



StepAdd: A pharmacist-assisted personalised mobile health intervention to promote physical activity among type 2 diabetes patients

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Content outline

- Background
- Part 1: Theory-based framework of mHealth intervention, StepAdd
- Part 2: Personalisation mechanism of *StepAdd*
- Part 3: Prelimiary efficacy and feasibility of *StepAdd*
- Conclusions and take home message





Diabetes and self-care

Estimates of the global prevalence of diabetes in the 20–79 year age group (millions)





Patients are required to build self-care habits around lifestyle modification²





Walking and mobile health (mHealth)



Walking one mile per day, or more (≥1.6 km/day): ↓2-fold reduction in adjusted risk of all-cause mortality

in older adults with diabetes³



Recent meta-analyses found a moderate-to-large positive effect in daily step changes due to use of mHealth apps. $^{\rm 4,5}$





Problems with current mHealth apps

Patients lose motivation to engage with the intervention after some time.⁶

Lack of theoretical framework for behavior change and personalisation









Aim

1.To propose a theory-based framework and personalisation mechanism for a smart phone-phased mHealth app, *StepAdd*

2.To assess preliminary efficacy and feasibility of *StepAdd*





Part 1: Theory-based framework of *StepAdd*











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Part 2: Personalisation mechanism of StepAdd

-Personalised goal setting

-Individualized feedback

-Personalised coaching

-Personalised coping planning





Personalised goal setting: examples

Reach goal for at least 6 days in this week

- (+) 500 steps ((+) 300 steps if current goal is not the highest to date)

-Capped at physician-set maximum step goal

Reach goal for 3,4, and 5 days in this week

- Maintain current step goal

- 5 days: (+) if same goal has been reached for 5 days 2 weeks in a row





Personalised goal setting: examples







Personalised goal setting: examples

- StepAdd will ask user if they are confident to meet the proposed goal 5 or more days in the following week
- If not confident, app will propose:
- 1. \bigcirc 200 steps per day until confidence is reached, with a maximum \bigcirc of 600 steps (while preventing going below physician-directed minimum step goal)

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過去の歩行実績から計算すると、 次の1週間の毎日の歩数の目標を 3,600歩とすることをお勧めしま す。前週の目標歩数から、300歩 減らしています。次の画面で、薬 剤師と相談しながら決めた Y.Nagataさんの「歩けていない理 由」を確認して、それを打ち破る ためのチャレンジを決めてくださ い。最後に、Y.Nagataさんが目標 の歩数を達成する自信がどれくら いあるかをお聞きした上で、目標 歩数を決めます。

今日の活動

次へ

今日の活動

Calculating from your previous walking records, we recommend setting a goal of 3,600 steps per day for next week. This goal is 300 steps per day less than last week. On the next screen, please confirm your "barrier to walking" that you identified with your pharmacist, and decide on a coping strategy you will use to tackle this issue. Lastly, after asking you about how confident you are in achieving your step goal, we will set a new step goal.

Next

Example of personalised goalsetting communication with the patient (with English translation)



Individualised feedback

• The message is programmed according to the difference between the target step goal entered by the participants and the actual steps achieved.



Examples of continuous status on steps relative to goals (with English translation)







Personalised coaching: community pharmacist

- Instruct how to use app and devices
- Monitor patients's walking progress
- Help identify barriers in achieving step goals
- Check occurrence of adverse events
- Assess patients' self-care behavior
- Examine app usage









Personalised coping planning

Monthly	 Users input a barrier in achieving the step goal on app after discussion with pharmacist, and suggest a solution strategy to overcome the barrier for the upcoming week
Weekly	 The solution strategies are revised by users on the app
End of each day	 Users provide a yes/no binary assessment on the app, on whether or not the strategy was implemented that day
End of each week	 App provides feedback by displaying the number of days that the coping strategy was implemented



Personalised coping planning

今日の活動	今日の活動
今週のチャレンジ	This Week's Challenge
「暑い」に対して、今週はどのよ うに取り組むのが良いでしょう か。よく考えて毎日実行するチャ レンジを選びましょう。下の選択 肢から1つ選ぶか、自由記述で入 力してください。 以下の選択肢から、当てはまるも のを1つ選んでください。	How would you like to deal with the barrier "it is hot" this week? Think carefully and choose a coping strategy that you will use everyday. Select one of the options below, or type in your own solution description. Please choose an option from below.
 昼内(ショッピングモー ル、地下街など)で歩く 	Valk indoors (Shopping malls, underground shopping areas etc.)
○ きい 涼しい時間帯に歩く	It is hot Walk at cooler hours
	It is hot

Example of setting a personalized coping strategy on the app (with English translation)



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Part 3: Preliminary efficacy and feasibility of StepAdd





Methods

- A single-arm pilot study from August 2021 to December 2021 using pre-post evaluation
- In collaboration with Mitsui Memorial Hospital, Nihon Chouzai (community pharmacy), Mitsui&Co.,Ltd (funder)
- Two-week baseline step count measurement period and a 12-week intervention period of using *StepAdd*
- Minimum sample size of 25 participants is required to detect 20% difference in step count



Inclusion criteria

- Aged 20 years and above
- BMI 22 kg/m² and above
- HbAlc 7.5% and above



- Average recorded baseline step count less than 10,000 steps / day
- Being in the contemplation, preparation, or action stage of the transtheoretical model (TTM) to achieve 10,000 steps / day
- Willing to attend monthly meetings with the pharmacist during the research period



Intervention Procedure



-Monitor steps, blood pressure,body weight

-Received personalized feedback on app

-Assess coping planning strategies

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Weekly

-Review goal achivement on app

-Set new step goal

-Review coping planning strategies



Monthly

- Coaching and app use assessment by pharmacist
- Update barriers to achieve step goal



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Basic demographic characteristics

- Male: 75.8% (25/35)
- Mean age: 61.5 ± 9.4 years
- BMI: 28.7 \pm 3.7 kg/m²
- Blood pressure: 146.3 ± 17.6; 81.1 ± 10.4 mmHg



Primary outcome: step count



An increase of 4,714 ± 3,638 steps (*P<.0001*), representing an 86.7% increase in the mean (n=33).



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Secondary outcomes: BMI, blood pressure

	End of week 0 (n=33)	End of Week 12 (n=33)	Difference	P value
BMI (kg/m²)	28.7±3.7	28.4±3.6	-0.3±0.6	0.0038
Systolic Blood Pressure (mmHg)	146.3±17.6	148.8±16.2	2.2±13.8	0.3690
Diastolic Blood Pressure (mmHg)	81.1±10.4	77.9±11.4	-3.0±8.5	0.0531





Secondary outcome : Blood Investigations

	End of Week 0 (n=33)	End of Week 12 (n=32)	Difference	<i>P</i> value
HbA1c (%)	8.58±1.02	7.79±1.11	-0.79±1.04	0.0001
Fasting blood sugar (mg/dL)	160.0±34.5	142.4±36.9	-18.7±26.9	0.0004
HDL-C (mg/dL)	50.0±13.8	52.4±13.5	2.5±4.4	0.0032
Triglyceride (mg/dL)	206.8±131.3	160.0±111.8	-50.1±72.2	0.0005
LDL-C (mg/dL)	112.9±33.4	112.4±32.4	-0.5±16.3	0.8553





Self-care behavior

Frequency of self-management behavior related to physical activity^a



^aEvaluation scale for self-management behavior related to physical activity of type 2 diabetes patients (ES-SMBPA-2D) ^bPhysical Activity Self-Regulation scale (PASR-12) Japanese version





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Conclusions

Personalized goal setting, coping planning, feedback

> Social cognitive theory-based mHealth intervention

Personalized coaching from pharmacists Greatly improves:
 ✓□ Step counts
 ✓□HbA1c, BMI and lipids
 ✓□Self-care behavior, self-regulation

High participants retention

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Take-home message

Blended in-person and mHealth intervention delivery approach with application of behavior change theory-based personalisation mechanism have great potential to promote physical activity.





Thank You



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