The development and feasibility of a pedometer-based exercise decision support system for women with systemic lupus erythematosus

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Background

Low levels of physical activity are common in women with systemic lupus erythematosus (SLE), and a sedentary lifestyle is associated with risk factors of cardiovascular diseases, poor health outcomes and increased mortality. It has been suggested that encouraging physical activities could benefit SLE population. However, there is limited information about effective strategies of promoting physical activity for people with SLE.

The study

Purpose

Based on the results of our previous study, medication use (e.g., corticosteroid) and environment factors were significantly correlated with physical activities levels of women with SLE. Therefore, this study proposed the translation research-evidence to clinical guideline for exercise intervention in patients with SLE, and this study aimed to design and evaluate the feasibility of a pedometer-based exercise decision support system on smartphone Apps for SLE women.

Methods

The structure of this proposed system includes a personal information system, physiological sensors (HR, BP), environmental detectors (temperature, humidity, ultraviolet, and atmospheric particulate matter), a step counter, a goal calculation algorithm, a step-count feedback section and the cloud computing system. Function of the system developed by Android Apps consists of pre-exercise assessment (based on personal, physiological and environmental information), exercise decision making, personalized exercise recommendation, and real-time monitoring and feedback (Figure 1).

We proposed an initiate goal of 5,000-7,000 steps/day that include 30 minutes of moderate to vigor physical activity (100~130 steps/min). Personalized goals were developed by increasing 500 steps/day based on the user's average steps/day of the previous week. A feasibility study was conducted among ten women who was diagnosed with SLE, aged between 20 and 65 years old, at immunology outpatient clinics of a university-based medical center in Taiwan. Each participant was instructed to carry the smartphone and use this proposed system for 4 weeks.

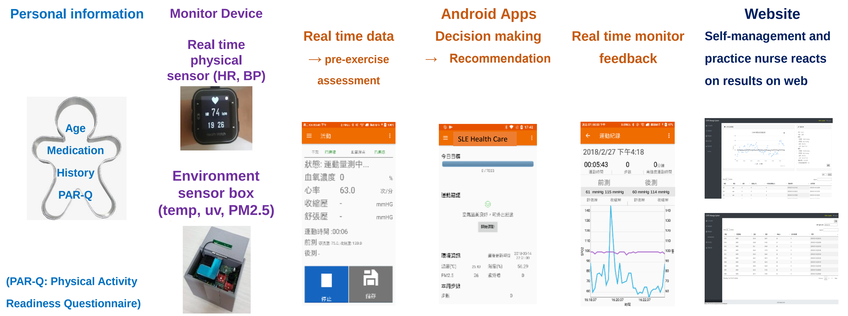

Figure 1. The structure of exercise decision support system for users with SLE

Results

Nine women who had mild to moderate SLE disease severity completed the study. Their mean age was 48.3±13.5 years. At the first week, average daily step counts of the participants ranged between 1578 and 4050 with the mean of 2669 steps/day (Table 1). Average bouts of moderate to vigor physical activity were less than 5 mins /day in all participants. Although mean daily steps of these women were not increased during the 4-weeks study (mean differences: 488±1276 steps/day, p= 0.28) (Figure 2), they reported satisfaction for the proposed system to promote daily activity at homes.

Table 1 Basic information and average steps/day of the SLE women (N=9)

No	Age	SLE severity (SLEDAI)	Baseline (steps/day)	4th week (steps/day)
1	39	4	1578	1359
2	55	1	2184	2825
3	64	6	2214	5740
4	61	3	3410	3743
5	36	6	4050	3749
6	59	6	3614	3350
7	41	2	1721	2471
8	54	2	2516	3794
9	25	4	3733	3384

SLEDAI: SLE Disease Activity Index

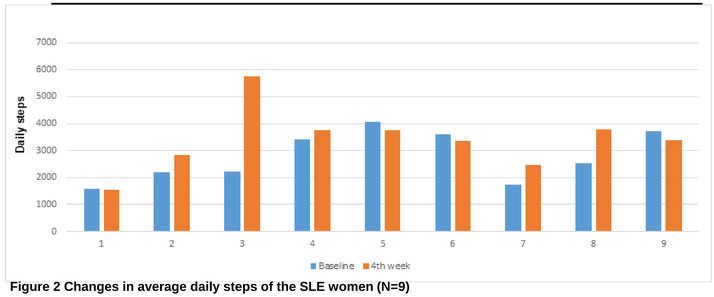

Figure 2 Changes in average daily steps of the SLE women (N=9)

Discussion & Conclusion

This system is innovate, because the pre-exercise assessment mechanisms and personal goal setting are specific to detect suitable environment factors and the recommended amount of daily activity for SLE users. Results of this feasibility study showed that women with SLE remain very sedentary life style. Additional potential factors including usability and baseline level of Apps usage will be explored in our future study. Based on the amount of activity and goals reached of the participants, we will adjust the program of this system accordingly. Further evaluation of its efficacy is in progress.

Acknowledgement

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