic reviews; Free et al., 2013, E.g. Bort-Roig et al., 2014,
- **Q: Is evaluation needed for mHealth?**



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Reasons for lack of research

- No suitable methodology? (My PhD topic)
 - RCTs take a long time
 - "in the wild" versus in the lab
- Rapid changes in technology
 - Obsolete results
 - Validity issues
- Of particular importance: researchers working in "silos" (will return to later).



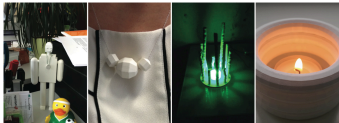
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mHealth and Positive Psychology

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“Positive Technology”

- “Positive technology” (Riva et al., 2012)
 - Not what is ‘wrong’ with technology, but what is right
 - How we can manipulate and enhance experience through technology
 - Hedonic (Visualisations, ambience)
 - Actualisation / engagement (goals, structuring)
 - Connectedness (Social media)



Stusak et al., 2014 13

mHealth and Positive Psychology

Proposed parallels between mHealth field and PosPsy field:

- New(ish) field
- Exciting, lots of potential
- Requires a very critical approach
- Multi-disciplinary?



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PosPsy themes (1)

- **Prevention (and flourishing?)**
 - E.g. Physical activity prevents a range of diseases
 - Physical activity also has positive effects on mood, quality of life, functional capacity, cognitive function, self esteem (Morgan 1997, Penedo & Dahn, 2005).
 - Strategies:
 - Information / Educational messages
 - Feedback: Enhancing skills, self-knowledge and awareness, self-efficacy
- **Uplifting the population (through delivery method)?:**
 - Mass-participation approaches: the *availability* to large numbers of people
 - App store
 - Not necessarily targeting “patients”; everyone is a user / consumer

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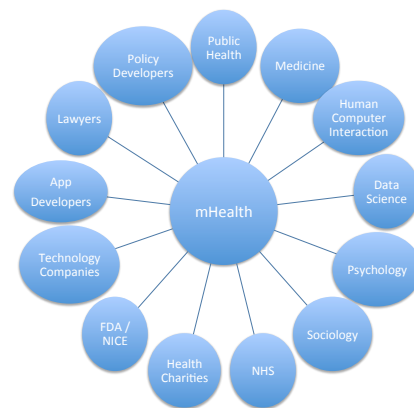
PosPsy themes (2)

- **Quality of Life?**
 - Management of chronic conditions
 - E.g. Diaries, rehabilitation, home settings
- **Agency: Self-help**
 - Can be accessed on App store by consumers; “stand-alone” interventions
 - Can be in conjunction with consultations
 - Generally promote autonomy, agency
- **Flow?**
 - Ubiquity → “Seamless” design
 - “A good tool is an invisible tool. By invisible, I mean that the tool does not intrude on your consciousness; you focus on the task, not the tool” (Weiser, 1994)
 - “Transformation of flow”: Riva et al., 2012

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mHealth: Multidisciplinary Methods

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Computing Science: some roles in mHealth

- Human Computer Interaction (HCI)
 - User experience (UX) and Usage patterns
 - Highly iterative development processes
 - Focus on innovation/new technologies
 - Often qualitative evaluation methods
- Data Science / Machine Learning
 - Developing algorithms
 - Recognition and classification (e.g. of physical activities)
 - Inference
 - Highly statistical / quantitative evaluation methods

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Psychological Science

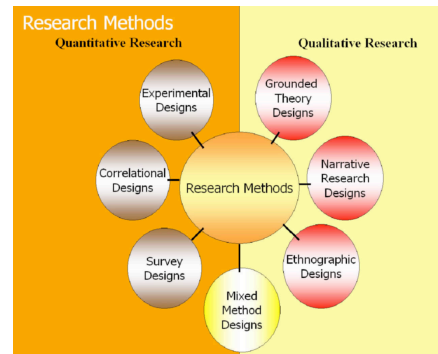
- Social Psychology
 - Measurement tools: “Ecological Momentary Assessment” (Stone & Shiffman, 2008): context-aware reports, sensing
 - See Miller et al., 2012: **The Smartphone Psychology Manifesto**
 - Individual and group level
 - Research methods
- Developmental and Clinical Psychology
 - E.g. games for ASD diagnosis and improvement (e.g. Evo app from Akili Interactive)
 - Usability for those with e.g. Schizophrenia (Ben Zeev et al., 2014)
- Health psychology
- Occupational psychology

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Disciplinary research topics: interweaving and influencing

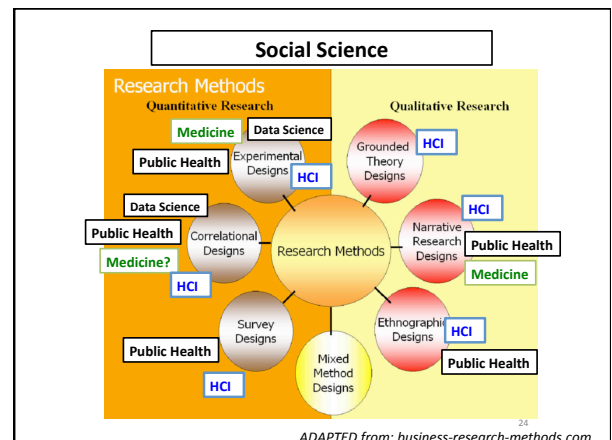
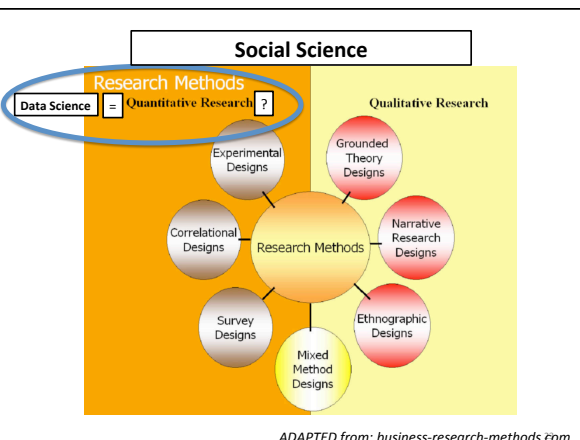
- **Recognition/classification accuracy** → accuracy of findings
- **User Experience** → adherence / drop-out and therefore effectiveness
- **Motivating, promote self-efficacy** → Short term aspects of effectiveness (Klasjna, Consolvo, Pratt, 2011)
- Health research ↔ **development of the app features** (quality of the app)
- **Reality:**
 - “siloeed” processes, i.e. highly segmented research processes and results
 - Highly varied in “quality” (from a health perspective).

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Scoping Review

- My PhD work
- Exploring the objectives and methods in the evaluation of physical activity interventions delivered using mobile technologies
 - Searching across disciplines
 - Using a “scoping review” methodology (Arksey & O’Malley, 2007; Levac, 2011)
 - Difficult and time-consuming process....

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Difficulties (1) – Doing reviews

- Computing and Engineering databases/titles/ abstracts not necessarily designed for systematic-style reviews
- Terminology: “pervasive health”, “persuasive”, “ubicomp”
- Comprehending the unknown (!)
- Publishing: Journals versus Conferences
- Differences in format and writing style

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Difficulties (2): Working together

- **Jon Whittle, on the Catalyst Project** (GIST, Oct 2015):
 - Terminology
 - Perspectives / training
 - Methodological timescales
 - Interests
- **Workshop: What works in digital health technologies - bridging the disciplinary divide** (UoG, 2015)
 - Different disciplines in one room
 - Understanding “what others are up to” in the same field.
 - How should conceptualise working together
 - Methodologies to learn from

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Unknowns

- Should Computing Science improve the methodological quality of their work (in the eyes of health researchers)?
- Should health researchers go into technical details?
- Do we need guidelines for everyone to follow?
- Should disciplines work together? Is this realistic? *HOW* do we do it? Should we have “middle men?” or each discipline plays to strengths?

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Being an interdisciplinary PhD student

- Exposed to many things I know nothing about (and making notes to check up on it later).
- Training/reading versus immersion in others’ working environments
- Lots of gauging how much people know about the other discipline...
- Lots of tailoring and explaining one disciplines’ work and concepts to people from different disciplines
- Learning that not trying to bring two entire disciplines together (just aspects of them)
 - Lots of narrowing and specifying
- Psychology is brilliant for learning about experimental design and generally working across disciplines → this class is privileged!

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Conclusions

1. mHealth is the application of mobile technologies to health; medical, public health and well-being
2. Despite many proposed benefits, we need to be critical of the research on effectiveness – there’s not much of it and mostly at the ‘early’ stages of the trial process
3. Although RCTs are “gold-standard”, we need new methods to study mHealth
4. There’s a lot to learn from many other disciplines involved
5. We can borrow from/work together with other disciplines (and there is already overlap in methods) but we need to uncover *how* best to work together

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Questions?

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Further Reading

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Coming soon.... Our "Quped" step-counting/social comparison app on the App Store

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