Frequent interruptions of prolonged sitting improve fasting glucose, dawn phenomenon and night-time glucose control in type 2 diabetes.

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Acknowledgements

The research team

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Background

- Cross-sectional evidence: Too much sitting/sedentary time has detrimental effect on glucose control.
- Experimental evidence: Frequent interruptions of prolonged sitting with light-intensity walking breaks (LIWB) reduce PPG, daily mean glucose and night-time glucose.

  (1) 2 min LIWB every 20 min Vs Uninterrupted sitting for **5 hours** (Dunstan et al., 2012)

  (2) 3 min LIWB every 30 min Vs Uninterrupted sitting for **7 hours** (Dempsey et al., 2016)

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Background (Continued)

- Limited consensus on how frequently sitting should be interrupted.
- The effect of frequency of interrupting sitting time with LIWB on basal glucose (fasting glucose, the dawn phenomenon and night-time glucose) is unknown.
- Aimed to investigate the dose-response between frequency of interrupting sitting time with LIWB and basal glucose.

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Study design

- A randomised three-treatment, two-period balanced incomplete block trial.
- Participants completed two of the following three treatment conditions: sitting 7 hours interrupted by 3 min LIWB (3.2 km/h) every

    (1) 60 min (Condition 1);

    (2) 30 min (Condition 2); and

    (3) 15 min (Condition 3).

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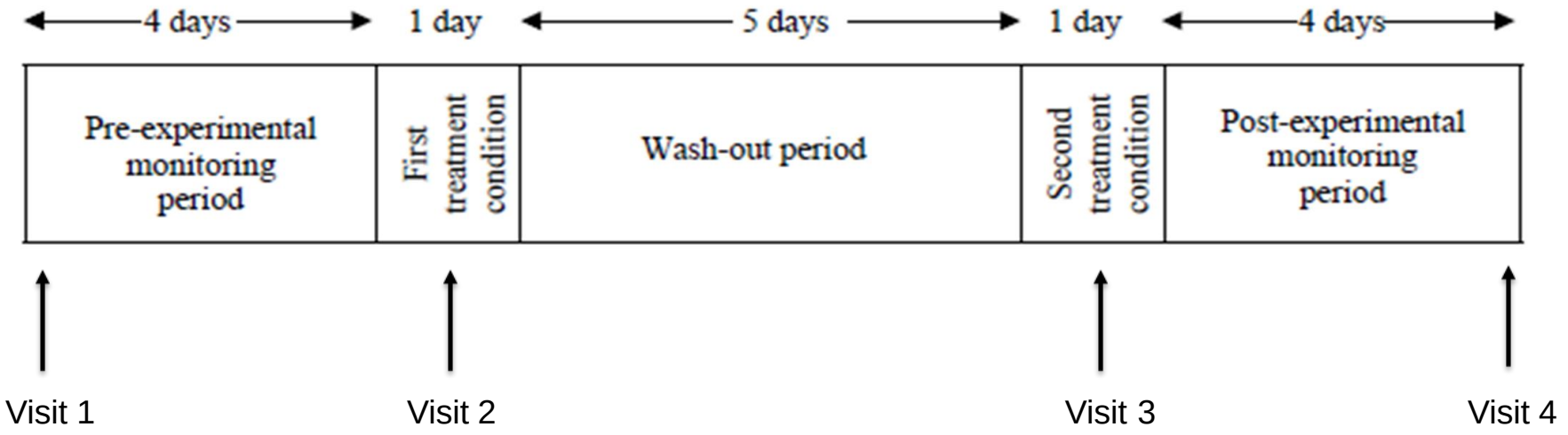
Study design

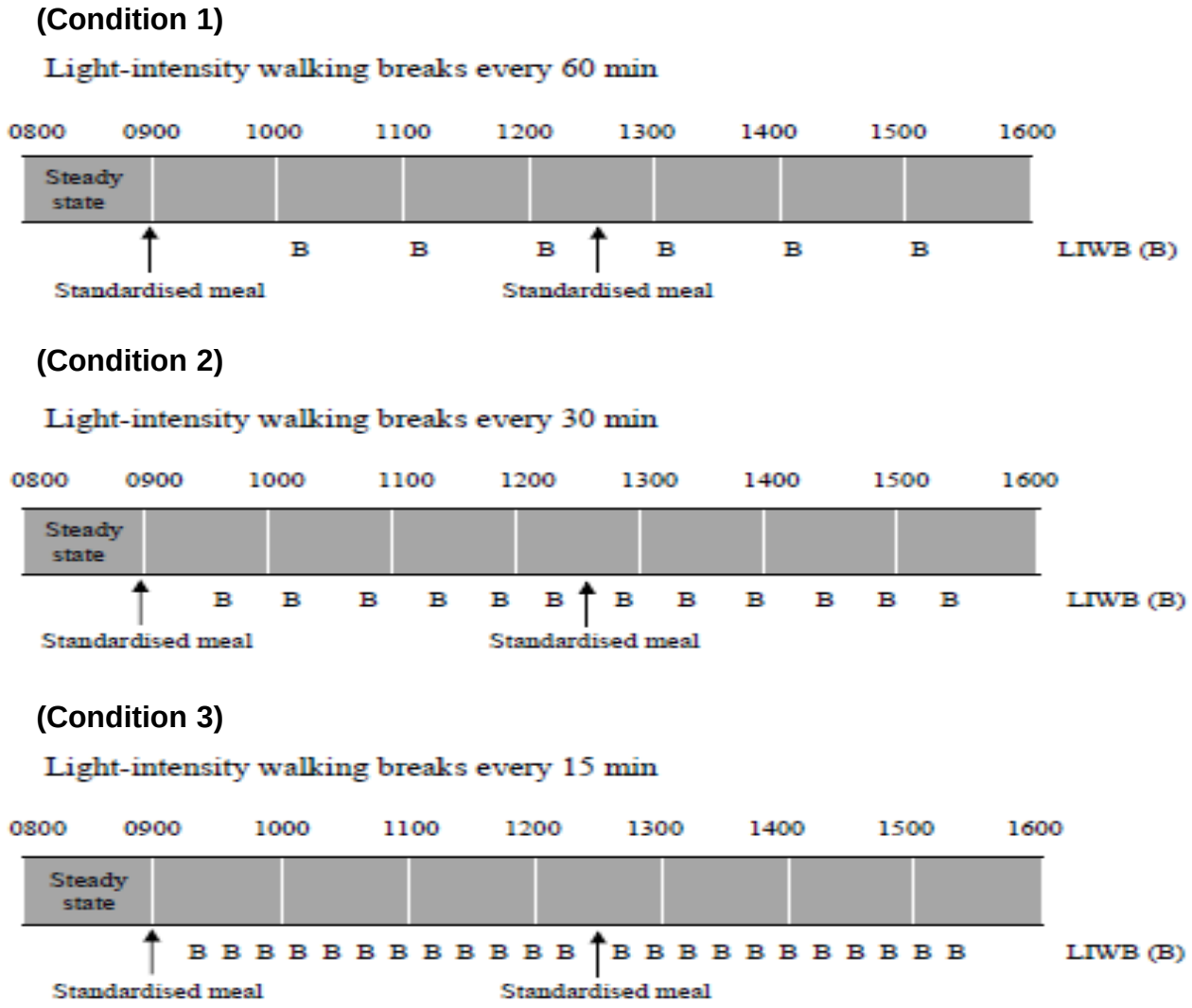
- ActivPAL3 activity monitor (PAL Technologies, Glasgow, UK) and continuous glucose monitoring (CGM, Abbott FreeStyle Libre) were used.
- Sleep diary and 24-hour Dietary Recall Form.
- Standardised meals were provided.

Figure 1. Study protocol.



Study design

Figure 1. Study protocol (continued).



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Study design

Participants

- Twelve participants (8 men, 4 women) with type 2 diabetes controlled by diet or metformin ± sulphonylurea, Mean age 60.0±3.2 years, BMI 30.2±1.4 kg/m^2.

Glucose measurements

- Outcome measures were changes in basal glucose variables of the nights and early mornings before and after treatment conditions.
- The changes in glucose variables were calculated by subtracting glucose values before treatment conditions from glucose values after treatment conditions.

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Glucose measurements

- Fasting glucose: Glucose just before the start of breakfast (Thomas et al., 2016).
- The dawn phenomenon: Was calculated by subtracting the nocturnal (starting at midnight) nadir glucose from prebreakfast glucose (Monnier et al., 2012).
- Duration of the dawn phenomenon: The time interval between the nocturnal nadir glucose and prebreakfast glucose.
- Night-time glucose: Glucose during the period between bedtime and waking time.

Results

Table 1. Changes in glucose variables.

Glucose	Condition 1 (*n*=8)	Condition 2 (*n*=8)	Condition 3 (*n*=8)
Model 1			
Fasting glucose (mmol/l)	-0.1±0.2*	-0.6±0.2	-1.0±0.2
The dawn phenomenon (mmol/l)	0.3±0.4	0.6±0.3*	-0.6±0.4
Duration of the dawn phenomenon (h)	1.9±1.2*	-0.1±1.4	-3.1±1.3
Night-time mean glucose (mmol/l)	-0.9±0.4	-1.2±0.3	-0.5±0.4
Night-time glycaemic variability (CV%)†	2.5±1.8*	6.1±4.8*	-9.7±3.9
Model 2			
Fasting glucose (mmol/l)	-0.1±0.2*	-0.6±0.2	-0.9±0.2
The dawn phenomenon (mmol/l)	0.3±0.4	0.7±0.3*	-0.7±0.4
Duration of the dawn phenomenon (h)	1.8±1.1*	-0.9±1.3	-2.8±1.2
Night-time mean glucose (mmol/l)	-1.1±0.4	-1.2±0.3	-0.3±0.4
Night-time glycaemic variability (CV%)	0.3±3.5	5.4±3.1*	-6.5±3.6

Data are marginal means±SE.
Model 1 was adjusted for age, sex, BMI, carbohydrate intake and energy expenditure.
Model 2 was additionally adjusted for anti-diabetes medication dose and sedentary time.
*Significantly different compared with Condition 3 ($P<0.05$).
†CV, coefficient of variation.

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Conclusions

- Frequency of interrupting sitting time with LIWB has the dose-response effect on basal glucose.
- Frequent interruptions of prolonged sitting with LIWB every15 min improve basal glucose control.
- Longer-term exposure to LIWB every15 min might consequently reduce diabetes complications.

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Thank You For Listening!

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