Are web-based personally tailored physical activity videos more effective than personally tailored text-based interventions? Results from the three-arm randomised controlled TaylorActive trial

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ABSTRACT

Objectives Some online, personally tailored, text-based physical activity interventions have proven effective. However, people tend to 'skim' and 'scan' web-based text rather than thoroughly read their contents. In contrast, online videos are more engaging and popular. We examined whether web-based personally tailored physical activity videos were more effective in promoting physical activity than personally tailored text and generic information.

Methods 501 adults were randomised into a video-tailored intervention, text-tailored intervention or control. Over a 3-month period, intervention groups received access to eight sessions of web-based personally tailored physical activity advice. Only the delivery method differed between intervention groups: tailored video versus tailored text. The primary outcome was 7-day ActiGraph-GT3X+ measured moderate-to-vigorous physical activity (MVPA) assessed at 0, 3 and 9 months. Secondary outcomes included self-reported MVPA and website engagement. Differences were examined using generalised linear mixed models with intention-to-treat and multiple imputation.

Results Accelerometer-assessed MVPA increased 23% in the control (1.23 (1.06, 1.43)), 12% in the text-tailored (1.12 (0.95, 1.32)) and 28% in the video-tailored (1.28 (1.06, 1.53)) groups at the 3-month follow-up only, though there were no significant between-group differences. Both text-tailored (1.77 (1.37, 2.28]) and video-tailored (1.37 (1.04, 1.79)) groups significantly increased self-reported MVPA more than the control group at 3 months only, but there were no differences between video-tailored and text-tailored groups. The video-tailored group spent significantly more time on the website compared with text-tailored participants (90 vs 77 min, p=0.02).

Conclusions The personally tailored videos were not more effective than personally tailored text in increasing MVPA. The findings from this study conflict with pilot study outcomes and previous literature. Process evaluation and mediation analyses will provide further insights.

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INTRODUCTION

To reduce chronic disease risk and improve mental health, it is recommended that adults engage in ≥150 min of moderate intensity physical activity per week.[1] Unfortunately, physical inactivity is highly prevalent both globally and in Australia,[2 3] where less than half of the population is meeting the National Physical Activity Guidelines.[4] To reduce the burden of disease and healthcare costs, effective and affordable population-based interventions that can reach large numbers of people are needed.[5] Given that about 90% of Australians have access to broadband internet-based, web-based interventions have potential to increase physical activity at a population level.[6]

Web-based interventions that provide 'tailored' or individually adapted physical activity advice have demonstrated good effectiveness compared with interventions offering generic or targeted information.[7] Compared with generic messages, tailored messages are more likely to be read, remembered, saved and discussed with others.[8] Content in web-based, computer-tailored interventions is typically delivered as text-based information. Yet eye-tracking studies demonstrate that internet-based reading is characterised by more time spent browsing, scanning, keyword spotting and non-linear reading, while less time is spent on in-depth concentrated reading.[9] Consequently, text-based intervention content may not be read, processed and actioned as intended, limiting intervention effectiveness.

This obstacle may be overcome using tailored online videos, given that watching web-based video content is increasingly popular and may soon surpass television as most the popular channel for delivering video-based content.[10] Videos may work better because they reduce the cognitive effort needed to process information, which can lead to better comprehension and are more engaging.[11] Moreover, our pilot studies[9 12 13] and other studies[14 15] have demonstrated preliminary efficacy for using tailored videos to increase physical activity. However, methodological limitations of these studies (ie, self-report, short follow-up, small samples) require larger studies with longer follow-up periods to assess whether these findings can be replicated. Therefore, we conducted a three-arm randomised controlled trial named 'TaylorActive'. 'Taylor' refers to both the act of providing tailored information, but also to the name of the character who guided participants through the intervention; 'Active' refers to physical activity, hence the TaylorActive trial. The trial examined

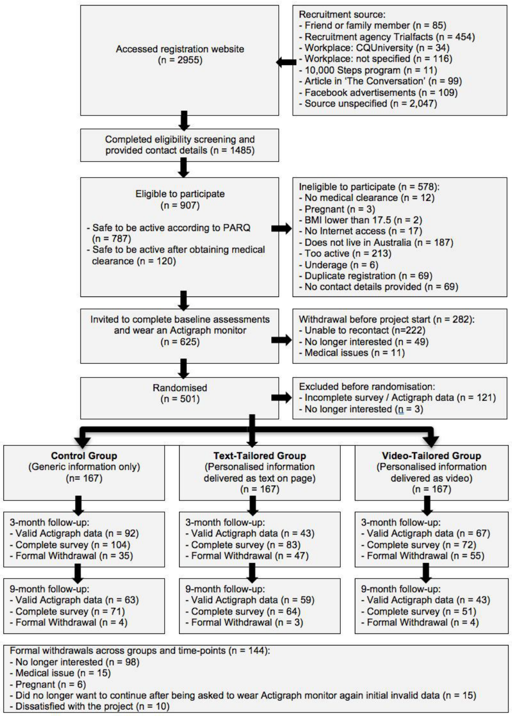

Figure 1 Participant flow chart. BMI, body mass index; PARQ, Physical Activity Readiness Questionnaire.

the long-term efficacy of a web-based physical activity intervention that provided personally tailored videos and compared it to a traditional personally tailored text condition and a control condition receiving generic information.

METHODS

Study design

The TaylorActive intervention study protocols have been described in depth elsewhere.[16] Participants were randomised into three groups: video tailored, text tailored and control (figure 1). Assessments were conducted at baseline, 3 and 9 months. All groups received access to the same website; this allowed for comparison of web-usage statistics across all groups and ensured that non-specific website elements (eg, design, readability, user-friendliness) did not confound usage between groups. All groups received access to a text-based library with generic physical activity information. The control group had no access to other website components and was regarded as 'usual care' condition, as generic physical activity information is freely available on the Internet.[17] The text-tailored and video-tailored groups also gained access to eight personally tailored physical activity sessions (delivered over 3 months) and an action-planning tool. The sole difference between both intervention groups was how the tailored information was delivered: as tailored text on a webpage in the text-tailored group, or as tailored online videos in the video-tailored group. All groups received regular reminders to return to the website at an identical schedule to control for contact between groups.

Participants and recruitment

Eligible participants were those aged 18+ years, who had broadband Internet access, who could speak and read English, were living in Australia, did not engage in ≥150 min of moderate-to-vigorous physical activity (MVPA) per week,[4] answered no to all questions on the Physical Activity Readiness Questionnaire (or obtained medical clearance),[18] were not pregnant, had a body mass index over (BMI) 17.5 kg/m^2, and no impairments preventing them from becoming more active. Social media advertisements (ie, Facebook), traditional media (eg, radio, The Conversation), email (eg, CQUni staff) and third-party databases (ie, www.trialfacts.com) were used to direct interested people to a recruitment webpage. This webpage contained detailed study information and an automated screening tool.

Procedure

Project officers verified eligibility and contact details following completion of the screening survey, before posting an accelerometer with instructions, wear-time log and a return postbag. Participants were asked to wear the accelerometer for seven consecutive days. If returned accelerometers contained invalid data, a new accelerometer was sent for a second attempt. Self-reported data were obtained via 30 min interviews using Computer Assisted Telephone Interviewing (CATI—a telephone surveying technique in which the interviewer follows a script provided by a software application) by trained and blinded interviewers from CQUniversity's Population Research Laboratory. Randomisation, using a randomly generated sequence via www.randomization.com, occurred once baseline data was obtained. Accelerometer and CATI procedures were repeated at 3-month and 9-month assessments. There was no face-to-face contact with participants at any time during the study.

Intervention

Intervention content

An in-depth description of the intervention is available elsewhere.[16] Briefly, the intervention aimed to increase all types of physical activity (eg, leisure, active travel, house/garden work, occupation). A library, available to all groups, contained 19 articles about different aspects of physical activity (eg, 'Why be active', 'Get started walking', 'Make time to be active'). The eight sessions of tailored physical activity content, available to both the text-tailored and video-tailored groups, was generated in response to brief online questionnaires about physical activity in conjunction with questions relating to evidence-based individual, social and environmental determinants of physical activity. IF-THEN algorithms were applied to select personally relevant advice from a comprehensive database. Health behaviour theories used to inform intervention content included self-determination theory,[19] social cognitive theory[20] and theory of planned behaviour.[21] The following constructs were addressed throughout the sessions: self-efficacy, intentions, social support, knowledge, outcome expectancies, attitudes, facilitators and barriers and risk perception, intrinsic and extrinsic motivation, need for relatedness, peripheral and central cues and habits. The following behavioural change techniques were applied to change theoretical constructs: feedback, self-monitoring, goal setting, habit formation, instruction, problem solving and action planning (see online supplemental file 2 for more detail). Physical activity advice and goals were tailored to participants' main motivation to increase activity levels: (1) improve health, (2) increase fitness, (3) increase strength, (4) lose weight and (5) reduce stress. The eight sessions with tailored feedback were delivered in a set order at a set time. New sessions could only be accessed when previous sessions had been completed; up to three email reminders were sent when participants did not access new sessions. A website feature to create action plans—a self-regulation strategy to develop detailed short-term activity plans—was also available for both intervention groups.[22] At the end of each session (except the first and last session) participants were asked questions on how they would meet their activity goals (ie, what, where, when, how often, how long, with whom).

Intervention delivery

The text-tailored feedback was displayed as plain text on a webpage supplemented with graphs indicating progress where relevant. The video-tailored content was provided as a single seamless video for each session with a male or female actor (named 'Taylor' in either case) that could be selected by the participants. The content of text and video tailoring was identical, and kept brief, as our formative research indicated that the videos should be short (range: 4–7 min) to prevent disengagement.[12] Information that could easily be provided in the text-tailored feedback (eg, participants name, BMI, minutes of MVPA, graphs showing progress over time), but could not be prerecorded into the videos was provided as text layered on top of the video (ie, an 'overlay') in an attempt to make the videos as tailored as possible.

Measures

Primary outcome measure

At each assessment time point, MVPA (minutes/week) was assessed by hip-worn ActiGraph GT3X+ activity monitors during all waking hours over 7 days.[23] Monitors were configured to collect triaxial acceleration data at a sampling frequency of 30 Hz, but downloaded as 1 s epochs and aggregated to 60 s epochs using Actilife software (V.6.13.3). Valid wear time was defined as ≥10 hours on ≥5 days within a 7-day period.[24] Non-wear time was assessed using the Choi *et al* algorithm (vector magnitude) and was defined as 90 consecutive minutes of 0 counts per minute, allowing for a 2 min interruption.[25] MVPA was defined as ≥2690 counts per minute (vector magnitude).[23] MVPA was also dichotomised (</≥150 min/week) to reflect meeting the National Physical Activity Guidelines.[4]

Secondary outcome measures and website engagement

Self-reported MVPA was assessed by the Active Australia Survey.[26] Steps per day and sedentary time (<200 vector magnitude counts/minute) were assessed by the ActiGraph.[23] Sitting time was assessed by the Workforce Sitting Questionnaire.[27] Time spent on the website (assessed by the Google Analytics web traffic platform) and number of sessions completed by intervention groups (collected from the intervention website database) were objectively recorded.

Sample size and power analysis

The sample size was based on ActiGraph measured MVPA (minutes/week). Reviews of web-based physical activity interventions show small to moderate changes in physical activity and dropout rates up to 30%.[28 29] Hence, to detect a small to moderate physical activity (minutes/week) difference between groups (video tailoring, text tailoring and control), at the 3-month primary time point, 130 participants per group were required to achieve 80% power using an alpha level of 0.05. This number of participants per group was inflated by 30% (170 participants per group) to account for drop-out.

Analyses

Analyses were conducted by independent statisticians (LL, CO) from the Clinical Research Design, IT and Statistical Support group at the Hunter Medical Research Institute using SAS V.9.4. The analysis followed the intention-to-treat (ITT) principle, specifying that data from all those who were randomised were to be analysed. To ensure that the ITT population was analysed, missing baseline data on the ActiGraph measures (n=38) were imputed using single group mean imputation (these data were missing due to a difference in how valid ActiGraph data were identified prior to randomisation and at the point of conducting analyses after the trial). Sensitivity analyses were conducted on all primary and secondary outcomes using multiple imputation (MI) on a missing at random assumption. MI was completed with chained equations (mice) using 25 imputations for all outcomes except sedentary time and daily sitting time which used 200 imputations. Baseline values and factors significantly associated with the outcome were used in MI models.

Differences between groups over time on primary and secondary outcomes were examined using generalised linear mixed models (GLMM), including fixed effects for group, time, the group by time interaction and a random subject effect. Accelerometer measured MVPA, self-reported MVPA and steps per day were modelled with a gamma distribution and a log link, and were reported as the percentage change (95% CI). Dichotomous outcomes were modelled with binomial distribution and a logit link and reported as ORs (95% CI). Accelerometer measured sedentary time and self-reported sitting were modelled using linear mixed models and reported as differences in means (95% CI). Models examining accelerometer outcomes were adjusted for wear time. A Mann-Whitney U test was used to compare median total time spent on the website (at week 12) between intervention groups. Between-group differences in number of sessions completed was examined using GLMM with a fixed effect for intervention (text vs video) and a random subject effect. Two separate GLMMs (gamma distribution and log link), including fixed effects for group, time, time on site, group by time interaction, group by time by time on site interaction and a random subject effect, were used to examine how differences in time on site (per 10 min increment) influenced intervention effects. Alpha was set at 0.05.

Results

Table 1 shows participant baseline data. The majority of participants were female (72%), had 14 or more years of schooling (78%), had a professional occupation (76%) and had a Caucasian origin (89%). Average age was 44 (±13), nearly 40% were obese and 21% were meeting the Australian physical activity guidelines (ActiGraph measured). Attrition was high with only 186 participants remaining at 9 months (see online supplemental file 1 for patterns of missing data for outcome measures).

Table 2 presents descriptive data for the primary and secondary outcomes by study group and assessment point. Table 3 presents the within and between-group changes in primary and secondary outcomes for both the ITT and sensitivity analyses. The sensitivity analyses displayed a similar overall pattern and magnitude of results in comparison to the ITT analyses. For the primary outcome of accelerometer measured MVPA, there were time effects for the control (23% increase, ITT; $p<0.01$) and video-tailored (28% increase, ITT, $p<0.01$) and text-tailored (12% increase ITT; not significant) groups at 3 months only; though there were no significant differences between any of the groups. However, significant between-group differences were observed for self-reported MVPA: both text-tailored (77% difference, ITT) and video-tailored (37% difference, ITT) groups increased physical activity more than the control group at 3 months only, but there were no significant differences between intervention groups. According to the sensitivity analyses at 3 months, text-tailored participants took significantly more steps compared with video-tailored participants, were meeting self-reported activity recommendations more compared with

Table 1 Participant characteristics at baseline

Variable	Control (N=167) N (%)	Text-tailored (N=167) N (%)	Video-tailored (N=167) N (%)	Total (N=501) N (%)
Gender				
Male	46 (28)	49 (29)	45 (27)	140 (28)
Female	121 (72)	118 (71)	122 (73)	361 (72)
Age (years)				
18–44	85 (51)	90 (54)	85 (51)	304 (53)
45–64	69 (41)	72 (43)	69 (41)	233 (40)
65 and over	13 (7.8)	5 (3.0)	13 (8.0)	41 (7.0)
Years of schooling				
≤13 years	33 (20)	37 (22)	39 (23)	109 (22)
14–20 years	117 (70)	112 (67)	104 (62)	333 (66)
>21 years	17 (10)	18 (11)	24 (14)	59 (12)
Body mass index (kg/m^2)				
Underweight (<18.50)	2 (1.2)	1 (0.6)	5 (3.0)	8 (1.4)
Normal weight (18.50–24.99)	41 (25)	57 (34.1)	61 (37)	170 (29)
Overweight (24.99–29.99)	55 (33)	43 (26)	56 (33)	173 (30)
Obese (≥30)	69 (41)	66 (40)	45 (27)	227 (39)
Relationship status				
Not in a relationship	48 (29)	47 (28)	59 (35)	154 (31)
In a relationship	119 (71)	120 (71)	108 (65)	347 (69)
Ethnicity				
Caucasian	148 (89)	148 (89)	149 (89)	445 (89)
Indigenous/African/Asian/other	19 (11)	19 (11)	18 (11)	56 (11)
Urbanisation				
Major city	93 (56)	91 (54)	87 (52)	271 (54)
Regional city	69 (41)	63 (38)	66 (40)	198 (40)
Remote or very remote	5 (3.0)	13 (7.8)	14 (8.4)	32 (6.4)
Occupational category				
Professional	114 (82)	110 (76)	94 (69)	318 (76)
White collar	19 (14)	25 (17)	32 (23)	76 (18)
Blue collar/other	6 (4.3)	9 (6.3)	11 (8.0)	26 (6.2)
Employment status				
Full time	88 (53)	93 (56)	80 (48)	261 (52)
Part time/casual	51 (31)	51 (31)	57 (35)	159 (32)
Other	28 (17)	22 (13)	30 (18)	80 (16)
Combined household income per year (AUD)				
\$A1–\$A64 999	31 (19)	18 (11)	34 (20)	83 (17)
\$A65 000–\$A129 999	61 (37)	62 (37)	58 (35)	181 (36)
\$A130 000+	59 (35)	60 (36)	40 (24)	159 (32)
No income/no response	16 (9.6)	27 (16)	35 (21)	78 (16)

AUD, australian dollar.

control and were sitting less (self-reported) than control and video-tailored groups.

Compared with the text-tailored group (figure 2), the video-tailored participants were less likely to complete a session, but this difference was not statistically significant (OR 0.82, 95% CI 0.52 to 1.30; p=0.402). However, participants in the video-tailored group spent significantly (p=0.02) more time (90.1±71.7 min)) on the website over the 3-month intervention-period compared with the text-tailored group (77.0±79.9 min; figure 3). In the video-tailored group, every 10 min increase in using the website was associated with a 4% increase in ActiGraph measured MVPA at 3 months (1.04 (1.01, 1.07); p=0.001). No significant associations were observed for the text-tailored group at 3 months or for either group at 9 months.

DISCUSSION

Changes in physical activity

This study examined the efficacy of a video-tailored physical activity intervention compared with a text-tailored intervention and a control group. No significant differences were observed between groups in the primary outcome of accelerometer measured MVPA at 3 or 9 months. Examination of secondary outcomes revealed some changes over time and between groups, however, these were inconsistent. These findings were surprising given that computer-tailored physical activity interventions more broadly have demonstrated good effectiveness,[7] and also given the positive outcomes of our formative research and pilot studies, which indicated participants' preference for and higher attention to personally tailored videos.[9 12 13] Moreover, other studies have demonstrated support

Table 2 Descriptive statistics for the accelerometer and self-report primary and secondary outcomes by group and time

	Accelerometer measured outcomes			Survey measured outcomes		
Group	Baseline	3 months	9 months	Baseline	3 months	9 months
Accelerometer measured MVPA (min/week), continuous (M±SD)				**Active Australia Questionnaire measured MVPA (min/week), continuous (M±SD)**		
Control	92.1 (88.9)	115.5 (94.9)	106.0 (80.6)	197.7 (208.7)	246.7 (246.6)	322.1 (261.5)
Text tailored	104.6 (98.5)	127.4 (102.6)	122.2 (101.1)	179.0 (176.1)	327.0 (251.9)	253.0 (242.4)
Video tailored	113.4 (123.0)	125.16 (98.6)	125.9 (105.3)	205.5 (221.3)	336.7 (297.6)	282.3 (264.4)
Accelerometer measured MVPA (% meeting guidelines), dichotomous (n, %)				**Active Australia Questionnaire measured MVPA (% meeting guidelines), dichotomous (n, %)**		
Control	32 (19)	25 (30)	16 (28)	60 (36)	50 (48)	39 (55)
Text tailored	37 (22)	24 (32)	19 (33)	61 (37)	55 (66)	32 (50)
Video tailored	40 (24)	21 (34)	12 (30)	65 (39)	43 (60)	26 (51)
Accelerometer measured sedentary time (min/day), continuous (M±SD)				**Workforce Sitting Questionnaire measured sitting time (min/day), continuous (M±SD)**		
Control	624.9 (79.8)	614.6 (72.2)	606.1 (80.8)	542.8 (164.5)	528.9 (164.1)	531.2 (166.8)
Text tailored	636.4 (75.0)	615.9 (77.5)	595.4 (83.4)	581.5 (183.1)	509.5 (149.1)	516.3 (156.8)
Video tailored	625.9 (71.4)	628.8 (66.3)	613.7 (71.2)	522.9 (181.8)	501.8 (164.5)	510.9 (160.9)
Steps per day, continuous (M±SD)						
Control	7000 (2186)	7465 (2401)	7314 (2117)			
Text tailored	6980 (2296)	7760 (2610)	7721 (2300)			
Video tailored	7401 (2456)	7852 (2316)	8009 (2545)			

M, mean; MVPA, moderate to vigorous physical activity; SD, Standard Deviation.

for the usability, feasibility and acceptability of using tailored videos over text-based interventions.[30–32] To our knowledge, no other studies have specifically examined the use of tailored videos to increase physical activity; however, some studies have examined video tailoring in relation to smoking cessation,[33–35] diet[36] and obesity prevention.[14 15] In these studies, the video-tailored intervention groups outperformed the other intervention groups. Interestingly, while Walthouwer *et al* concluded that their video-tailored intervention was effective overall for weight-gain prevention, the physical activity component within this broader intervention was ineffective, and thus in line with our study outcomes.[15]

A possible explanation for these findings is the use of a more rigorous study methodology including the use of accelerometers to measure physical activity instead of using surveys as in our pilot study.[13] Many physical activity intervention studies have shown large discrepancies between survey and accelerometer measured physical activity outcomes.[37 38] Similarly, in this study, self-reported physical activity outcomes demonstrated more favourable changes compared with the accelerometer measured outcomes. Self-report physical activity measures are known to over-report actual physical activity levels which may explain the observed discrepancies.[39] Another explanation may be that the tailored videos were not being perceived as sufficiently engaging. In our pilot study, tailored video content was developed for only two sessions using low-cost methods, including many images of people being active outdoors with a voice over.[12 13] However, for this study, eight comprehensive sessions were developed including high-quality video production comprising of hundreds of video snippets.[16] The greater number of videos required meant that videos did not show presenters engaging in activity, rather all videos were created in a studio with presenters reading from an autocue. This had the advantage of the content of the two interventions being very closely matched, thus allowing to isolate any differences inherent to the mode of delivery. However, this lack of diversity in the video library may have made the videos less interesting to watch. Additionally, it is harder to tailor videos than it is to tailor text. We used overlays to present information that could not be delivered by the actors featured in the videos, (eg, participant name, exact amount of MVPA), however, this may not have worked as well as anticipated. Finally, a lack of change in targeted psychosocial correlates of physical activity (eg, self-efficacy, attitudes) due to ceiling effects, may also have prevented the interventions from being effective. Subsequent process evaluation and mediation/moderation analyses will provide further insights.

Website usage

A strong decline in completing sessions was observed for both intervention groups, with slightly fewer participants in the video-tailored group completing all sessions. This finding is comparable to other studies that reported sharp declines in intervention usage.[40 41] Interestingly, Walthouwer *et al*[14] reported similar outcomes to our study in terms of session completion: fewer participants in the video group completing all sessions (11% completed all sessions in their study, compared with 35% in this study). It may be that watching videos is perceived as more burdensome, as the pace of gathering new information is dictated by the pace of the video; unlike in the text-tailored group, where one could read and skip/scan at one's own pace. This may also explain why the video-tailored group spent more time online (this was also observed in our pilot study), but without a meaningful effect on MVPA. In previous studies, time spent using the intervention has been associated with the effectiveness of the intervention).[28] However, our study indicates that simple engagement measures, such as time spent online, may not be meaningful enough when using tailored videos, as it was only marginally related to change in physical activity. Speaking more broadly, about why neither text-tailored or video-tailored interventions were effective: it may be that the overall architecture of the website (a 'tunnel' with periodically released sessions) was ineffective, though little research has been conducted on optimising website structure, and outcomes have been inconclusive.[42] Furthermore, the tailored websites had very few features beyond the actual tailoring of information (eg, no social networking or gamification), and perhaps a larger number of features is needed to achieve more meaningful behaviour change.[41] Subsequent in-depth analyses of user engagement will provide further insights.

Table 3 Results of the generalised linear mixed models for the outcome measures

Effect	Intention-to-treat results			Sensitivity results	
	Baseline to 3 months	Baseline to 9 months	Group × time p value	Baseline to 3 months	Baseline to 9 months
Accelerometer measured MVPA (min/week), continuous††					
Within control	1.23 (1.06 to 1.43)**	1.19 (0.97 to 1.47)	0.83	1.23 (1.03 to 1.47)*	1.33 (1.09 to 1.62)**
Within text	1.12 (0.95 to 1.32)	1.14 (0.97 to 1.34)		1.10 (0.88 to 1.38)	1.22 (1.01 to 1.47)*
Within video	1.28 (1.06 to 1.53)**	1.15 (0.94 to 1.41)		0.98 (0.77 to 1.25)	1.23 (0.85 to 1.78)
Between text and control	0.90 (0.72 to 1.13)	0.96 (0.73 to 1.25)		0.89 (0.68 to 1.17)	0.92 (0.70 to 1.21)
Between video and control	1.03 (0.82 to 1.31)	0.97 (0.72 to 1.29)		0.80 (0.59 to 1.08)	0.93 (0.60 to 1.44)
Between video and text	1.14 (0.89 to 1.47)	1.01 (0.78 to 1.31)		0.89 (0.63 to 1.28)	1.01 (0.66 to 1.55)
Accelerometer measured MVPA (% meeting guidelines), dichotomous‡					
Within control	1.84 (0.96 to 3.52)	1.58 (0.74 to 3.35)	0.99	1.79 (1.00 to 3.20)	1.92 (0.98 to 3.76)
Within text	1.63 (0.84 to 3.16)	1.73 (0.83 to 3.60)		1.61 (0.87 to 3.01)	1.67 (0.90 to 3.10)
Within video	1.66 (0.83 to 3.32)	1.45 (0.63 to 3.36)		1.39 (0.78 to 2.48)	3.56 (1.74 to 7.26)***
Between text and control	0.88 (0.35 to 2.23)	1.10 (0.38 to 3.12)		0.90 (0.39 to 2.09)	0.87 (0.35 to 2.13)
Between video and control	0.90 (0.35 to 2.33)	0.92 (0.30, 2.83)		0.78 (0.38 to 1.62)	1.86 (0.67 to 5.16)
Between video and text	1.02 (0.39 to 2.67)	0.84 (0.27, 2.55)		0.86 (0.39 to 1.93)	2.14 (0.86 to 5.30)
Active Australia Questionnaire measured MVPA (min/week), continuous†					
Within control	1.10 (0.93 to 1.31)	1.48 (1.22 to 1.78)***	<0.001	1.11 (0.93 to 1.34)	1.54 (1.28 to 1.85)***
Within text	1.94 (1.60 to 2.36)***	1.53 (1.23 to 1.89)***		1.74 (1.41 to 2.15)***	1.25 (1.01 to 1.55)*
Within video	1.50 (1.22 to 1.85)***	1.20 (0.97 to 1.49)		1.38 (1.14 to 1.67)***	1.16 (0.93 to 1.44)
Between text and control	1.77 (1.37 to 2.28)***	1.04 (0.78 to 1.38)		1.56 (1.21 to 2.01)***	0.81 (0.61 to 1.09)
Between video and control	1.37 (1.04 to 1.79)*	0.81 (0.61 to 1.08)		1.24 (0.95 to 1.61)	0.75 (0.58 to 0.98)*
Between video and text	0.77 (0.58 to 1.03)	0.79 (0.58 to 1.06)		0.79 (0.60 to 1.04)	0.93 (0.69 to 1.24)
Active Australia Questionnaire measured MVPA (% meeting guidelines), dichotomous‡					
Within control	1.63 (0.96 to 2.77)	2.28 (1.24 to 4.18)**	0.21	1.42 (0.91 to 2.20)	2.25 (1.29 to 3.92)**
Within text	3.56 (1.98 to 6.40)***	1.77 (0.95 to 3.31)		3.08 (1.74 to 5.46)***	1.66 (0.90 to 3.06)
Within video	2.47 (1.36 to 4.51)**	1.71 (0.86 to 3.37)		1.86 (1.07 to 3.24)*	2.24 (0.98 to 5.10)
Between text and control	2.18 (0.99 to 4.80)	0.78 (0.33 to 1.86)		2.17 (1.06 to 4.45)*	0.74 (0.30 to 1.80)
Between video and control	1.52 (0.68 to 3.37)	0.75 (0.30 to 1.86)		1.31 (0.63 to 2.72)	0.99 (0.39 to 2.57)
Between video and text	0.70 (0.30 to 1.61)	0.96 (0.38 to 2.43)		0.60 (0.27 to 1.36)	1.35 (0.49 to 3.73)
Accelerometer measured sedentary time (min/day), continuous (M±SD)§					
Within control	−3.89 (−12.91 to 5.14)	−8.72 (−19.32 to 1.87)	0.45	−5.99 (−17.35 to 5.37)	−12.56 (−26.36 to 1.25)
Within text	−15.01 (−26.4 to -3.6)**	−17.8 (−29.3 to -6.4)**		−12.31 (−26.1 to 1.47)	−23.28 (−39.1 to −7.5)**
Within video	−1.16 (−12.03 to 9.70)	−7.37 (−22.85 to 8.10)		1.36 (−8.65 to 11.37)	−4.96 (−20.12 to 10.19)
Between text and control	−11.12 (−25.59 to 3.34)	−9.13 (−24.69 to 6.43)		−6.32 (−24.71 to 12.07)	−10.72 (−32.04 to 10.60)
Between video and control	2.72 (−11.52 to 16.97)	1.35 (−17.36 to 20.06)		7.35 (−7.65 to 22.35)	7.59 (−13.39 to 28.58)
Between video and text	13.85 (−1.97 to 29.66)	10.48 (−8.70 to 29.65)		13.67 (−2.98 to 30.32)	18.31 (−2.98 to 39.61)
Workforce Sitting Questionnaire measured sitting time (min/day), continuous§					
Within control	−24.95 (−55.60 to 5.70)	−19.51 (−55.1 to 16.1)	0.17	−20.51 (-44.20 to 3.18)	−13.68 (−45.73 to 18.37)
Within text	−70.4 (−104 to −36.7)***	−59.2 (−96.5 to −21.7)**		−70.9 (−102.7 to −39.2)***	−66.6 (−110 to −22.8)**
Within video	−17.68 (−53.58 to 18.21)	−17.23 (−58.51 to 24.1)		−13.90 (−45.77 to 17.98)	−13.84 (−53.22 to 25.54)
Between text and control	−45.52 (−91.13 to 0.08)	−39.66 (−91.27 to 11.9)		−50.44 (−89.9 to −10.9)**	−52.99 (−107.8 to 1.86)
Between video and control	7.27 (−39.93 to 54.47)	2.27 (−52.20 to 56.75)		6.61 (−32.87 to 46.10)	−0.16 (−51.54 to 51.21)
Between video and text	52.79 (3.51 to 102.07)*	41.94 (−13.76 to 97.64)		57.05 (11.7 to 102.4)**	52.83 (−6.53 to 112.19)
Steps per day, continuous†					
Within control	1.05 (1.00 to 1.11)	1.05 (0.99 to 1.12)	0.79	1.05 (0.97 to 1.13)	1.07 (1.01 to 1.14)*
Within text	1.08 (1.03 to 1.14)**	1.09 (1.03 to 1.16)**		1.08 (1.01 to 1.16)*	1.10 (1.01 to 1.19)*
Within video	1.03 (0.96 to 1.10)	1.05 (0.97 to 1.13)		0.95 (0.88 to 1.03)	1.07 (0.94 to 1.22)
Between text and control	1.03 (0.96 to 1.11)	1.04 (0.95 to 1.13)		1.03 (0.93 to 1.15)	1.02 (0.92 to 1.14)
Between video and control	0.98 (0.90 to 1.07)	1.00 (0.91 to 1.10)		0.91 (0.81 to 1.01)	1.00 (0.85 to 1.18)
Between video and text	0.95 (0.87 to 1.04)	0.96 (0.87 to 1.06)		0.88 (0.79 to 0.97)**	0.98 (0.86 to 1.12)

All accelerometer based outcomes were adjusted for wear time.
*P<0.05, **p<0.01, ***p<0.001.
†Reported as the percentage change (95% CI).
‡Reported as ORs (95% CI).
§Reported as differences in means (95% CI).
MVPA, moderate to vigorous physical activity; OR, Odds Ratio.

Strengths and limitations

Major strengths of the trial were the use of validated and objectively measured outcomes, the longer than usually reported follow-up period (9 months), the large sample for this type of study, nationwide participant recruitment, the randomised controlled design and the strict protocol in isolating the intervention delivery mode, while keeping all other variables similar across intervention groups. A notable limitation of this study was the high drop-out and associated missing data (49% at 3 months, 67% at 9 months). This may have had an impact on the results if the data were not missing at random.

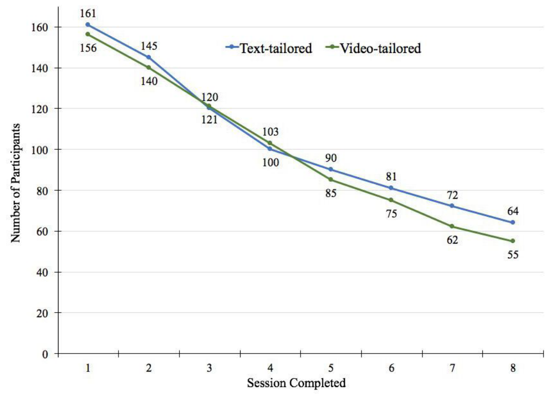

Figure 2 Number of participants that completed each session by intervention group.

The sensitivity analysis, using MI (including additional sociodemographic covariates to reduce impact of any systematic differences between groups), was largely consistent with the main results, despite some small differences which may be attributable to lack of statistical power and/or differential drop-out. There may be several reasons for the large participant drop-out. First, high drop-out is typical of web-based behavioural studies, with many other studies reporting similar levels of drop-out.[43–45] Sometimes this occurs due to technical issues (eg, website down, tailored feedback is not being delivered, web-based videos are not playing, reminder e-mails not being sent), however, no such issues were observed by the research team or reported by participants during the trial. As such technical issues were unlikely to be responsible for the high drop-out. Second, there was no face-to-face contact between participants and the research team at any point, and this may have reduced feelings of accountability as we have observed in other trials.[40 44] Third, participant burden may have been too high, with study protocols requiring lengthy telephone-administered questionnaires at each time point.[15] Other studies have demonstrated associations between participant retention and survey length.[45–47] A further limitation could be the lack of a true (ie, no treatment) control group, as physical activity increases were observed in the control group. While increases in information-only control groups has previously been reported,[48] generic physical activity information is freely available on the Internet and forms a strong basis to compare whether more comprehensive, complex and costly interventions are more effective. A final limitation was the high proportion of Caucasian, highly

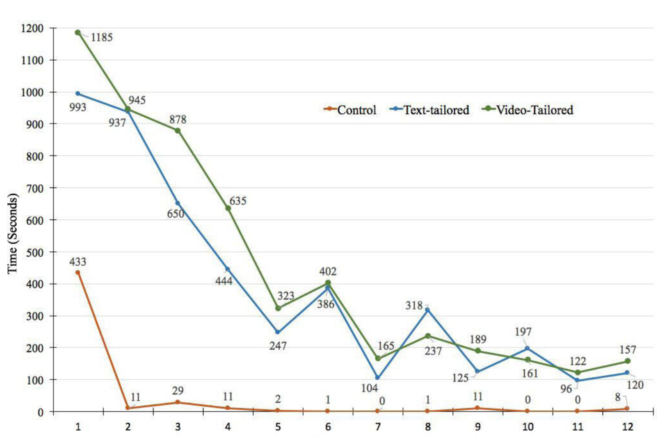

Figure 3 Time on website during the intervention phase (12 weeks) by study group (n=501).

Key messages

What are the findings?

- ► Online personally tailored videos were not more efficacious in increasing physical activity compared with online personally tailored text-based information and a usual care control group.
- ► The time spent watching online video-based information may be less impactful to stimulate behavioural change, as compared with other online activities (eg, goal-setting, self-monitoring); as the time spent online was only weakly associated with behavioural change, whereas previous studies have shown stronger associations.

How might it impact on clinical practice in the future?

- ► Sport and exercise medicine professionals may use less complex websites, than those offering tailored videos, to help people increase their physical activity.

educated and female participants. Future studies should aim to include more diverse populations.

CONCLUSION

The TaylorActive trial observed that a video-tailored physical activity intervention was not more efficacious to increase MVPA than a text-tailored intervention or control group. The lack of an intervention effect is in contrast with pilot and other study results. Future research should examine whether video-tailored physical activity interventions are truly ineffective and investigate the mechanisms of change in such trials (through mediation and moderation analyses). Likewise, more research specifically examining whether videos reduce cognitive effort to process information is needed.[11] Further, if this field of research is to truly progress, it remains important to examine the effectiveness of specific intervention components in isolation, in contrast to examining a plethora of components simultaneously that make it impossible to attribute outcomes to specific components. To build more effective web-based interventions we need to understand which specific intervention components lead to positive behavioural change.[49]

Correction notice This article has been corrected since it published Online First. A typographical error in the title has been corrected.

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Contributors CV, CES, RCP, WKM and MJD conceived the project and procured the project funding. CV led the coordination of the trial. CV, CES, RCP, AR, SA, SS, WKM and MJD assisted with the protocol design. CH managed the trial including data collection with data management from DP. CV, CES and DFC developed intervention content for the trial and MJD performed the sample size calculations. LL and CO conducted the analysis for this paper. CV, MJD and QT interpreted the data. CV drafted the manuscript, and all authors read, edited and approved the final manuscript.

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Data availability statement Data are available on reasonable request. The data set supporting the conclusions of this article will not be shared at present as it is still being used for analysis of other outcomes of the TaylorActive randomised controlled trial. However, any reasonable request to access the data will be considered and must be made to Corneel Vandelanotte: c.vandelanotte@cqu.edu.au

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