ICTs for the medical profession: an application in chronic care

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Project: “Positive Technology and Active Ageing”

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**Members:** Dept. of Psychology, Dept. of Sociology, Dept. of Linguistic Sciences, School of Medicine (Catholic University)

**Topic:** role and functions of PT devices for active and healthy ageing; development and test of PT devices aimed at citizens’ wellbeing

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**Positive technology** (PT):
focuses on bio-psycho-social aspects of cognition, emotions, and positive experiences. Suggests how to foster positive emotions, promote personal growth, and support creativity through technology (Riva et al., 2014)

PTs are classified according to their effects on personal experience:
- **Hedonic**, induce pleasant experiences
- **Eudaimonic**, support achievement of engaging experiences
- **Social/Interpersonal**, improve social integration and/or connectedness

(Riva et al., 2014)
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- Maria Grazia Rossi, Catholic University, Milan
- Ilaria Ciullo, A.O. Istituti Clinici di Perfezionamento. Milan
- Michelangelo Chasseur, Touchware

Our goal: development of a mobile application for diabetes patients; test of the prototype.
Main app functions: improve patient self-management and adherent behaviors
Role of education in chronic care

What can doctors use to achieve patient adherence and self-management through dialogue?

EDUCATION
intended as the purposeful combination of:

✓ Information

BUT ALSO

✓ Critical thinking
✓ Practical skills

Selected references:
Kahneman, 1991; Heisler et al., 2002; Epstein & Street, 2011; El-Gayar et al., 2013; Epstein & Gramling, 2013; Felton et al., 2015.
Existing ICTs for patient support: telemedicine, phone calls, text messages, decision aids, web apps, mobile apps

Our assumption: mobile apps are appropriate tools to strengthen understanding and critical thinking

Methodology:
1) Review of research articles
2) Review of mobile apps
3) Design of a prototype for patient education
4) Intervention study to test prototype’s usability and effects
A review of research articles & mobile applications for Italian diabetes patients
SEARCH CRITERIA

Keywords:
- diabetes AND Italy OR Italian AND app OR application
- diabetes AND mobile AND Italy OR Italian

RESULTS

The review of the literature reveals a lack of data regarding Italy. The five articles selected are not studies on mobile apps (Castelnuovo et al., 2009; Lanzola et al., 2007) or studies that include interventions with Type 2 diabetes patients (Rossi et al. 2009, 2013; Vuattolo et al., 2012).
SEARCH CRITERIA

**Keywords:**
- diabete (diabetes)
- diabete glicemia (diabetes glycemia)
- diabete educazione (diabetes education)
- diabete sport (diabetes sport)
- diabete movimento (diabetes exercise)
- diabete dieta (diabetes diet)
- diabete alimentazione (diabetes nutrition)
Inclusion criteria:
- Apps that have Italian user interface
- Apps used for blood glucose monitoring
- Apps designed to be used primarily by patients (whether with or without the intervention of health care professionals, such as doctors, nurses, etc.)
- Apps designed (also) for patients with Type 2 diabetes

Exclusion criteria:
- Apps that have non-Italian user interface
- Apps designed to be used by doctors and/or other health care professionals
- Apps that are not primarily designed for diabetes self-management (e.g. recipe apps; sport apps, such as pedometers)
- Apps that are not specifically designed for diabetes
- Duplicated apps
- Paid apps
- Apps requiring login
<table>
<thead>
<tr>
<th>Keywords</th>
<th>Google Play Store</th>
<th>Apple App Store</th>
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Rejected apps

- No Italian: 53%
- Paid apps: 22%
- No diabetes self-management: 14%
- Other: 11%

Details for rejected apps on GPS & AAS

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<td>67%</td>
<td>15%</td>
<td>12.50%</td>
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<tr>
<td>AAS</td>
<td>25%</td>
<td>35%</td>
<td>16.50%</td>
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### Selected apps

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<tr>
<th>Google Play Store</th>
<th>Apple App Store</th>
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<tbody>
<tr>
<td>Total apps 20</td>
<td>Total apps 13</td>
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<tr>
<td>Duplicate 10</td>
<td>Duplicate 6</td>
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<tr>
<td>(3 in common with Play Store selection)</td>
<td></td>
</tr>
<tr>
<td>Play store final selection 10</td>
<td>Apple store final selection 7</td>
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<tr>
<td><strong>General final selection 17</strong></td>
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### Characteristics and functions of the tested apps:

- **Technical information:** Store (GPS/AAS), Version number, Average rating
- **Data upload:** Blood glucose, Exercise, Diet, Medication, Blood pressure, Weight, Notes, Export/data sharing
- **Education:** Decision support, Messages, Contents, Visual aids, Goal setting, Social
**Decision support:** functions aimed at providing a feedback or a suggestion on medication dosage, food dosage, and so on.

**Messages:** verbal messages used as alerts or reminders.

**Contents:** educational content about what is diabetes *stricto sensu* and why it is important to have healthy life styles.

**Visual aids:** functions aimed at providing a visual feedback on the trend of patients self-management.

**Goal setting:** functions designed for planning activities and used by patient to work on a particular aspect of self-management.

**Social:** functions designed for sharing ideas, doubts and information on social networks or social communities of diabetes patients.
Education as a composite category

- Decision support: 47% (8)
- Messages: 47% (8)
- Contents: 11.8% (2)
- Visual aids: 94.1% (16)
- Goal setting: 17.6% (3)
- Social: 17.6% (3)
Focus on Education & Visual aids

- Bant Trends
- Glucose table:
  - All Results: 127.6, Standard Deviation 114.3, 92 Total Tests
  - Pre-Breakfast: 105.2, Standard Deviation 63.6, 13 Tests
  - Post-Breakfast: 153.8, Standard Deviation 148.8, 13 Tests
  - Pre-Lunch: 125.2, Standard Deviation 132.5, 13 Tests
  - Post-Lunch: 122.2, Standard Deviation 96.9, 13 Tests
  - Pre-Dinner: 89.1, Standard Deviation 36.7, 14 Tests
  - Post-Dinner: 166.4, Standard Deviation 140.3, 13 Tests
  - Night: 135.7, Standard Deviation 147.9, 12 Tests
- Graph displaying glucose levels over time.
Design of a prototype for patient education and intervention study
Limitations of reviewed apps:

- lack of explicit theoretical models
- weak educational component
- functions of information giving and critical thinking are poorly linked

How to strengthen the educational component of a mobile application for patient education?

- Solid theoretical models about clinical practice, professional dialogue, and the cognitive dimension

  - **Messages**: not only alerts/reminders, but motivation boosters (Walton & Krabbe, 1995; Bigi, 2014, 2015; Bigi & Macagno, submitted)
  
  - **Goal setting**: not a task in isolation, but a cooperative activity performed by health care professionals and patients (Street, Elwyn & Epstein, 2012; Baca-Motes et al., 2013)

  - **Decision support**: triggers and nudges are not persuasion tricks out of context (Fogg, 2003), but incorporated in a long-term relationship (doctor-patient) and in an engaging experience (Kaptein et al., 2010)
Participants: 60 Type 2 diabetes patients
Duration: 12 months
Assessment methods: qualitative interviews, questionnaires

Aims of the study
To assess the following parameters:
- app usability (questionnaires)
- improvement of patients’ awareness of their disease (questionnaires)
- improvement of patients’ self-management abilities (monitoring of HbA1c; correct performance of self-monitoring)

Current stage of the study: identification of outpatient clinic and preparation of assessment materials
THANK YOU!

Healthy Reasoning Project
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