1. **Project Title：A scoreboard based smartphone App of self-managed physical moving activities for office workers** (Authors: Yi-Chang Li, Chia-Yu Lien and Austin Shieh, Date: Augest 2, 2012)

2. **Description of project**

How much physical activity do you need? CDC suggests working your way up to 150 minutes of **moderate-intensity aerobic activity**, 75 minutes of **vigorous-intensity aerobic activity**, or an equivalent mix of the two each week. (http://www.cdc.gov/healthyweight/physical_activity/index.html)

What are moderate activities? What are vigorous activities? and what activities can be tracked by GPS on a smartphone?

Moderate: While performing the physical activity, if your breathing and heart rate is noticeably faster but you can still carry a conversation — it's probably moderately intense. Examples include walking briskly* (a 15-minute mile), light yard work (raking/bagging leaves or using a lawn mower), light snow shoveling*, actively playing with children, and biking at a casual pace*.

Vigorous: If your heart rate is increased substantially and you are breathing too hard and fast to have a conversation, it's probably vigorously intense. Examples include jogging/running*, swimming laps, rollerblading/inline skating at a brisk pace*, cross-country skiing*, most competitive sports (football, basketball, or soccer), and jumping rope.

Note: * means the activity can be tracked by a GPS on the smartphone

We present **a scoreboard app** for office workers in UCSF on the smartphone with AGPS. Following users include: medical professionals in UCSF hospitals as well as students, staffs and faculty on the UCSF campus. Users will get scores for physical activities, such as walking, running, skating, and cycling. A score is reported to users on a weekly basis (Monday through Sunday). Users will receive a score reminder each day (e.g. before 8pm). On Sunday, users will get a summary report and will be encouraged to continue by a symbol of completion if he/she reaches above the baseline (CDC suggestion of 150 minutes of **moderate-intensity aerobic activity**, 75 minutes of **vigorous-intensity aerobic activity**, or an equivalent mix of the two each week.) If his/her score is under the baseline, a reminder will also be sent to the smartphone to encourage him/her to exercise more in the next week.

Notice: This app is not designed for an office worker who likes exercise. It is for an office worker who may use "no time" or "too busy" as an excuse and not exercise at least above the baseline. Score is calculated based on the intensity and the time of moving activities. The score formula will be opened after Aug 10.

3. **Deliverables**

An iPhone or an Android App will be delivered by free downloading on Apple's Appstore or Google's Market. The app will benefit UCSF office workers or campus members on improving their fitness. The app will be opened to public free download when the program is well-tested by UCSF users.

Time bond depends on final scope and requirements.

4. **Impact on UCSF's mission and/or community (Expected Contribution of this project)**

This project is expected to have a little contribution as one of the pilot projects to prevent individuals at work from becoming a pre-type-2-diabetes. Physical exercise is a key component of lifestyle modification. The modification can help individuals prevent or control type 2 diabetes (Fowler, 2010). Although diet is probably more important in the initial phases of weight loss, incorporating exercise as part of a weight-loss regimen helps maintain weight loss and prevent regaining of weight (Klein et al. 2004; Bassuk and Manson 2005).

Internet technologies and mobile technologies introduced innovative way to improve individual fitness and prevent health problems (such as Faghri et al., 2008; Fukuoka et al. 2010, to name a few).

UCSF has been well known by academia and the community because of its history and leadership in innovation and its vision of curing diabetes. The app presented in this project is a pilot study for presenting an innovative tool for office workers who have smartphone with AGPS to prevent them from type 2 diabetes. After implementation and testing of our app, a future pilot trail is expected for evaluating the effectiveness for individuals at work sites with type 2 pre-diabetes symptoms.

5. **List of team members and their roles**

- Yi-Chang Li, Visiting Assistant Professor, Institute for Health and Aging, School of Nursing, UCSF (team leader and part-time programmer)
- Chia-Yu Lien, Master students, School of Nursing, UCSF (as a team member to adapt calorie conversion and develop a scoreboard for this project)
- Austin Shieh, EECS undergraduate student, UC Berkeley, (as a team member and a part-time programmer in this project

6. **Estimated time devoted by each team member**

Equal devotion is made by each team member.

7. **For staff: pre-approval documentation from your supervisor**

No staff at this time

Reference

1. Ainsworth BE, Haskell WL, Herrmann SD et al. 2011. Compendium of Physical Activities: A Second Update of Codes and MET. Med Sci Sports Exerc. 43(8):1575-1581.
2. Bassuk SS and Manson JE. 2005.Epidemiological evidence for the role of physical activity in reducing risk of type 2 diabetes and cardiovascular disease,Journal of Applied Physiology,99(3):1193-1204.

3. Faghri PD Omokaro C. Parker,C. Nichols,E. Gustavesen S. and Blozie E. 2008. E-technology and Pedometer Walking Program to Increase Physical Activity at Work,Journal of Primary Prevention,29(1):73-91.
4. Fowler MJ. 2010. Diagnosis, Classification, and Lifestyle Treatment of Diabetes.Clinical Diabetes. 28(2):79-86
5. Fukuoka Y, Vittinghoff E, Jong SS, Haskell W. (2010). Innovation to motivation--A pilot study of mobile phone intervention to increase physical activity among sedentary women. Preventive Medicine, 51(3-4), 287-289
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Appendix I. Current progress of the project

The calculation formula for calculation of the score got in each physical activity and the total score a week is based on 2008 Physical Activity Guidelines for Americans.

Compendium of physical activities has provided a guideline to measure energy cost of physical activities. Ainsworth et al. (2010) presented their second update of metabolic equivalent of task (MET) value for measuring compendium of physical activities. MET values represent the ratio of work metabolic rate to resting metabolic rate. According to the activity intensity, MET rates range from 0.9 while sleeping to 10.0 in rope jogging. For a moderate intensity activity, it's MET is between 3 and 6. For a vigorous intensity activity, it has MET between 6 and 10. Table 1 lists a variety of physical activities and their MET consumed in the activity.

For moving physical activities (such as walking, running, and biking), users select the name of physical activities from menu, GPS will track and keep his/her moving on the map and report the time of activity (Minutes consumed by activity) to user. For non-moving physical activities (e.g. rope jogging) or the individual body moving in a very limited space (e.g. play with children), users select the name of physical activities from menu and input the time of activity (Minutes consumed by activity) by himself/ herself.

For a week, the Score of the Activity in a week (SA_w). SA_w is calculated by the formula (f1) which is a summation of SA_d in seven days of the week (f1).

$SA_w = \sum_{i=1}^{7} SA_{di}$,

i is Monday, Tuesday,… Sunday (f1)

SA_d is calculated by the formula (f2) which is a summation of time consuming on each activity (measured by minutes) an individual taken in a day. In 2008 Physical Activity Guidelines for Americans, it suggests that in a week, every individual should have at least 150 minutes of moderate-intensity aerobic activity, or 75 minutes of vigorous-intensity aerobic activity, or an equivalent mix of moderate- and vigorous-intensity aerobic activity. Therefore, a weight (w) is adapted and added in f2 which represents the weights of two types of activity.

$SA_d = \sum_{j=1}^{n} w * \ Minutes\ consumed\ by\ activity_j$, (please see table 1)

w represents the weight of each type of activity, w =1 for moderate-intensity, w=2 for vigorous-intensity.

n represents the number of activities in a day,

j represents the item of the activity (f2)

In order to encourage individuals to reach the baseline and to exercise in a regular base, we suggest that every individual has to achieve SA_d greater than 150. That is, score of 150 is our baseline score (BS) recommended for an individual as a minimum required activities in a week.

For example:

If one choose to walk a 30 minute of 3.4mph (moderate intensive) and a 30 minutes of running jogging (vigorous intensive) as a way of exercise today. He/ she gets today's score SA_d by calculation.

$SA_d = 30 + 2 * 30 = 90$

Table 1 Physical activities' categories and MET

Moderate Intensity Activities (which MET is between 3 and 6)	**MET**
bicycling, stationary, 50 watts, very light effort	3.0
walking 3.0 mph (4.8 km/h)	3.3
walking 3.4 mph (5.5 km/h)	3.6
bicycling, <10 mph (16 km/h), leisure, to work or for pleasure	4.0
bicycling, stationary, 100 watts, light effort	5.5
Vigorous Intensity Activities (which MET is grater than 6)	**MET**
jogging, general	7.0
calisthenics (e.g. pushups, situps, pullups, jumping jacks), heavy, vigorous effort	8.0
running jogging, in place	8.0
rope jumping	10.0

Appendix II. Current status of the prototype development

Figure 1 demonstrates our prototype which is under construction. Red spot represent the position of individual who is using our app. Orange circle means the distance of half a mile within the individual access.

Figure 1 Prototype which is under construction