Mobile health interventions to promote physical activity and reduce sedentary behaviour

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Behavioural and Implementation Science Group

N-READY Using nicotine replacement therapy to quit smoking in pregnancy

VBI VERY BRIEF INTERVENTIONS Very brief interventions to increase physical activity in primary care

PAM Programme on Adherence to Medication

propels

PReS

MedEx-UK

iQuit in Practice

Pregnancy lifestyle survey 2017

MaSC Management of Smoking in Primary Care

MiQuit

Quit Sense

ImpRes Implementation Science Research Development Tool

CUT DOWN YOUR DRINK

OptiMine

Mind & Body

Outline

- The problem of physical inactivity
- Mobile health interventions to promote physical activity and reduce sedentary behaviour
  - Evidence for mHealth interventions
  - Just-in-time adaptive interventions

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The problem of physical inactivity

- Fourth leading risk factor for death worldwide[1,2]
- Estimated direct cost to the NHS £1.06 billion[3]
- Republic of Ireland: 33% adults meet guidelines[4]
- Northern Ireland: 55% adults reported meeting guidelines[5]

Image by Peggy and Marco Lachmann-Annke from Pixabay

[1] WHO 2010; [2] Lee et al. 2012; [3] Allender et al. 2007;
[4] WHO Ireland physical activity factsheet 2018;
[5] Health Survey NI 2016/2017

We need solutions that can reach many people

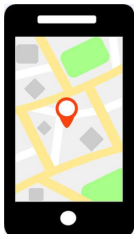
- Multiple opportunities to promote healthy behaviours[1], but lack of time and resources
- 'Scalable interventions':
  - can reach many people
  - are relatively cheap

[1] www.makingeverycontactcount.co.uk

How to reach many people?

- Very brief face-to-face interventions

- Digital interventions
- A combination: practitioners signposting to digital support



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Mobile health interventions to promote physical activity and reduce sedentary behaviour

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Mobile health interventions

- mHealth: "medical and public health practice supported by mobile devices" [1]
- Mobile devices make delivery of behaviour change support more interactive and responsive [2]

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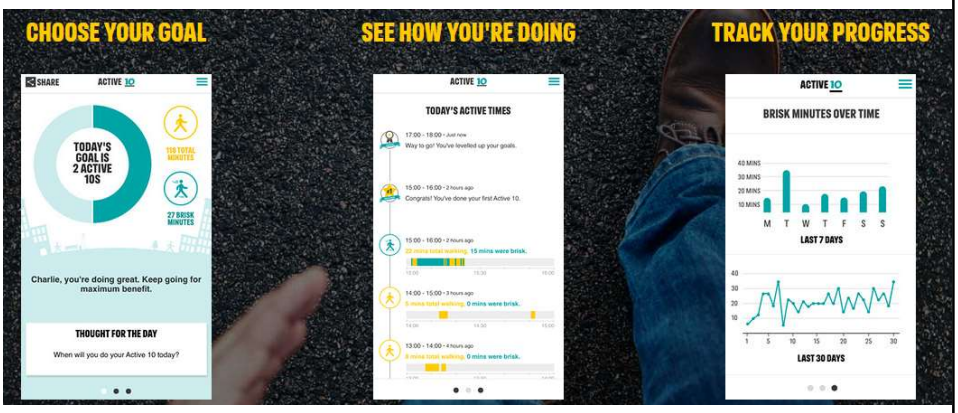
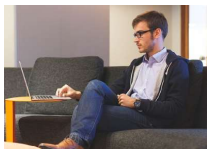
[1] WHO report 2011; [2] Direito et al. *ABM* 2017



www.nhs.uk/oneyou/active10/home

What do we know?

- Three systematic literature reviews of 44 high-quality studies
- mHealth intervention: SMS, smartphone apps
- Comparison: 'usual care', no intervention, alternative or traditional interventions
- mHealth more effective at reducing sedentary behaviour [1,2]
- mHealth no more effective at increasing physical activity [1,3]



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[1] Direito et al. *ABM* 2017; [2] Stephenson et al. *IJBNPA* 2017; [3] Hakala et al. *J Rehab Med* 2017

Common behaviour change techniques

- goal setting
- self-monitoring
- social support
- feedback
- instruction
- adding objects (e.g., pedometer or wearable)
- information about consequences of being active
- prompts and cues

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Mean number of BCTs : 7 in intervention, 3 in comparison [1]

[1] Direito et al., *ABM* 2017; [2] Stephenson et al., *IJBNPA* 2017

Rarely used techniques

Evidence-based techniques to help people make initial increases:

- problem solving
- action planning
- review of goals
- setting easy-to-perform tasks and making them increasingly difficult (graded tasks)

Direito et al., *ABM* 2017

Engagement

- Engagement with apps a challenge[1-5]
- Poor engagement may be due to delivery of support at fixed times
- Real-time support could improve engagement and effectiveness

[1] Direito et al. *ABM* 2017; [2] Stephenson et al, *IJBNPA* 2017; [3] Mateo et al., *JIMR* 2015; [4] Muller et al., *IJBNPA* 2016; [5] Middelweerd et al., *IJBNPA* 2014

Image by Jan Vašek from Pixabay

Just-in-time adaptive interventions to promote physical activity and reduce sedentary behaviour

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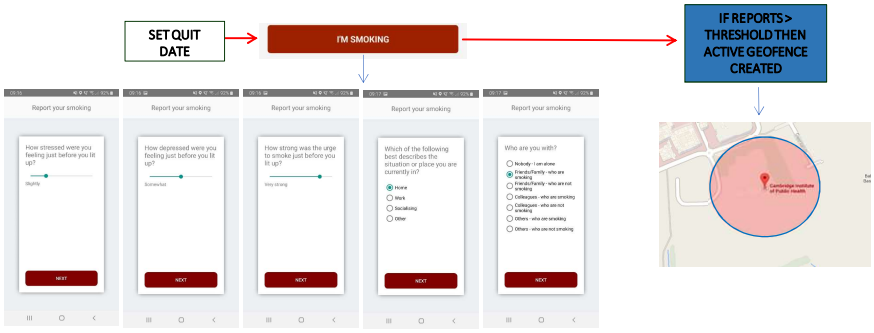
JITAI - three key features

1. Behavioural support (message or alert) contains advice relevant at the time delivered and addresses a need in real time
2. Support is adapted or tailored according to data collected by the system since the support was initiated
3. Support is triggered by the system, not the user

[1] Naughton, *Nicotine & Tobacco Research* 2016; [2] Naughton and Hardeman 2018, https://blogs.ucl.ac.uk/cbc-digi-hub-blog/2018/06/15/just-in-time-adaptive-interventions-jitais-are-not-self-help/

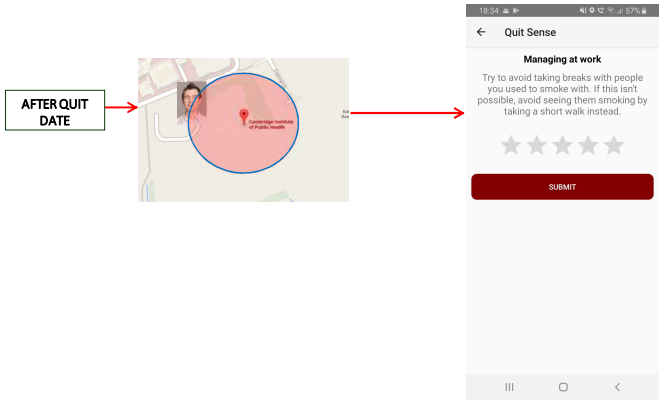
Quit Sense: JITAI for smoking cessation

Quit Sense Geofence-triggered support



Naughton et al (2016) *JMIR mHealth uHealth*

Quit Sense Geofence-triggered support



MRC Medical Research Council | SUPPORTED BY NIHR National Institute for Health Research

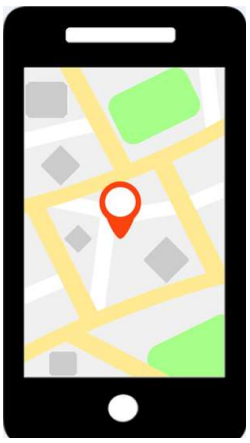
Naughton et al (2016) *JMIR mHealth uHealth*

JITAIs for physical activity

Hardeman et al., *IJBNPA* 2019; https://doi.org/10.1186/s12966-019-0792-7

Aim

To identify the features, feasibility, acceptability and effectiveness of just-in-time adaptive interventions to promote physical activity



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Methods

- Systematic search of 10 databases, including Scopus, Medline, and ACM Digital Library (Nov 2018)
- Inclusion: studies of any design reporting data about JITAIs, irrespective of population, age and setting
- Paper screening and data extraction independently checked
- Narrative synthesis

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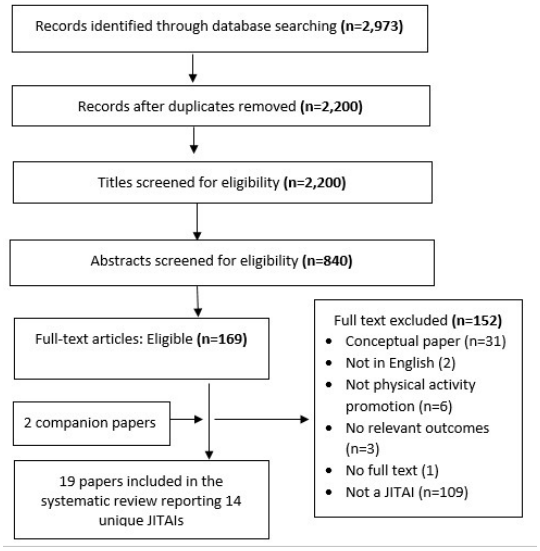
Protocol: www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017070849

Study selection

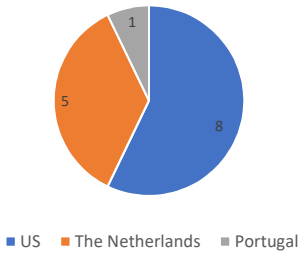


Included papers
Bond et al. (2014)
Thomas & Bond (2015)
Ding et al. (2016)
Finkelstein et al. (2015) / Ouyang et al. (2015)
Gouveia et al. (2015)
He & Agu (2014)
Hermens et al. (2014) / Tabak (2014, Ch 6)
Lin et al (2011) / Lin (2013, Ch 5)
Lin et al. (2013, Ch 6)
Pellegrini et al. (2015)
Rabbi et al. (JIMR 2015)
Rabbi et al. (UBICOMP 2015)
Rajanna et al. (2014)
Van Dantzig et al. (2013)
Van Dantzig et al. (2018)

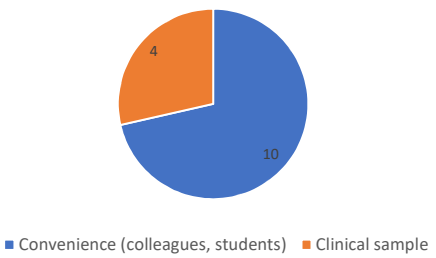
Studies and participants

- Feasibility or pilot studies among adults
- Sample size 6 to 86, one outlier (256)
- Intervention duration: 3-4 weeks

Country

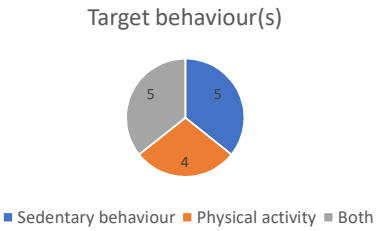


Type of participants

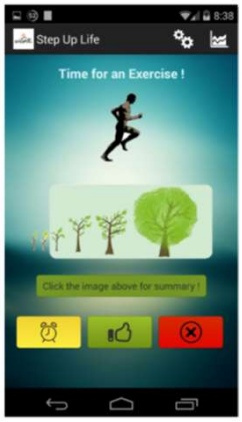


JITAI features

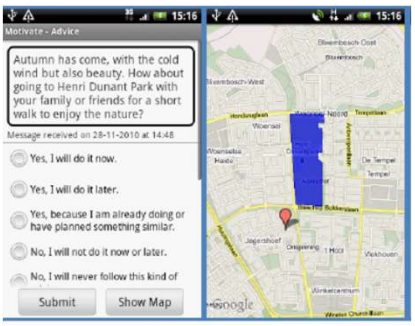
- Sensors: in-built accelerometer, global positioning system (GPS), time of day, weather and electronic diary
- Real-time support:
  - Prompt to stand up or take a break when no activity sensed for a specified period (10/14)
  - Suggestions for activities when opportunistic moments were sensed (9/14)



Rabbi et al (2015)



Rajanna et al (2014)



Lin et al (2011)

Theories and behaviour change techniques

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- 5/14 JITAIs were based on theory
- Common techniques:
  - Goal setting (behaviour) (14/14)
  - Prompts/cues (14/14)
  - Feedback on behaviour (11/14)
  - Action planning (9/14)

Views about just-in-time messages

Compared to random messages, participants perceived the just-in-time messages as:

- more timely and increasing awareness of opportunities to walk [1]
- more relevant and resulting in higher intentions to follow messages [2]

[1] Ding, *IEEE Wireless Health* 2016; [2] Rabbi et al., *JIMR Mhealth Uhealth* 2015

Feasibility and acceptability

Challenges were related to:

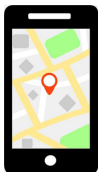
- Technology
- Accuracy of sensors
- Timing of messages
- Content of messages

Do JITAIs work?

- No study large enough to detect an effect on physical activity
- Six randomised studies:
  - no evidence of positive effect in three studies
  - evidence of positive effect on behaviour in two studies
  - mixed evidence in one study
- Lack of evidence on uptake, reach, sustained engagement, effectiveness and value for money

Key messages: decision makers

- Commission mHealth interventions when research evidence shows that they increase physical activity and/or reduce sedentary behaviour
- If no evidence available, incorporate evaluation in the commissioning process
- Be cautious in commissioning JITAIs until more is known about their (cost-)effectiveness



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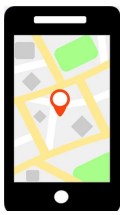
Key messages: practitioners

- Signpost patients or clients to mHealth interventions which have been commissioned or are available on, for instance, the NHS Digital Apps Library
- Be cautious in signposting patients or clients to JITAIs for physical activity
- However they are unlikely to cause health-related harm



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Key messages: researchers

- Long-term (cost-)effectiveness of mHealth
- Better reporting of intervention content
- Strategies to promote uptake and engagement
- Develop theory- and evidence-based JITAIs
- Evaluate them in real-world settings, including public health, health and social care
- Use consistent terminology for JITAIs

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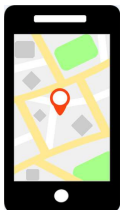

Thank You

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