Gamification for health promotion in smartphone apps: systematic review of behaviour change techniques

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Increase in smartphone usage

- Smartphone use increasing globally
- Over 2 billion users worldwide 2016
- 1/3 worlds population by 2018
- Over 80% of UK population

Globally over 500 million people use mobile health applications on smartphones

http://www.emarketer.com
Games: largest market share of apps

- Most downloaded category: 33% of all downloads
- 70% of app store revenue
- Estimated 33.5 million (69%) of UK population aged 8-74 old, playing games, on average 14 hours per week
- 52% of gamers in the UK are women, average age 31

(IAB 2014 & ukie 2015)

Screen shot: Candy Crush Saga
Tory MP apologises for playing Candy Crush during committee

Constituents said they were not impressed by the MP's behaviour

BBC News 08/12/14
Gamification & M-Health

- Process of using ‘gaming’ elements to engage/motivate people in non-game contexts
- Concept used by airlines, U.S. military, higher education
- Relatively new concept in Mobile-Health
- Gaming features effective method for modifying human behaviour & promoting healthy behaviours
  (Muessig E. et al., 2013, Brown J.S. et al., 1997 & Lieberman D. et al., 2013)
- Systematic review: “Does Gamification work?” found gamification can influence psychological and physical outcomes (Hamari J. et al., 2014)
- Promising links between gamification principles & behaviour change science (Cugelman B. et al., 2013)
<table>
<thead>
<tr>
<th>Gamification Strategies</th>
<th>Validated behaviour change ingredients</th>
</tr>
</thead>
</table>
| Goal setting                    | • Agree behavioural contract  
                                | • Goal setting (behaviour)                                                 |
| Capacity to overcome challenges | • Time management  
                                | • Action Planning                                                        |
| Providing feedback on performance | • Prompt self-monitoring of behavioural outcome  
                                | • Prompt self monitoring of behaviour                                       |
| Reinforcement                   | • Provide rewards contingent on successful behaviour                           |
| Compare progress                | • Prompt self-monitoring of behavioural outcome  
                                | • Provide normative information about others behaviour                      |
| Social connectivity             | • Social influences (norms)  
                                | • Plan social support/social change                                         |
| Fun & Playfulness               | • N/A                                                                         |
Aim of systematic review

• To identify number of health & fitness apps to incorporate gamification in the official Apple & Android app stores & NHS apps library
• To explore the use of behaviour change techniques
• To consider association with user ratings & pricing
Methods: Part one

- Prospero Registration number: CRD42015029841
- Initial search: official Apple/Android app stores & NHS Health apps library in April 2014
- Medical, Health & Wellness or Health & Fitness section
- Looked at ‘top-rated’ apps as defined by app stores (based on number of downloads)
- Both free & purchased apps
- Identified apps that contained gamification

Screen shot: Official Apple, Google Play store, NHS Health apps library
<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
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</tr>
</thead>
<tbody>
<tr>
<td>English language smartphone apps</td>
<td>Apps designed for tablet computers</td>
</tr>
<tr>
<td>Available through Google play and iTunes or NHS app store</td>
<td>Non-English language apps</td>
</tr>
<tr>
<td>Included in the Medical, Health &amp; Wellness or Health &amp; Fitness section of Google play and iTunes and all NHS apps</td>
<td>Apps in other section of the stores</td>
</tr>
<tr>
<td><strong>Apps including gamification techniques: rewards, prizes, avatar use, badges, leader boards, competitions, health-related challenges</strong></td>
<td>Smartphone apps that do not contain gamification techniques</td>
</tr>
<tr>
<td>Smartphone apps targeted at users of any age</td>
<td>Smartphone apps designed for Health Care professionals</td>
</tr>
<tr>
<td>Free and paid Smartphone apps</td>
<td>Apps not targeting to change a physical health behaviour</td>
</tr>
<tr>
<td>Apps targeting to change a physical health behaviour</td>
<td></td>
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</tbody>
</table>
Flow chart of app selection process

Top rated health behaviour apps for smartphones (n=1680)

Apple store (n=240 medical, n=240 health & wellness)
Android store (n=300 free medical, n=300 paid medical, n=300 free health & fitness, n=300 paid health & fitness)
NHS app library (n=4)

Excluded after screening app store entries
Did not use gamification (n=1495)
Not health related (n=23)
Not in English (n=11)
Not targeting to change a physical health behaviour (n=6)
Duplicates (n=21)
Designed for healthcare professionals (n=53)

Potentially relevant apps identified for full evaluation (n=71)

Excluded apps (n=7)
No longer available (n=5)
Technical difficulties (n=2)

Apps included in the review (n=64)
Methods: Part two

- Apps meeting inclusion criteria downloaded onto test devices (LG Nexus 5 Android/iPhone 5c)
- Two trained researchers screened apps independently
- App content assessed against: taxonomy of behaviour change techniques (Michie S. et. al., 2013)
- Explored use of Individual behaviour change techniques/ categories/ combinations
- Considered associations with user ratings & price

Screen shot: BCT Taxonomy
Results

- The median number of techniques: 14 (range 1-22)
- Common combinations:
  - Goal setting, self-monitoring, non-specific reward and non-specific incentive
    (n=35, 54.6 % apps)
  - Goal setting, self-monitoring and focus on past success
    (n=33, 51.5 % apps)
- No correlation between the number of BCTs &
  - App user ratings
    \( (p = 0.0715; r_s = 0.227) \)
  - Price
    \( (p = 0.4464; r_s = 0.097) \)
## Results: BCT Categories

<table>
<thead>
<tr>
<th>BCT Category Groups</th>
<th>Number &amp; % of Apps to use category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback &amp; Monitoring</td>
<td>n= 60 93.7%</td>
</tr>
<tr>
<td>Comparison of Behaviour</td>
<td>n= 52 81.2%</td>
</tr>
<tr>
<td>Reward &amp; Threat</td>
<td>n= 52 81.2%</td>
</tr>
<tr>
<td>Self-belief</td>
<td>n= 51 79.6%</td>
</tr>
<tr>
<td>Repetition &amp; Substitution</td>
<td>n= 50 78.1%</td>
</tr>
<tr>
<td>Social Support</td>
<td>n= 48 75%</td>
</tr>
<tr>
<td>Goals &amp; Planning</td>
<td>n= 46 71.8%</td>
</tr>
<tr>
<td>Shaping Knowledge</td>
<td>n= 25 39%</td>
</tr>
<tr>
<td>Associations</td>
<td>n= 20 31.2%</td>
</tr>
<tr>
<td>Antecedents</td>
<td>n= 18 28.1%</td>
</tr>
<tr>
<td>Identity</td>
<td>n= 12 18.7%</td>
</tr>
<tr>
<td><strong>Natural Consequences</strong></td>
<td>n= 9 14%</td>
</tr>
<tr>
<td>Comparison of Outcomes</td>
<td>n= 5 7.8%</td>
</tr>
<tr>
<td>Scheduled Consequences</td>
<td>n= 3 4.6%</td>
</tr>
<tr>
<td>Covert Learning</td>
<td>n= 2 3.1%</td>
</tr>
<tr>
<td>Regulation</td>
<td>n= 1 1.5%</td>
</tr>
</tbody>
</table>
Results: Individual BCTs

Self-monitoring of behaviour (n=55, 85.9% apps)
Social support unspecified (n=48, 75% apps)
Non-specific reward (n=49, 81.6% apps)
Non-specific incentive (n=49, 81.6% apps)
Focus on past success (n=47, 73.4% apps)
Conclusion

• Relatively few apps employed gamification
• Majority exercise & fitness apps
• Self-regulatory techniques most commonly used
• Although apps designers using BCTs, wide variation in use
• Apps not being designed collaboratively with Public Health Practitioners & Health Psychologists
• None of the included apps have been rigorously evaluated

• Gamification could provide a potentially cost-effective platform for health behaviour change & health promotion and could have substantial Public Health impact
Cigbreak®
Cigbreak®

Silver Star Rewards

Smoking 20 cigarettes each day will cost you £50 every week. In a year, that adds up to a fabulous holiday

And you’ve also won

1

BACK NEXT MAP

Gold Star Rewards

Your lung capacity increases so you breathe more easily and cough less.

And you’ve also won

1 1

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Cigbreak®

Level 13

Your Goal

x 30

Power-Ups

NRT power-ups

You have 4

Buy for 3

NRT mouthspray

Buy for 3

NRT gum

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Cigbreak®

hope's
Quit Journey

This person is motivating me to quit

Plan to Avoid Triggers
List 3 strategies to help you avoid triggers:

1. Enter text...
2. Enter text...
3. Enter text...

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Acknowledgments

Bart’s & The London School of Medicine & Dentistry
Professor Robert Walton
Professor Steph Taylor
Professor Chris Griffiths
Dr. Liz Steed
Dr. Ratna Sohanpal
Dr. Arun Thiyagarajan

Kings College London
Dr. Lindsey A Edwards

Kingston University
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Healthy Games
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