Towards Health Exercise Behavior Change for Teams Using Life-logging

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Abstract

• In this research, we focus on team level behavior change.

• We propose and evaluate information sharing models based on Competition and Collaboration techniques for team level behavior change.

• As a result, external competition technique is resulted the most effective performance for competitive team.
Background

- The spread of various kind of life log services and applications
  - We can easily detect and store various daily activity

- A lot of kind of human behavior change techniques are used in those applications.
  - Gamification (Ranking, Collaboration, Score, Badge, Visualizing…etc)
  - Almost techniques focus to individual human behavior change

- Activity as a team (such as sport team, project team, or laboratory…etc)
  - In a team, there are various kind of relation ship with team members
  - Team level behavior change is useful in many fields
Research Question

- Effects of existing techniques (individual human behavior change) are not clear to use for **team-level behavior change**
What is the team?
-Classification of Group-

In this research, the target group is “team”!!
Related Work

- Researches of information sharing with group for promoting their behavior change

Those researches don’t force Team Level Behavior Change
What is Team Level Behavior Change?

- Team Level Behavior Change
  = “Comfortable Promoting Team Total Amount of Activity”

- **Team Performance (TP):** maximize of team total score

  \[
  TP(n) = \frac{\sum_{i=1}^{n} IP_i}{n}
  \]

- **Unpleasant level (UL):** minimize of unpleasant

  \[
  U(n) = \frac{\sum_{i=1}^{n} Q_i}{n}
  \]

  \[
  UL(n) = \frac{\sum_{i=1}^{n} U_i}{n}
  \]
Purpose of Research

- Survey the effects of difference of promoting behavior change techniques on teams
  - Especially, we focus on “Competition” and “Collaboration” techniques
### Information sharing models for team behavior change

<table>
<thead>
<tr>
<th>Information sharing models</th>
<th>Combination of promoting behavior change techniques</th>
<th>Concrete example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IND</strong> (individual)</td>
<td></td>
<td>Achieve one's goal</td>
</tr>
<tr>
<td><strong>iCL</strong> (internal collaboration)</td>
<td></td>
<td>Achieve the team goal with team members</td>
</tr>
<tr>
<td><strong>iCP</strong> (internal competition)</td>
<td></td>
<td>Competition with team members</td>
</tr>
<tr>
<td><strong>iCLCP</strong> (internal competition and collaboration)</td>
<td></td>
<td>Competition with team members and Achieve the team goal with team</td>
</tr>
<tr>
<td><strong>iCL+eCP</strong> (internal competition and external competition)</td>
<td></td>
<td>Competition with team total activity</td>
</tr>
<tr>
<td><strong>iCLCP+eCP</strong> (internal competition and collaboration, and external competition)</td>
<td></td>
<td>Competition with team total activity and Competition with team members</td>
</tr>
</tbody>
</table>
Aaron2:
-Promoting Team Based Behavior Change Application-
Experiment

1. Participant team
   - **Strong Aim Sharing Team**: (Baseball Team) Official Baseball Club in Keio Univ.
   - **Weak Aim Sharing Team**: (Laboratory Team) Computer Science Laboratory in Keio Univ.

2. Each teams assigned one information sharing model, and all participants use Aaron2 during 3 weeks.

3. Each models is evaluated by team total performance (*TP*) and unpleasant level (*UL*)
Baseball Team
(Official Baseball Club in Keio University)

Baseball-A

IND

基地

iCL

Baseball-B

Baseball-C

iCP

Baseball-D

iCLCP

Baseball-E

iCL+eCP

Baseball-F

iCLCP+eCP

Baseball-H

Baseball Team

Laboratory Team
(Computer Science Laboratory in Keio University)

Lab-A

IND

Lab-B

iCL

Lab-C

iCP

Lab-D

iCLCP

Lab-E

iCL+eCP

Lab-F

Lab-G

iCLCP+eCP

Lab-H
“Baseball team” vs “Laboratory team”

- The total amount of activity of 8 groups in baseball club, 6 groups (except for Baseball-A(IND) and Baseball-B(iCL)) outperformed all groups in laboratory team.

- Sharing amount of sit-up activity is closely related to performance.
"No Information Sharing Model" vs "Information Sharing Model"

• IND is the most lower model than another models

- This result mean that information sharing is effective for team level behavior change
TP: Team Performance

Effect of *Number of behavior change techniques*

- Team behavior change is *not influence to number of information sharing techniques*

![Graph showing the amount of sit-ups over time for different baseball groups with different interventions.]
TP: Team Performance

“Competition” vs “Collaboration”?

• The models with “competition” element showed better results than not competition models

- Especially, using an competition techniques is more better than other models.
TP: Team Performance

Standard Deviation (SD) of iCP+eCP and iCLCP+eCP

- The standard deviation of iCL+eCP (459.71) was much larger than iCLCP+eCP (190.67)
Unpleasant Level (UL) of Baseball Team

- Participants of IND and iCLCP+eCP feel they don’t want to use their information sharing models.
- Participants of iCLCP and iCL+eCP don’t feel strong social pressure from team members.

<table>
<thead>
<tr>
<th>Team</th>
<th>Model</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball-A</td>
<td>IND</td>
<td>2.75</td>
<td>2.25</td>
<td>4.25</td>
<td>3.08</td>
</tr>
<tr>
<td>Baseball-B</td>
<td>iCL</td>
<td>3.50</td>
<td>3.25</td>
<td>2.75</td>
<td>3.17</td>
</tr>
<tr>
<td>Baseball-C</td>
<td>iCP</td>
<td>3.25</td>
<td>3.25</td>
<td>3.25</td>
<td>3.25</td>
</tr>
<tr>
<td>Baseball-D</td>
<td>iCLCP</td>
<td>3.50</td>
<td>3.50</td>
<td>3.00</td>
<td>3.50</td>
</tr>
<tr>
<td>Baseball-E</td>
<td>iCL+eCP</td>
<td>3.00</td>
<td>3.25</td>
<td>4.00</td>
<td>3.42</td>
</tr>
<tr>
<td>Baseball-F</td>
<td>iCL+eCP</td>
<td>3.00</td>
<td>2.75</td>
<td>4.50</td>
<td>3.42</td>
</tr>
<tr>
<td>Baseball-G</td>
<td>iCLCP+eCP</td>
<td>2.50</td>
<td>2.50</td>
<td>3.25</td>
<td>2.75</td>
</tr>
<tr>
<td>Baseball-H</td>
<td>iCLCP+eCP</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Q1: How do you feel activity sharing using application?  
Q2: Do you want to use this application continuously?  
Q3: Do you feel pressure from other members?
Discussion

• Team design
  - A team has various kind of role (Manager, Reader, Rival)

• Uniqueness of each information sharing model
  - iCLCP+eCP: Raising the standard of the ability for all member

• Type of life-log data
  - “Automagically detected data” vs “Manually detected data”
  - Relationship with “sharing contents” and “team goal”
Future Work

• Create the platform for team level behavior change

• We will try to more large scale evaluation

Team Behavior Change Model

- Life-log
  - Ex) Auto-detection data, Manual input data

- Technique of Information sharing
  - Ex) Competition, Collaboration, Goal, Barge

- Type of team
  - Ex) Type of team [Lat type, Leader Type], Community

http://life-cloud-dev.ht.sfc.keio.ac.jp/tetujin/test-aaron
Conclusions

- We propose six types of information sharing models \((IND, iCL, iCP, iCLCP, iCL-eCP, iCLCP-eCP)\) for team level behavior change, and evaluate them.

- According to our Aaron2 exercise promotion web application on smart phones and extensive user study among 64 total users for three weeks.

- As a result, “External Competition” technique resulted the most effective for competitive teams such as sport teams.
Thank you for your kind attention.

Do you have any questions?

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Appendix
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• According to our Aaron2 exercise promotion web application on smart phones and extensive user study among 64 total users for three weeks.

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Strong Aim Sharing Team
(Official Baseball Club in Keio University)

**IND**
Baseball-A

**iCL**
Baseball-B

**iCP**
Baseball-C

**iCLCP**
Baseball-D

**iCL+eCP**
Baseball-E

**iCLCP+eCP**
Baseball-F

**Baseball-G**

**Baseball-H**

**Total Activity of P1**
- **P1**

**Total Activity of Team-B**
- **Team-B**

**Total Activity of Each Participants in Team-C**
- **P9**
- **P10**
- **P11**
- **P12**

**Total Activity of Team E and F**
- **Team-E**
- **Team-F**

**Total Activity of Team G and H**
- **Team-G**
- **Team-H**

**Total Activity of Each Participants in Team G and H**
- **P25**
- **P26**
- **P27**
- **P28**
- **P30**
- **P31**
- **P32**
Experimental Procedure

1st step: Introduction of the user study
- Description of group configuration
- Collect signed permission agreement letters
- Install Aaron2 to own smart phone

2nd step:
- Do Sit-ups with member

3rd step:

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Six Type of Information Sharing Model

- **IND**
- **iCL**
- **iCP**
- **iCLCP**
- **iCL+eCP**
- **iCLCP+eCP**
**IND: Individual**

- The aim of this model is **to achieve their own goal**
  - No information exchange occurs between members
  - Simple own activity visualizing model
The aim of this model is to encourage collaboration between team members, given by a common goal:

- **Common Goal** = “Total amount of activity by the team”
- Pressure from team members is the most lowest in six type of information sharing models
- A simple collaboration technique
**iCP**: *internal competition*

- The aim of this model is **encourage competition between team members**
  - all team member can access to all other members’ amount of total activity
  - a simple competition technique
**iCLCP**: internal competition and collaboration

- The model is a combination of *iCL* and *iCP*

- Team total amount of activity and each team members’ individual amount of activity are shared with all members
**iCL+eCP:**

*Internal Collaboration and External Competition*

- This model is a combination of **iCL** and competition between multiple teams (External Competition).
- The aim of this model is to **encourage competition** among teams by **visualizing each team’s total activity**.
iCLCP+eCP

*Internal Collaboration, Competition and External Competition*

- The model is **a combination of iCLCP and competition between multiple teams**

- With this model, **each team members can access to all types of information**

  - Pressure from team members is the most strongest in proposed models

![Diagram showing collaboration and competition between team members]
Abstract

• This study is the research of utilizing life-log data for team level health exercise behavior change

• We propose six types of information sharing models for team level behavior change, and evaluate them

[source] http://toyokeizai.net/articles/-/35921
Aaron2: 
-Promoting Team Based Behavior Change Application-

- Aaron2 is activity counter for exercise
- This application is used by team members, and Aaron2 can set the information sharing model (IND, iCL, iCP, iCLCP, iCL-eCP, iCLCP-eCP)
- Also that is work on muti-platform (iOS and Android)
Daily Active User Rate

- Daily active user rate decreased toward the end of experiment

- **Average Rate**
  - Baseball: 44.35%
  - Laboratory: 38.84%