MEDINFO23

8 – 12 JULY 2023 | SYDNEY, AUSTRALIA

Effect of Step Count Measurement on Glycemic Control: Secondary Analysis of a Randomized Controlled Trial

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Background

Diabetes

- **422** million diabetes patients
- **1.6** million annual deaths

(IDF, 2019)

Walking is part of treatment

- Effective for glycemic control

(Tudor-Locke et al., 2011)

- Recommended > 7500 steps/day

(Haas et al., 2014)

mHealth apps to increase step counts

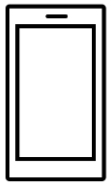
- Promote walking with step-tracking and feedback

(Kondo et al., 2022)

- Effective for glycemic control for diabetes patients

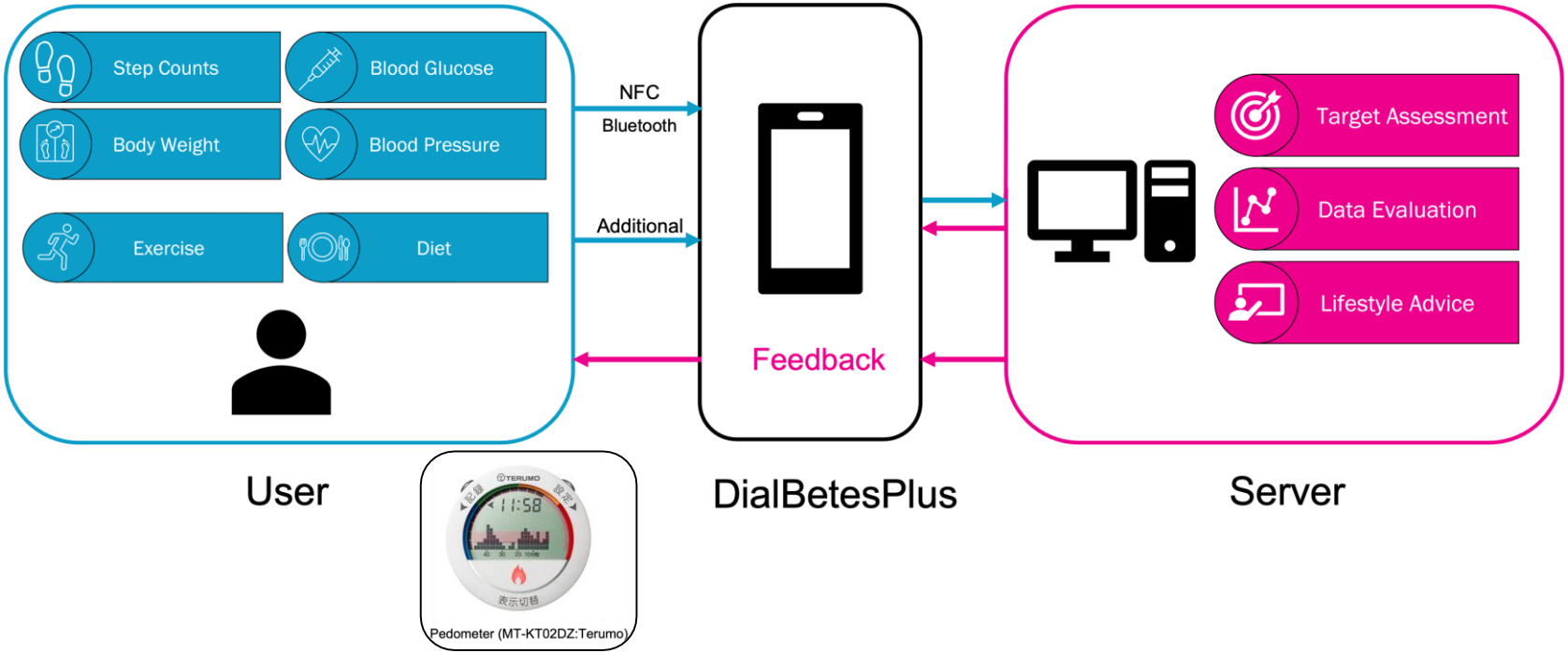
(Benoto et al., 2017)(Wu et al., 2018)

- Engagement declines…



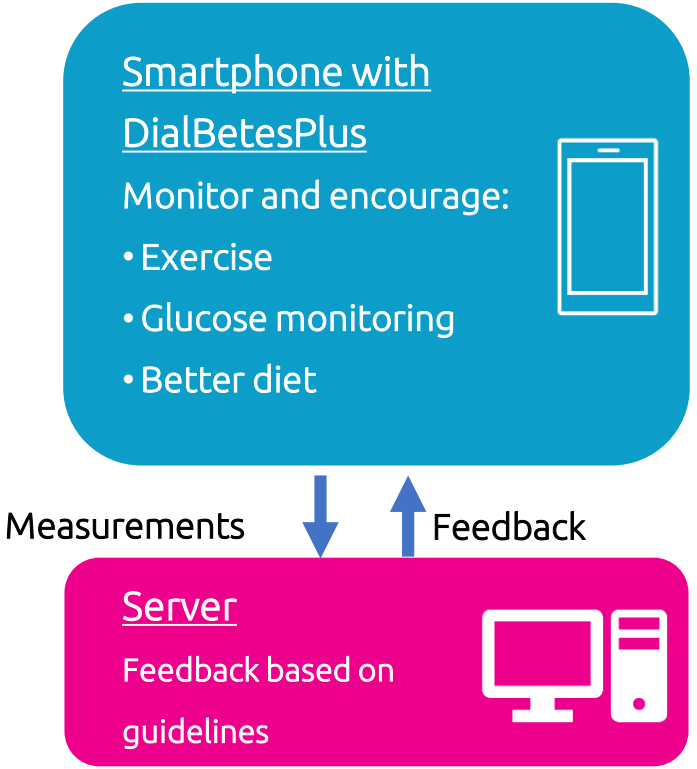
(Localytics, 2021)

DialBetesPlus



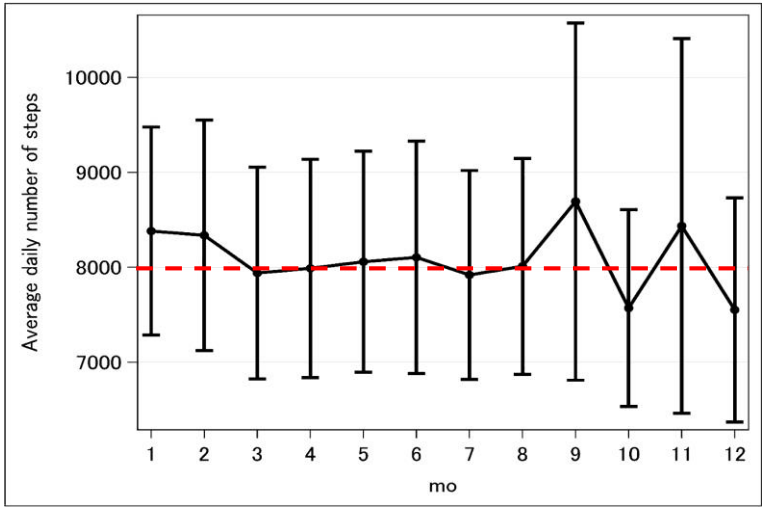
DialBetesPlus RCT

- 132 subjects
  - Intervention group (N=66)
  - Control group (N=60)
- Type 2 diabetes patients with moderately increased albuminuria
  - 30 ≤UACR <302 mg/g creatinine
- July 2018 - August 2019
- Average age : 59.5
- Eight hospitals in Japan
- Outcomes
  - UACR
  - HbAIc



DialBetesPlus Results

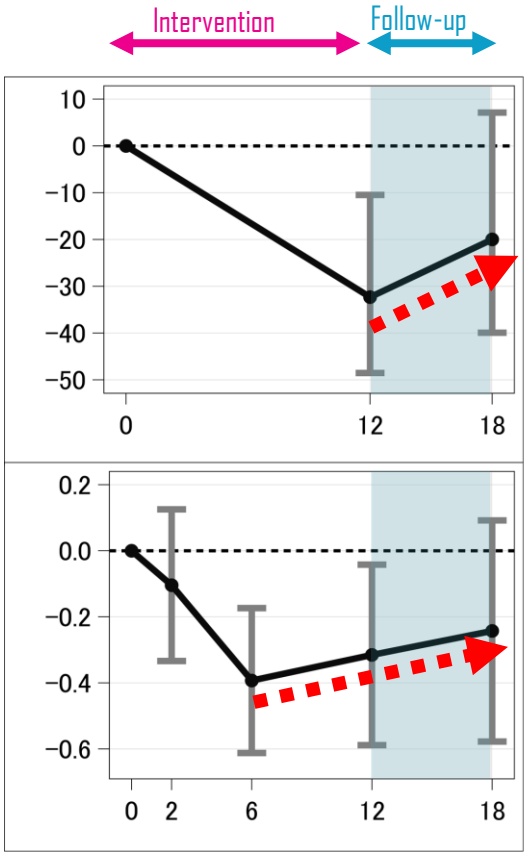
Average daily number of steps



Between-arm differences

UACR: % change

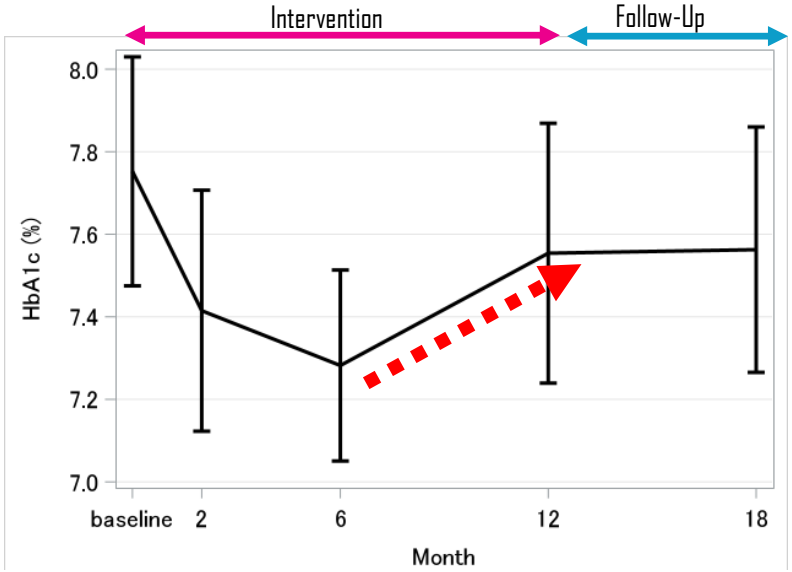
HbA1c: % pts change



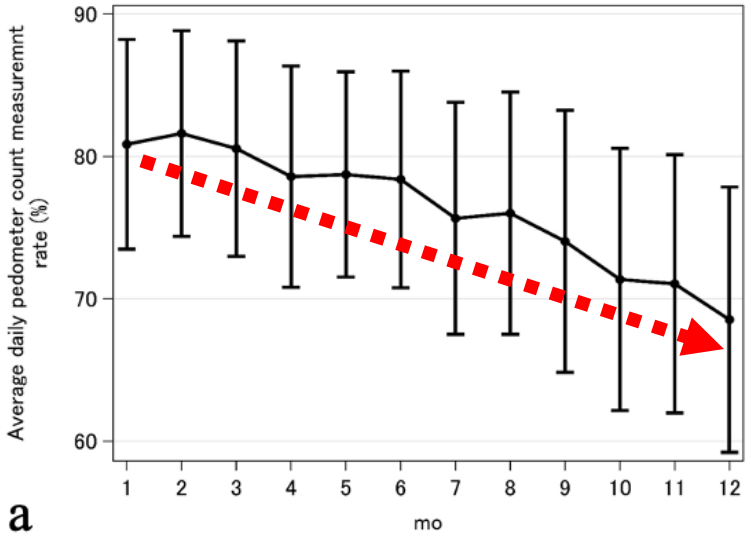
The intervention improves UACR and HbA1c levels

DialBetesPlus Results

Trend of HbA1c level per month of intervention



Progression of measurement rate



Does engagement with an app have a correlation with HbA1c levels?

Statistical Analysis

Confirm the relationship between change in HbA1c (pts) and change of step count measurement rate (pts)

- Correlation

  Change in HbA1c (pts) vs change of step count measurement rate (pts)

- Regression analysis
  - Response Variable

    Change in HbA1c (pts): HbA1c at 12 months – HbA1c at 6 months
  - Explanatory Variables

    Change of step count measurement rate: Rate at last 6 months – Rate at first 6 months

    HbA1c at 6 month (%)

    Average step count in 6-12 month (steps)

Results – Correlation

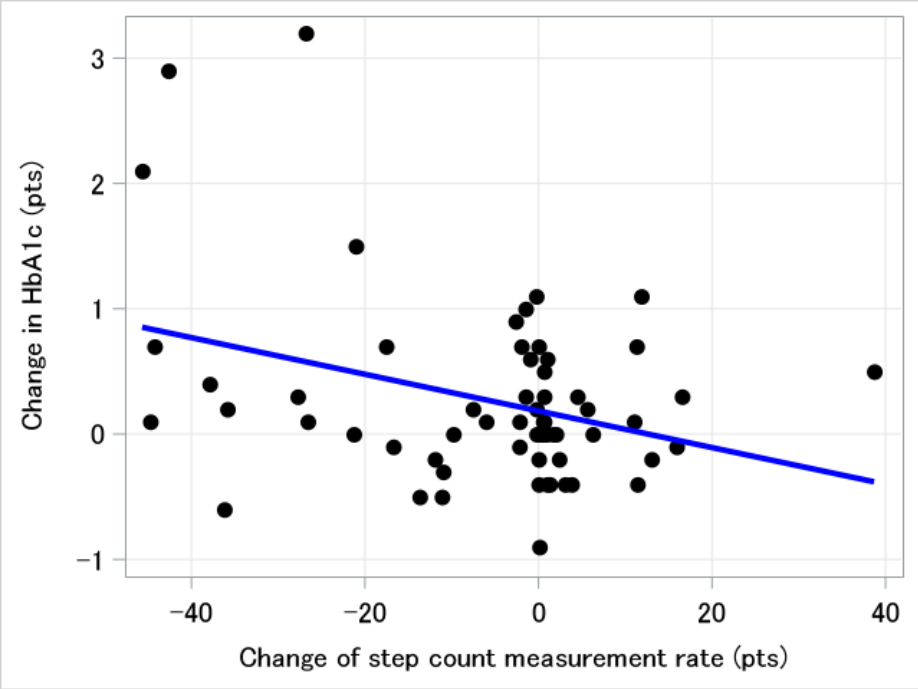


Figure 1. Plot of change in HbA1c versus change of step count measurement rate.

- Significant inverse correlation between two variables:
  - Change in HbA1c (pts)
  - Change of step count measurement rate (pts)
- Correlation coefficient : -0.335 (p=.0083)

Results – Regression analysis

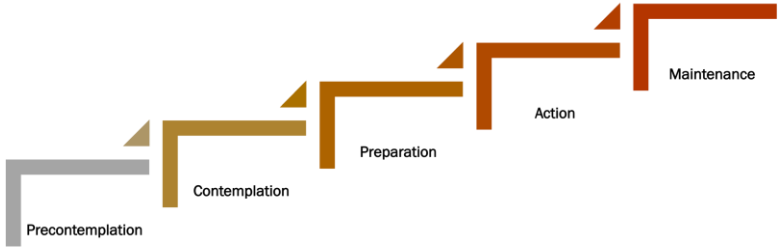
	Coefficient	Lower 95% CI	Upper 95% CI	P
Intercept	-0.342	-1.924	1.241	0.667
Change of step count measurement rate (pts)	-0.015	-0.026	-0.005	0.006
HbA1c at 6 month (%)	0.102	-0.098	0.302	0.312
Average step count in 6-12 month (steps)	-0.028	-0.073	0.017	0.214

Table 1. Results of the regression analysis for the change in HbA1c

- HbA1c worsens significantly with decreasing measurement rates
  - 20 pts decrease in measurement rate is associated with a worsening of HbA1c 0.3 pts

Discussion

- Reduced step count measurement frequency is correlated with significantly worse glycemic control
  - Patients with low measurement rates may have lost their motivation towards measurement or walking
- Future research should focus on
  - Establishing causality between step count measurement and glycemic control
  - Investigating how motivation for treatment affects glycemic control, based on the stages of change model



Conclusion

Self-measurement of step count positively correlates with glycemic control

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