Chronic disease risks and use of a smartphone application during a physical activity and dietary intervention in Australian truck drivers

Nicholas D. Gilson,[1] Toby G. Pavey,[1] Corneel Vandelanotte,[2] Mitch J. Duncan,[3] Sjaan R. Gomersall,[1] Stewart G. Trost,[4] Wendy J. Brown[1]

Abstract

Objective: This study examined chronic disease risks and the use of a smartphone activity tracking application during an intervention in Australian truck drivers (April-October 2014).

Methods: Forty-four men (mean age=47.5 [SD 9.8] years) completed baseline health measures, and were subsequently offered access to a free wrist-worn activity tracker and smartphone application (Jawbone UP) to monitor step counts and dietary choices during a 20-week intervention. Chronic disease risks were evaluated against guidelines; weekly step count and dietary logs registered by drivers in the application were analysed to evaluate use of the Jawbone UP.

Results: Chronic disease risks were high (e.g. 97% high waist circumference [≥94 cm]). Eighteen drivers (41%) did not start the intervention; smartphone technical barriers were the main reason for drop out. Across 20-weeks, drivers who used the Jawbone UP logged step counts for an average of 6 [SD 1] days/week; mean step counts remained consistent across the intervention (weeks 1-4=8,743[SD 2,867] steps/day; weeks 17-20=8,994[SD 3,478] steps/day). The median number of dietary logs significantly decreased from start (17 [IQR 38] logs/weeks) to end of the intervention (0 [IQR 23] logs/week; $p<0.01$); the median proportion of healthy diet choices relative to total diet choices logged increased across the intervention (weeks 1-4=38[IQR 21]%; weeks 17-20=58[IQR 18]%).

Conclusions: Step counts were more successfully monitored than dietary choices in those drivers who used the Jawbone UP.

Implications: Smartphone technology facilitated active living and healthy dietary choices, but also prohibited intervention engagement in a number of these high-risk Australian truck drivers.

Key words: chronic diseases, smartphones, truck drivers

Truck drivers in the Americas[1,2] and Europe[3,4] have been found to be highly susceptible to cardiovascular disease, type 2 diabetes and obesity. They are typically older men who experience long periods of inactivity and have poor diets.[5,6]

The *Shifting Gears* research project, which ran from February to November 2014, profiled chronic disease risks in Australian truck drivers and targeted these risks through a lifestyle intervention. In combination with educational messages, the intervention used smartphone technology to encourage drivers to implement and self-regulate physical activity and healthy dietary choices.

This study examined the chronic disease risk profile of Australian drivers who completed the baseline phase of *Shifting Gears*. The study also assessed driver engagement with smartphone technology during a subsequent 20-week intervention, specifically, the use of a commercial activity tracker and smartphone application (*Jawbone UP*) to monitor physical activity and dietary choices.

Methods

Following university ethics approval, 34 local delivery and 10 long haul drivers (all men) were recruited to the study through depot managers from two transport companies in Queensland, Australia.

These drivers provided informed consent and completed a validated health survey (demographics, physical activity,[7] fruit and vegetable consumption, workday sitting, perceptions of general health and medication/medical condition), and a physical examination (height, weight [used to calculate body mass index], waist circumference and blood pressure; April 2014).

Drivers who completed baseline were invited to attend an intervention briefing at their depot (May 2014). The intervention required drivers to identify and then target opportunities for physical activity (i.e. short walks during driver breaks) and healthy diet choices (i.e. food and beverages low in saturated fat and sugar) during the workday.

1. School of Human Movement and Nutrition Sciences, The University of Queensland
2. School for Human Health and Social Science, Central Queensland University
3. Priority Research Centre for Physical Activity and Nutrition, School of Medicine and Public Health, University of Newcastle, New South Wales
4. Institute of Health and Biomedical Innovation, School of Exercise and Nutrition Sciences, Queensland University of Technology
Correspondence to: Dr Nicholas Gilson, School of Human Movement and Nutrition Sciences, St Lucia Campus, The University of Queensland, Brisbane, QLD 4072; e-mail: n.gilson1@uq.edu.au
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To facilitate driver monitoring and self-regulation of healthy choices, those who met with a researcher were offered a free *Jawbone UP* activity tracker and shown how to access the associated smartphone application (*UP*). The application synchronises with the activity tracker to upload daily step counts and allows users to log dietary choices (either by direct entry or scanning a barcode) and to virtually connect (through *UP* functions such as news feeds, notifications and status updates) with other users.

Drivers who started the intervention received an invitation to virtually connect with a researcher via *UP*. Through this connection, researchers provided intervention guidance and support, recorded step logs/counts and logged total/healthy dietary choices for 20 weeks (June to October 2014).

For analyses, health survey and physical examination data were compared to standardised guidelines to assess chronic disease risks. Drivers who failed to complete the intervention were followed up in an effort to ascertain why drop out occurred. Descriptive statistics were calculated for behavioural outcomes; specifically, the number of weekly step count uploads, steps/day, dietary logs and the percentage of healthy diet choices relative to dietary logs. These data were statistically compared across five four-weekly intervention blocks using either repeated measures ANOVA (step count uploads) or the Friedman Test (dietary logs).

Results

The baseline sample (n=44) mainly consisted of middle-aged to older men (mean=47.0 [SD 10.1] years), who worked full time (70%) for an average of 61.5 (SD 10.0) hours/week. Three-quarters (75%) were classified as inactive (<500 MET·mins·week^{-1} in walking and leisure time activity), and drivers sat for an average of 9.1 (SD 2.5) hours/workday. The majority (93%) met recommended dietary guidelines for fruit (2+ serves/day); a minority (16%) met recommendations for vegetables (6+ serves/day).[8]

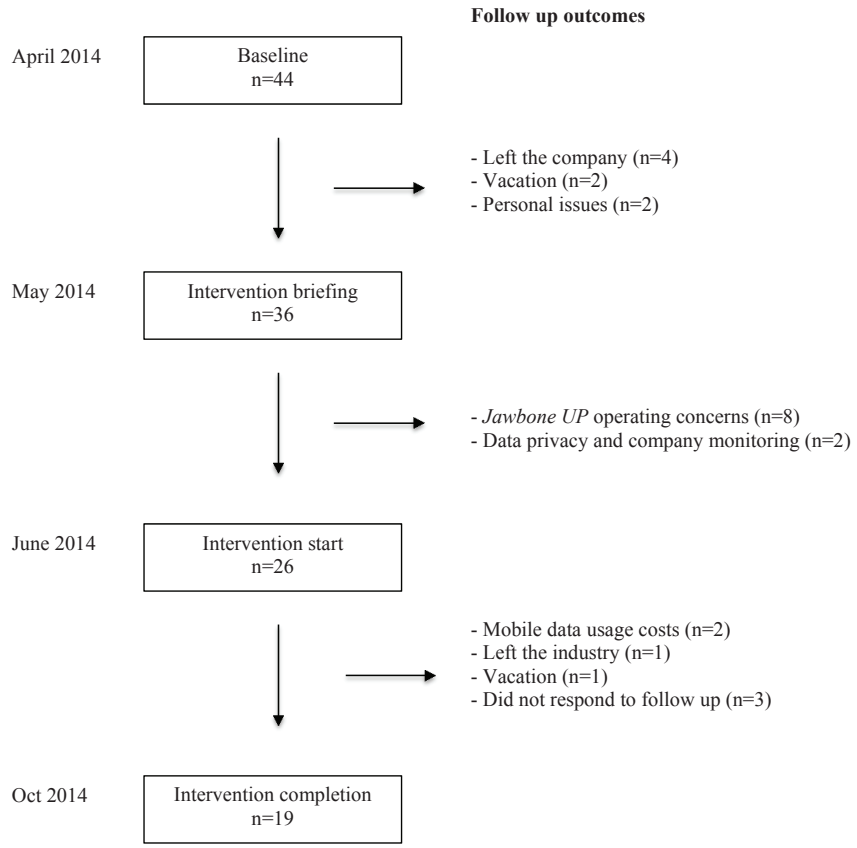
Most drivers (73%) rated their general health as 'good to excellent', although physical examinations (BMI n=43; waist circumference n=37; blood pressure n=35) indicated that the majority were obese (68%; ≥30 kg/m^2) and had a high waist circumference (97%; ≥94 cm). The prevalence of systolic (≥140 mm Hg) and diastolic (≥90 mm Hg) hypertension was 63% and 49%, respectively. Close to half (45%) were on medication or had a medical condition.

Study attrition from baseline to intervention briefing, start and completion is shown in Figure 1. Technical issues (n=12) associated with operating the *Jawbone UP*, concerns around data privacy and company monitoring, and mobile phone data usage costs were the main reasons for drop out.

Twenty-six drivers (59%) used the *Jawbone UP* during the 20-week intervention. Weekly step count uploads and dietary logs for these drivers are shown in Table 1. Step counts were uploaded for an average of 96 (SD 40) out of 140 days (range of 15–140 days/driver). The mean number of weekly step count uploads remained constant across the intervention timeline (mean=6 [SD 1] days/week), as did mean weekly step counts (weeks 1–4=8,743 [SD 2,867] steps/day; weeks 17–20=8,994 [SD 3,478] steps/day).

The median number of total dietary logs/driver was 72 (IQR 115; range of 0-466) for the 20 weeks. The number of dietary logs significantly declined from intervention start (median=17 [IQR 38] logs/week) to completion (median=0 [IQR 23] logs/week (p<0.01). Nine drivers did not log any dietary choices in the final four-week block of the intervention. There was a non-significant increase in the median proportion of healthy diet choices relative to total diet choices, in those drivers who used the dietary logging function of the *Jawbone UP* across the intervention (weeks 1–4: 38[IQR 21]%; weeks 17–20: 58[IQR 18]%).

Figure 1: Flow chart of driver attrition from baseline to intervention completion (April–October 2014, Australia).



Discussion

This study examined chronic disease risks in Australian truck drivers and assessed driver use of smartphone technology during a 20-week physical activity and dietary intervention.

Similar to the findings for truck drivers from other countries,[1-6] these Australian drivers had a range of chronic disease risk factors, including high levels of sitting, inactivity, low vegetable consumption and obesity. The dissonance found between actual and perceived health status is interesting to note and not only builds a strong case for intervention, but also highlights the need to improve driver awareness of health issues.

For drivers who used the *Jawbone UP*, process data indicated good general engagement with devices and facilitation of movement

Table 1: Step count and dietary outcomes for drivers who used the Jawbone UP over 20 weeks (June–October 2014, Australia).

	Weeks 1-4	Weeks 5-8	Weeks 9-12	Weeks 13-16	Weeks 17-20
n	26	24	23	20	19
Step count logs days/week					
Mean (SD)	6 (1)	6 (1)	6 (1)	6 (1)	6 (2)
Minimum	3	4	4	4	2
Maximum	7	7	7	7	7
Mean (SD) steps/day	8743 (2867)	8561 (2593)	9258 (2950)	9061 (3465)	8994 (3478)
Diet choices logged/week					
Median (IQR)	17 (IQR 38) **	9 (IQR 35)*	0 (IQR 23) *	1 (IQR 20) **	0 (IQR 23) **
Minimum	0	0	0	0	0
Maximum	80	68	103	103	56
Median (IQR) healthy diet choices /week[a]	38 (21) %	51 (34) %	56 (35) %	60 (11) %	58 (18) %

** Weeks 1-4 vs Weeks 5-8 and Weeks 9-12; p<0.05. ** Weeks 1-4 vs Weeks 13-16 and Weeks 17-20; p<0.01.*

a: Proportion of healthy diet choices relative to total diet choices logged/week

and healthy dietary outcomes. These findings add to a growing consensus that smartphone technology can play a valuable role in promoting healthy lifestyle choices.[9-11] The variation and decline in dietary logs observed across 20 weeks suggests a need to provide additional support and motivation for dietary monitoring, which may require greater investiture of time and commitment from users and health professionals, compared to the automated process of uploading step counts. Targeted strategies to overcome smartphone technical barriers should also be considered, given that this was the main reason why a number of drivers (who tended to be older men) failed to transition from baseline to intervention.

Study limitations included a relatively small sample size and short intervention period, and data specific to one commercially available activity tracker and smartphone application. However, to our knowledge, the current study is the first to profile chronic disease risk among Australian truck drivers, as well as the first to evaluate smartphone engagement in this high-risk occupational group. On-going analyses will examine the health impact of the *Shifting Gears* program; specifically, the extent to which smartphone use and adjunct ecological support strategies encouraged driver changes in physical activity, diet and weight-related indices.

Conclusions

Australian truck drivers are a priority occupational group for health action. Drivers in our sample who started intervention used the *Jawbone UP* frequently to monitor step counts. Monitoring of dietary choices was more variable, while a number of drivers were precluded from intervention because of smartphone technical barriers.

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