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Impacts of a Workplace-Based Weight-Control Intervention on Objective and Perceived Physical Activity among a Subgroup of Workers

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Abstract

Physical activity (PA) has many benefits; however, groups facing barriers to health-promoting behaviors are less likely to be physically active. This may be addressed through workplace interventions. The current study employs objective (accelerometry) and perceived (International Physical Activity Questionnaire [IPAQ]) measures of PA among a subset of participants from the “Working for You” study, which tests a multi-level (work group and individual) workplace intervention targeted at workers with low-incomes. Linear mixed and hierarchical logistic regression models are used to determine the intervention’s impact on moderate- to vigorous-PA (MVPA) and achieving the PA Guideline for Americans (≥150 minutes MVPA/week), respectively from baseline to 6- and 24-months, relative to a control group. Correlations (Spearman Rho) between perceived and objective PA are assessed. Of the 140 workers (69 control, 71 intervention) in the sub-study, 131 (94%) have valid data at baseline, 88 (63%) at 6-months, and 77 (55%) at 24-months. Changes in MVPA are not significantly different among intervention relative to control participants assessed by accelerometer or IPAQ at 6- or 24-months follow-up. The percent achieving the PA Guideline for Americans does not vary by treatment group by any measure at any time point (e.g., baseline accelerometry: [control: n=37 (57%); intervention: n=35 (53%)]). This study identifies limited agreement (correlation range: 0.04 to 0.42, all p>.05) between perceived and objective measures. Results suggest the intervention did not improve PA among

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No conflicts are declared by the authors.

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The study was approved by the Human Research Protection Office at Washington University in St. Louis (#201609029).

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the sub-study participants. Though agreement between objective and perceived MVPA is low, similar conclusions regarding intervention effectiveness are drawn.

Keywords

physical activity; measurement; worksite

Physical activity (PA) promotes health, prevents obesity, and reduces the risk of diabetes and other chronic conditions (Piercy et al., 2018; United States Department of Health and Human Services, 2020). The 2019 Physical Activity Guidelines for Americans identified numerous benefits of being active including: prevention of numerous chronic diseases (e.g., cancer; heart disease, type 2 diabetes), excessive weight gain, and depression (United States Department of Health and Human Services, 2020). Unfortunately, like many health behaviors that can help prevent chronic disease, individuals from historically marginalized groups face barriers (e.g. discretionary time, physical safety) to health and health promoting behaviors and are less likely to be physically active than those with fewer barriers (Haskell et al., 2007; Troiano et al., 2008; Tucker et al., 2011; Williams et al., 2018). This contributes to a disparate chronic disease burden (Barbeau et al., 2004; Byers et al., 2008; Clegg et al., 2009; Goetzel & Ozminkowski, 2008; Huang et al., 2011; Kogevinas & Porta, 1997; McLaren, 2007; Woods et al., 2006). These barriers are disproportionally experienced by populations that have been historically marginalized (e.g., racial/ethnic minorities) and contribute to chronic disease disparities (Hawes et al., 2019; Howell & Booth, 2022; Z. Javed et al., 2022; Javed et al., 2022; Luo et al., 2022; Prener et al., 2021).

Interventions are needed to promote PA among populations who face great barriers and who are less likely to have access to and benefit from health systems or community-based PA interventions (Lee & Cubbin, 2009; Mazzucca et al., 2021). Non-clinical settings such as workplaces offer a potentially effective setting for health promotion programs to reach and impact a broader, more diverse population (Mazzucca et al., 2021; Parrish et al., 2018). However, studies testing healthy weight interventions often have limited racial/ethnic representation (Aneni et al., 2014; Brown et al., 2018; Coenen et al., 2020; Haughton et al., 2018; Rongen et al., 2013). It is particularly important that interventions be developed in workplaces with employees who are low-income and who disproportionately face barriers to health behaviors and have previously had more limited access to workplace interventions (Grosch et al., 1998; Kopicki et al., 2009; Linnan et al., 2001; Parrish et al., 2018). There is mixed evidence regarding the effectiveness of workplace interventions to change health behaviors and address inequities, suggesting further work in this area is needed (Cairns et al., 2015; Coenen et al., 2020).

The “Working for You” study aimed to test a workplace intervention targeted at workers who were low-income in partnership with an academic medical center. Working for You adapted existing group- and individual-level intervention models to promote healthy weight and prevent chronic disease among workers (Stein et al., 2019; Tabak et al., 2020; Tabak et al., 2018). Though the primary target of this multi-level intervention was weight, an important behavioral component was increasing moderate- to vigorous-PA (MVPA). Given

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the robust discussion in the literature regarding appropriate methods to asses MVPA the current study employed both objective (accelerometry) and perceived (International Physical Activity Questionnaire [IPAQ]) measures of PA among a subset of participants from the larger multi-level trial to a) determine the impact of the intervention on MVPA and b) assess the agreement between these measures in this working population (Dowd et al., 2018; Kelly et al., 2016; Limb et al., 2019),.

Methods

Participants and Intervention

Participants for this study were recruited from a large cluster-randomized trial testing the impact of Working for You, a multi-level weight loss intervention among approximately 1,000 employees across 22 work groups at a Midwestern academic medical center. The study was cluster-randomized at the work group level, specifically targeting work groups where the average work group salary was less than $50,000 per year. Participants were predominantly employed in office and administrative support (e.g., billing and account collectors, medical claims), medical and lab technicians, housekeeping, and food service. The trial and intervention have been described elsewhere (Stein et al., 2019; Tabak et al., 2020; Tabak et al., 2018). Briefly, all participants in work groups randomized to the intervention received the group-level component, which is a workplace participatory program involving worker teams. These teams engaged in the design and implementation of weight-reducing interventions through changes in their workplace environments. Each work group developed their own intervention, with considerable variation (e.g., walking club, healthy snack provision, distribution of more information on employer wellness resources). Employees in the work groups randomized to intervention with obesity (body mass index >= 30) were also invited to participate in an interactive obesity treatment approach (iOTA). iOTA includes a) quarterly health coach meetings during which the participant collaboratively sets goals and b) an automated interactive SMS text-messaging program for ongoing support and self-monitoring (Stein et al., 2019; Tabak et al., 2018). Participants in work groups randomized to the control group completed data collection and did not have work group level or iOTA interventions. The larger study excluded those with a current cancer diagnosis or treatment, pregnant at study recruitment, or who had bariatric procedure within the last year (Stein et al., 2019). The current sub-study recruited participants from the larger study (as determined by a power calculation) with obesity (body mass index >= 30) and with no plans to leave the work group within the next six months.

While the Working For You study did not specifically target MVPA as an outcome, assessing MVPA across treatment groups was a reasonable objective for this sub-study. Eighty-five percent of sub-study participants in the intervention group were also enrolled in iOTA. iOTA participants could set goals based on a variety of weight loss behaviors. Goals targeting physical activity (e.g., increase number of steps per day, increase brisk activity) were chosen by 88% of participants over the course of the study, with the proportion being 100% among those contributing data to the final follow up time point.

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Measurement Procedures

Individual meetings were scheduled with each recruited participant, which included an informed consent process and explanation of the accelerometer device, the device wear log, and an instruction sheet. A member of the research team also showed each participant how to properly wear the accelerometer. Participants completed study assessments for the current sub-study at three time-points: baseline (enrollment), 6-months, and 24-months; however, if a participant did not have valid data at the baseline and 6-month time-points, they were not asked to participate in the 24-month time-point. Data was collected between April 2017 and December 2019.

Accelerometry

At baseline, 6-, and 24-months, free-living physical activity was measured with an ActiGraph GT3+ accelerometer (Ft. Walton Beach, FL) that was belt worn on the right hip during waking hours. Participants were instructed to wear the device for ≥ seven days (with ≥ three of the seven days being days they were at work) and to remove the device for showering or other water activities (Troiano et al., 2008). Participants were asked to use the device log to record the days and times they wore the accelerometer. Device log data was used during data reduction in order to visualize what days/time, and how much time, each participant spent wearing the devices at work, not at work, and total during the duration of the study.

Survey Data

Participants' demographic characteristics were drawn from their baseline survey (a self-report instrument) for the larger trial. At the end of each data collection time-point (baseline, 6-months, and 24-month follow up), the short version of the International Physical Activity Questionnaire (IPAQ) was self-administered to each participant (https://sites.google.com/site/theipaq/). The IPAQ is a self-reported questionnaire that measures perceived moderate and vigorous PA and sedentary behavior (Craig et al., 2003). Participants completed the IPAQ which used a referent period of the previous week (corresponding to the time they wore the accelerometer). Daily estimates of MVPA (weekly estimates divided by seven) were derived to put IPAQ data into same units as the actigraphy data. Participants who reported over 720 minutes (12 hours) per day were excluded from analyses using IPAQ data.

Analysis

ActiGraph data were downloaded and scored using the ActiLife v6.7.3 software. Data decision rules regarding non-wear time (sequences of ≥ 90 min of 0 counts) and the definition of a valid day (≥ 10 hours of waking-wear time in a 24-hour period) were used (Troiano et al., 2008). To determine waking-wear time, data points were excluded before and after participant reported time they applied/removed the accelerometry device. Participant data were included in the analysis if they have a minimum of five days of recorded activity with an average ≥ 600 minutes of recorded activity per day or for four days with ≥ 3000 total minutes (James et al., 2017). Participants wore the devices for 784 ± 76 min/day over 6.8 ± 1.0 days/week. Intensity cut points were calculated using the Troiano standard adult thresholds, which identified sedentary activity as 0–99 CPM (counts per minute), light activity as 100–2019 CPM, moderate activity as 2020–5998 CPM, and vigorous activity as ≥ 5999 CPM (NCI Division of Cancer Control and Population Sciences: Epidemiology and Genomics Research Program, 2020). Moderate to vigorous bouts were defined as having a minimum of 10 minutes of activity with a bout of 2 minutes and a minimum of 2,020 counts per minute (Matthew, 2005; Matthews et al., 2008; Troiano et al., 2008; Tudor-Locke et al., 2010).

Differences in baseline characteristics were assessed using Fisher's exact test and independent sample T-tests. Change in MVPA over time was assessed for two outcomes, each assessed using linear mixed models; objectively-measured (using accelerometry) and perceived-activity (using the IPAQ). These models included MVPA (based on either actigraphy or IPAQ) as the dependent variable and treatment group, time point (baseline, 6-months, and 24-months) and the interaction of treatment group and time point as the independent variables (fixed effects). The accelerometry-based data analysis also included an additional fixed effect for average daily wear time, to account for varying wear times across individuals. Random intercepts for work group were included to account for the hierarchical structure of the data.

The proportion of participants meeting US Department of Health and Human Services Physical Activity Guideline for Americans, 2nd edition guidelines for MVPA were calculated by dichotomizing objectively measured and perceived MVPA at minutes/week >= 150 (Piercy et al., 2018). Differences in proportion of participants meeting guidelines by treatment group at each time point were assessed using logistic regression models, where guideline status (met vs not met) was the dependent variable, and treatment group, time point, and the interaction of treatment group and time point were the independent variables.

In all models (linear and logistic) the hierarchical study design was accounted for using random intercepts for work group, and a first-order autoregressive covariance structure was applied to the residuals to account for repeated measures of the outcome among participants (Singer et al., 2003). This group-level analysis incorporates group mean comparisons, rather than individual trajectories of analysis, and allows for inclusion of participants providing valid data at selected time-points. Adjusted models also included additional fixed effect covariates age, annual income, and baseline body mass index, as these were not balanced by randomization. Finally, Spearman Rho correlations were used to assess agreement between objectively measured and perceived activity for MVPA. Agreement was assessed at each time point (baseline, 6-months, and 24-months), overall and stratified by treatment group. All analyses were conducted using SAS Software 9.4 (The SAS institute, Cary, NC).

Results

Of the 237 participants determined to be eligible for this study, 176 provided informed consent, and among these, 140 had accelerometer data that met wear-time criteria (Figure 1). Of these, 131 (94%) had valid baseline data, 88 (63%) had valid data at 6-months and 77 (55%) had valid data at 24-months. There was a statistically significant difference in follow-up between groups at 24 months, with greater participation among control participants;

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however, the difference was not statistically significant at 6 months or “any follow up” (6 or 24 months).

Demographic characteristics at baseline for the 140 participants included in the analysis are presented in Table 1. Participant age differed between groups, with the mean age in the control group 46.1 ± 10.7 years and 41.5 ± 10.1 years in the intervention group. The average body mass index for participants was greater (39.0 ± 7.2) for those in the intervention group compared to the control group (36.0 ± 5.0, p=0.005). Most participants identified as Black or African American (n = 71, 51%) or White or Caucasian (n = 64, 46%). The intervention and control groups differed with regard to education; while a similar percent (15% in both groups) reported a high school education or lower, 56% of those in the control group and 75% in the intervention group reported technical school or some college, and college/post-graduates were represented 29% of the control group, but only 10% of the intervention group. Across the groups, most participants (64%) reported a household income less than $70,000 per year.

There were no statistically significant differences between groups in MVPA at baseline assessed by accelerometry (control group mean [95% confidence interval]: 30.1 [22.9, 37.3]); (intervention group 25.9 [18.4, 33.5], Table 2). From baseline to 6-months, objective MVPA decreased by 1.8 minutes (95% confidence interval: −7.2, 3.5) for the control group, but only 0.2 minutes (−5.9, 5.6) for the intervention group and from baseline to 24-months MVPA decreased by 4.2 minutes (−8.5, 0.1) control group, but only 0.4 minutes (−5.6, 4.9) for the intervention group. When the difference in change from baseline between groups (i.e., intervention relative to control) was estimated using a regression model with age and income, the difference was not statistically significant at 6-months (1.7 minutes [−6.2, 9.5]) or at 24-months (3.8 [−2.9, 10.6]).

The trends were similar using perceived (IPAQ) measure, however the number of minutes as well as the confidence intervals were much larger: difference in change from baseline between groups estimated using a regression model (67.4 [−3.7, 138.6]) at 6-months and (37.7 [−30.9, 106.4]) at 24-months.

The baseline distribution of those meeting the Physical Activity Guideline for Americans did not vary by treatment group based on accelerometry: 37 (57%) for control group; 35 (53%) for intervention group (Table 3). Similar results were found with perceived activity, although the proportion reporting meeting guidelines was higher than was identified by accelerometry (47 [73%] for control group; 44 [70%] for intervention group). The proportion meeting guideline recommendations did not vary by treatment group at the follow up time points, when assessed by accelerometry or perceived (IPAQ).

When exploring the correlations between accelerometer- and perceived-MVPA, the correlations were low (range: 0.04 for the control group at 24-months to 0.42 for intervention group at 24-months), with no statistically significant correlations (i.e., all adjusted and unadjusted $p > .05$, Table 4).

All results were similar when intervention group participants were limited to those in iOTA (data not shown), with 82% of intervention group participants also in iOTA.

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Discussion

This study explored the impact of a multi-level weight loss intervention, Working for You, on PA, among a subgroup of participants, who wore accelerometers. The analysis did not detect significant differences in changes in MVPA among intervention group participants relative to those in the control group assessed by both accelerometry and IPAQ at 6- or 24-months follow-up. Further, though similar intervention affects were concluded based on these two measurement methods, the study identified limited agreement between the objective (accelerometry) and perceived (IPAQ) assessment of MVPA.

Working for You was developed to include many evidence-based strategies (e.g., tailored behavioral goals, skills training, informational and motivational text messages, behavior self-monitoring delivered by SMS text-messaging, and workplace participatory program) to promote health behavior changes, including increase in PA, related to weight loss and prevention of chronic disease (Stein et al., 2019; Strickland et al., 2020; Tabak et al., 2018). The null findings are consistent with the literature, which shows limited effectiveness of work-place health promotion interventions on PA behavior (Malik et al., 2014), particularly those delivered through technology (Aneni et al., 2014; Direito et al., 2017) and those targeting employees working in jobs that pay lower wages (Coenen et al., 2020; Rongen et al., 2013) and those with low socioeconomic status (even when they are effective in those with higher socioeconomic status) (Western et al., 2021). In the current study, the null findings may be related to the low intensity intervention overall, and a broad focus on (and powered to detect) weight loss, rather than on PA specifically. While participants were encouraged to select a PA goal as one of the three goals they aimed to work toward, not all participants chose this focus (only 12% of participants never selected a PA goal). In addition, while participants engaged with the individual-level iOTA intervention, preliminary findings suggest there were relatively few changes implemented in the workplace environment resulting from the work group-level intervention, which may contribute to limited impact on individual behavior. Interventions, which comprehensively change the workplace environment (and likely broader environmental and policy conditions) may be needed in addition to more intensive interventions targeting individual drivers of behaviors (Gu et al., 2020; Song & Baicker, 2019; Sorensen et al., 2016; Terry, 2019; Zhu et al., 2020).

Future research in PA promotion among diverse communities can consider the findings of the current study. The study did not demonstrate an impact on PA, which is notable given participants were more diverse with respect to numerous characteristics (e.g., race, income, education) than those in most worksite PA studies, including those in medical settings (Aneni et al., 2014; Blake et al., 2017; Brown et al., 2018; Coenen et al., 2020; Haughton et al., 2018; Rongen et al., 2013). Numerous structural factors (e.g., time, safe places to be active, social networks) influence, and disproportionally hinder, activity among individuals impacted by disparities (Barbeau et al., 2004; Huang et al., 2011; McLaren, 2007). More intensive or alternative strategies may be needed to overcome such structural factors and other barriers both inside and outside the workplace (Lee & Cubbin, 2009). Data were not collected on the participants' home and neighborhood environments, which limits the understanding of broader potential impacts on PA behaviors. However, there is

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ample evidence of the importance of neighborhood environments (Kepper et al., 2019; Smith et al., 2017) and activity and the importance of place-based interventions to reduce health inequities (McGowan et al., 2021). In addition, lower income workers are more likely to be facing barriers outside the workplace (e.g., financial, environmental or social stressors) which can take precedence over preventive behaviors (Kreuter et al., 2016; Thompson et al., 2019).

When considering the null findings in the current study, it is important to consider the high level of PA among this group of participants; at baseline 55% engaged in MVPA (assessed by accelerometer) for at least 150 minutes per week (achieving the MVPA recommended by the 2018 PA guidelines) (Piercy et al., 2018). These high levels of PA are like due to physical work demands, including work within a large physical campus. An intervention study by Folta et al. found approximately 20% of participants engaged in 150 minutes of MVPA per week (2019). However, a study of hospital workers found 62 out of 63 participants (98%), 21 of 22 (96%) physicians, and 100% of nurses and supporting staff, spent over 300 min in MVPA per week (Jun et al., 2019). These already high levels of MVPA may make additional activity challenging to achieve.

This study is strengthened by the randomized design with an intent-to-treat analysis, and the assessment of PA using both objective and perceived measures. Though agreement between objective and perceived activity was low, the current study drew similar conclusions regarding intervention impact with both accelerometry and IPAQ measures, which was consistent with a recent analysis of the Diabetes Prevention Follow-up or Outcomes Study (Kriska et al., 2020). This contributes to the discussion of whether perceived activity data, rather than requiring resource and time intensive objective assessments may be useful in intervention studies. However, other intervention studies comparing objective and perceived activity, with larger sample sizes have found that this may not always be the case (Limb et al., 2019). An important limitation of the current study is the inclusion of only a subset of the total participants in the cluster randomized study, limiting the sample size and increasing the potential for selection bias, and the significant attrition throughout the 24-month follow-up. These limit both power and generalizability. As the primary study was not powered to detect an effect in physical activity in a sub-set of participants and there was a lack of balance achieved by randomization between demographic characteristics in the control and intervention groups in the pilot sample, it is possible these are reasons an intervention effect was not identified. Further, despite the cluster-randomized design, there were significant imbalances in key demographic characteristics between groups at baseline, suggesting there may be unmeasured confounding, which detract from the ability to test the intervention effect. Generalizability is further limited in that participants within each work group could volunteer for the overall trial and further into the sub-study, assessing accelerometer, suggesting these participants may not be representative of all employees working in similar jobs; however, this study was conducted in a diverse set of hospital work groups (e.g., food service, housekeeping, billing), enhancing the overall generalizability of the trial.

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Conclusion

Overall, while we cannot conclude that the Working for You intervention improved PA among a subset of participants, the study contributes to our understanding of workplace interventions among diverse populations. Alternative strategies may be needed to promote health and address the significant structural barriers to numerous health behaviors among low income workers, a population disproportionately affected by health disparities.

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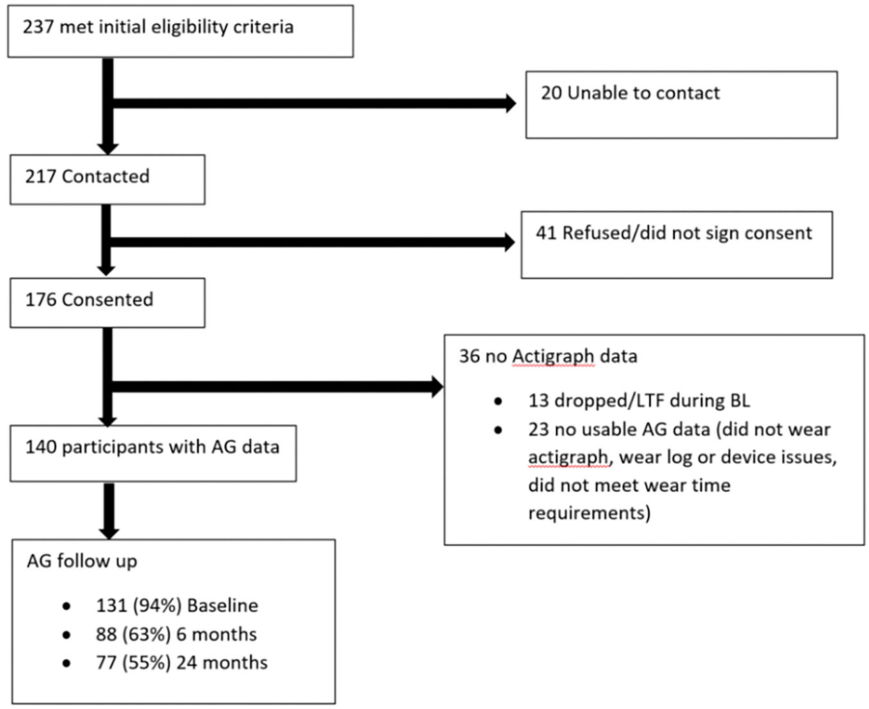

Figure 1.

Participant flow in the subgroup of Working for You study eligible for the accelerometry sub-study

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Table 1.

Baseline characteristics for participants in the sub-group of the Working For You study

	Total **N = 140***	**Control** **N = 69**	**Intervention** **N = 71**	**P†**
Weight, kg	103.7 ± 17.8	100.6 ± 15.7	106.8 ± 19.3	0.09
BMI	37.5 ± 6.3	36.0 ± 5.0	39.0 ± 7.2	**0.005**
Female gender	102 (73.4)	48 (70.6)	54 (76.1)	0.57
Age, years	43.7 ± 10.6	46.1 ± 10.7	41.5 ± 10.1	**0.009**
Race				0.37
Black/African American	71 (50.7)	33 (47.8)	38 (53.5)	
White/Caucasian	64 (45.7)	32 (46.4)	32 (45.1)	
Other	5 (3.5)	4 (5.8)	1 (14)	
Hispanic	1 (0.7)	0 (0.0)	1 (14)	1.00
Education				**0.01**
High school or lower	20 (14.6)	10 (14.7)	10 (14.5)	
Technical school/some college	90 (65.7)	38 (55.9)	52 (75.4)	
College graduate or post-graduate	27 (19.7)	20 (29.4)	7 (10.1)	
Annual household income				0.17
≤$30,000	26 (19.0)	10 (14.9)	16 (22.9)	
$30,001–$70,000	62 (45.3)	28 (41.8)	34 (48.6)	
≥$70,001	49 (35.8)	29 (43.3)	20 (28.6)	
Average daily accelerometer wear time, minutes	772.5 (729.1, 817.6)	756.9 (724.7, 809.3)	784.9 (734.3, 825.0)	0.18

Note. Presented are N (%) for categorical variables and mean ± SD or Median (25th, 75th %tile) for continuous variables

*Nine participants did not provide valid accelerometry data at baseline, but did contribute at later time points, so were included in this study.

†based on Fisher's exact test (categorical variables), two sample T test or Wilcoxon rank sum test (continuous variables), bold indicates $p<.05$

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Table 2.

Change in objective (accelerometry) and perceived (International Physical Activity Questionnaire, IPAQ) moderate or vigorous physical activity (MVPA) by treatment group

	MVPA (average minutes/day) mean (95% CI)*	Difference between treatment groups, Intervention vs Control (95% CI)	Unadjusted P†	Adjusted P‡
Objective MVPA- Accelerometry, controlling for wear time				
Baseline				
Control	30.1 (22.9, 37.3)	*ref.*		
Intervention	25.9 (18.4, 33.5)	−4.2 (−14.6, 6.3)	0.41	0.20
Change from baseline to 6-month follow up				
Control	−1.8 (−7.2, 3.5)	*ref.*		
Intervention	−0.2 (−5.9, 5.6)	1.7 (−6.2, 9.5)	0.68	0.77
Change from baseline to 24-month follow up				
Control	−4.2 (−8.5, 0.1)	*ref.*		
Intervention	−0.4 (−5.6, 4.9)	3.8 (−2.9, 10.6)	0.27	0.36
Perceived MVPA - IPAQ				
Baseline				
Control	126.1 (63.7, 188.5)	*ref.*		
Intervention	132.0 (66.1, 198.0)	5.9 (−84.9, 96.7)	0.89	0.73
Change from baseline to 6-month follow up				
Control	−10.1 (−59.5, 39.4)	*ref.*		
Intervention	57.4 (6.2, 108.5)	67.4 (−3.7, 138.6)	0.06	0.12
Change from baseline to 24-month follow up				
Control	−27.0 (−70.8, 16.9)	*ref.*		
Intervention	10.8 (−42.0, 63.6)	37.7 (−30.9, 106.4)	0.28	0.51

Note.

* Mean changes and CIs are estimated from the regression model. They take hierarchical structure into account and will vary slightly from raw means.

† P values derived from linear mixed model with MVPA as the dependent variable and treatment group, time point (baseline, 6, 24 months) and the interaction of treatment group and time point the independent variables (fixed effects). Random intercepts for work group were included to account for the hierarchical structure of the data. Repeated MVPA measures over time were accounted for using first order autoregressive covariance structure applied to the residuals.

‡ P values based on model with structure in unadjusted models, plus additional fixed effect covariates age, annual income and baseline body mass index.

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Ns = 140 participants contributed accelerometry data at 293 time points (baseline, 6-, 24-months); 139 participants contributed IPAQ data at 288 time points (baseline, 6-, 24-months)

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Table 3.

Proportion of participants meeting MVPA guidelines* by treatment group and time point as measured by objective accelerometry and perceived International Physical Activity Questionnaire (IPAQ)

	Proportion meeting guidelines*, N (%)	OR (95% CI)*	Unadjusted P*	Adjusted P†
Objective MVPA- Accelerometry				
Baseline				
Control	37 (56.9)	*ref.*		
Intervention	35 (53.0)	1.10 (0.28, 4.34)	0.88	0.75
6 month follow up				
Treatment group				
Control	26 (55.3)	*ref.*		
Intervention	26 (63.4)	1.72 (0.40, 7.48)	0.45	0.92
24 month follow up				
Control	22 (45.8)	*ref.*		
Intervention	11 (37.9)	0.89 (0.20, 4.01)	0.87	0.32
Perceived MVPA - IPAQ				
Baseline				
Control	47 (73.4)	*ref.*		
Intervention	44 (69.8)	0.85 (0.21, 3.38)	0.80	0.92
6 month follow up				
Control	31 (70.5)	*ref.*		
Intervention	33 (80.5)	1.58 (0.35, 7.11)	0.54	0.51
24 month follow up				
Control	31 (66.0)	*ref.*		
Intervention	24 (82.8)	2.62 (0.57, 12.04)	0.20	0.20

Note.

* Relative Odds and P values derived from generalized linear mixed model (logistic regression) with meeting moderate to vigorous physical activity (MVPA) guidelines (>=150 min MVPA/week) as the dependent variable and treatment group, time point (baseline, 6-, and 24-months) and the interaction of treatment group and time point the independent variables (fixed effects). Random intercepts for work group were included to account for the hierarchical structure of the data. Repeated MVPA measures over time were accounted for using a first order autoregressive covariance structure applied to the residuals.

† P values based on model with structure in unadjusted models, plus additional fixed effect covariates age, annual income and baseline body mass index. .

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Ns = 140 participants contributed accelerometry data at 296 time points (baseline, 6-, and 24-months); 139 participants contributed IPAQ data at 288 time points (baseline, 6-, and 24-months)

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Table 4.

Correlation of Objective (Accelerometry) and Perceived (International Physical Activity Questionnaire, IPAQ) moderate or vigorous physical activity (MVPA) by treatment group

	Spearman Rho	Unadjusted P*	Adjusted P†
Baseline			
Overall	0.18	0.59	0.51
By treatment group			
Control	0.16	0.64	0.69
Intervention	0.22	0.76	0.60
6 month follow up			
Overall	0.28	0.76	0.72
By treatment group			
Control	0.29	0.79	0.85
Intervention	0.29	0.88	0.73
24 month follow up			
Overall	0.14	0.79	0.61
By treatment group			
Control	0.04	0.64	0.57
Intervention	0.42	0.35	0.22

Note.

* P values derived from linear mixed model with objective (accelerometry) MVPA as the dependent variable and treatment group, time point (baseline, 6-, and 24-months), perceived (IPAQ)MVPA, interactions treatment group by time point, treatment group by IPAQ-measured MVPA, time point by IPAQ-measured MVPA, and treatment group by time point by perceived (IPAQ) MVPA as independent variables (fixed effects). Random intercepts for work group were included to account for the hierarchical structure of the data. Repeated MVPA measures over time were accounted for using a first order autoregressive covariance structure applied to the residuals.

† P values based on model with structure in unadjusted models, plus additional fixed effect covariates age, annual income and body mass index.

Ns = 139 participants contributed accelerometry data at 288 time points (baseline, 6-, and 24-months)