

Short-term Changes in Objectively Assessed Step-defined Physical Activity in The WAVE~Ripples for Change: Obesity Prevention in Active Youth Study

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Abstract

The WAVE study is an on-going multicomponent comparative-effectiveness trial aimed at improving nutritional habits, increasing habitual physical activity, and preventing unhealthy changes in body composition among active 14-19 year-old adolescents. Participants were recruited through soccer teams from 13 schools and enrolled in one of two conditions: 1) a novel and combined physical space (i.e., face-to-face) and virtual space (i.e., computer-based) learning intervention (combined group), or 2) a physical space learning intervention (comparison group). All participants within a given school were allocated to the same intervention arm (combined group = 9 schools; comparison group = 4 schools). **PURPOSE:** To evaluate 4-month changes in step-defined physical activity between the combined and comparison groups following initiation of the WAVE study. **METHODS:** Step-defined physical activity was assessed using the Fitbit Zip activity monitor at baseline and 4-months following intervention implementation. Participants were instructed to wear the Fitbit around their waist during all waking hours, except during water-based activities, for 7 consecutive days. Within- and between-group changes in daily steps and estimated moderate-to-vigorous physical activity (MVPA; time spent ≥ 100 steps/min) were assessed using linear mixed-effects models with random effects for school and participant using the R statistical software package. **RESULTS:** A total of 234 adolescents (152 girls, 82 boys) provided complete data at both assessment periods. Daily steps and MVPA significantly decreased among the combined ($-1,421 \pm 252$ steps/day, $p < 0.001$; -5.6 ± 1.2 min/day, respectively, $p < 0.001$) and comparison groups ($-1,985 \pm 367$ steps/day, $p < 0.001$; -7.2 ± 1.7 min/day, respectively, $p < 0.001$) from baseline to 4-months. Baseline adjusted between-group comparisons for change in steps/day (difference: 211 ± 495 steps/day, $p = 0.679$) and MVPA (difference: 0.9 ± 2.6 min/day, $p = 0.720$) were not statistically significant. **CONCLUSION:** Neither of the interventions evaluated increased or maintained levels of step-defined physical activity across the 4-month intervention period.

Background and Rationale

- 1 in 6 children under the age of 19,¹ and 1 in 3 adults are classified as obese in the US.²
- Obesity and associated healthcare costs are increasing.³
- Obesity is linked to many preventable diseases.³

The potential value of virtual space learning environments to positively influence adolescents' physical activity and nutrition behaviors, in an effort to prevent unhealthy weight gain (i.e., obesity), has yet to be explored.

Aim of Study

To evaluate 4-month changes in step-defined physical activity between the WAVE study's combined and comparison groups following initiation of a multicomponent comparative-effectiveness trial aimed at improving nutritional habits, increasing habitual physical activity, and preventing unhealthy weight gain among active 14-19 year-old adolescents.

Methods

Participants were recruited through soccer teams from 13 schools and enrolled in one of two conditions: 1) a novel combined physical (i.e., face-to-face) and virtual space (i.e., computer-based) learning intervention (combined group), or 2) a physical space learning intervention (comparison group). All participants within a given school were allocated to the same intervention arm (combined group = 9 schools; comparison group = 4 schools).

Step-defined physical activity was assessed using Fitbit Zip activity monitors:

- Fitbit Zip monitors were worn for 1 week at baseline and 4 months following intervention.
- Total daily steps (steps/day) and time spent at ≥ 100 steps/min (moderate-to-vigorous physical activity; MVPA) were quantified.
- Within- and between-group changes in daily steps and MVPA were assessed using linear mixed-effects models with random effects for school and participant using the R statistical software package.

Variable	Comparison	Intervention
n	75	159
Female	69.3%	62.9%
Age (yrs)	15.3 \pm 0.1	15.2 \pm 0.1
BMI (kg/m ²)	23.3 \pm 0.4	21.5 \pm 0.3

Table 1: Descriptive characteristics (M \pm SE).

Variable	Comparison	Intervention
Baseline steps	10157 \pm 460	9521 \pm 309
4-months steps	8173 \pm 460	8100 \pm 309
Adjusted Δ	-1732 \pm 410	-1521 \pm 275

Table 2: Steps/day (M \pm SE). Adjusted Δ not significantly different between groups ($p = 0.679$)

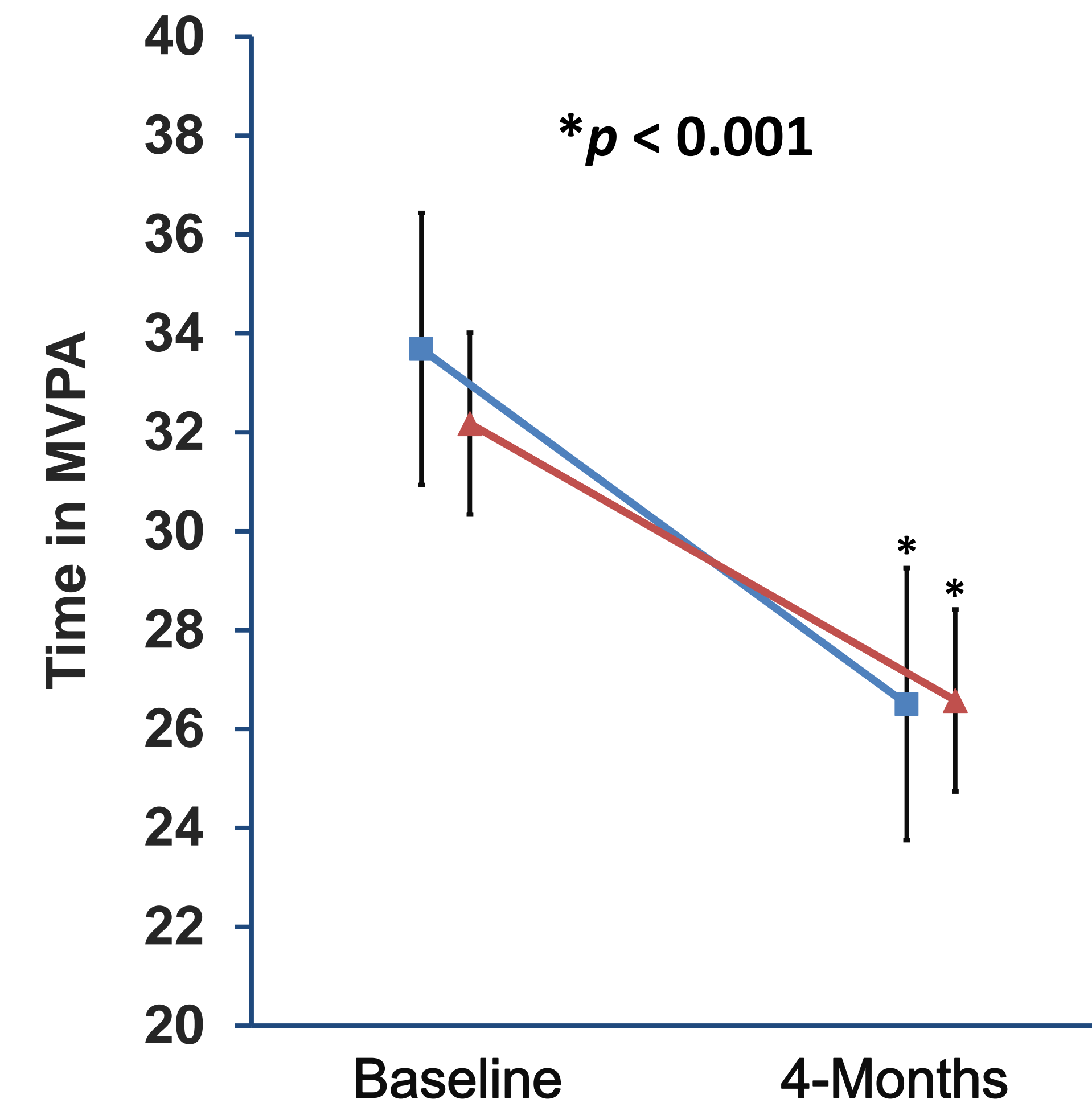


Figure 1: Minutes/day of moderate-to-vigorous physical activity at baseline and 4-months. *Significant within-group changes.

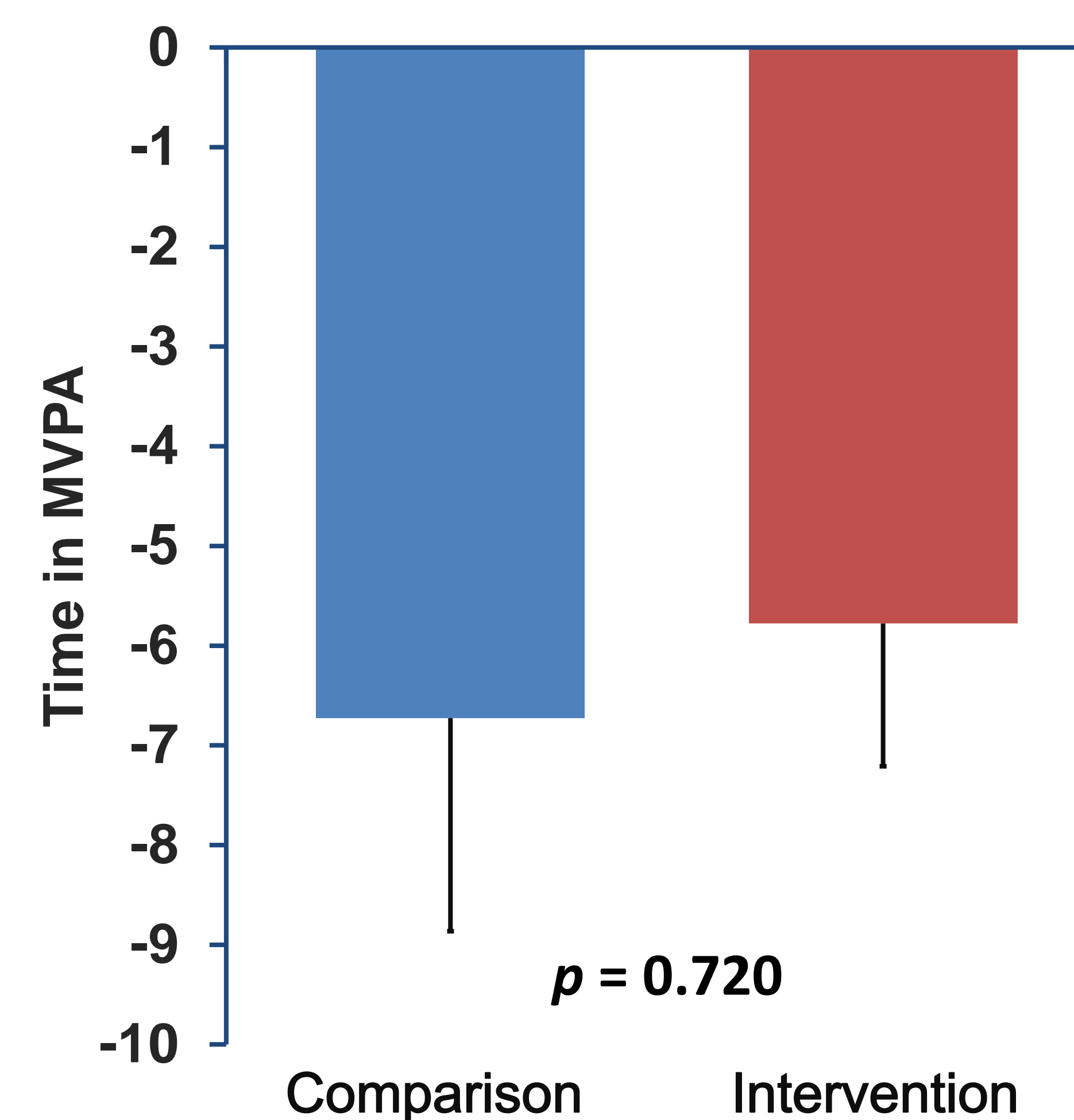


Figure 2: Change in minutes/day of moderate-to-vigorous physical activity between baseline and 4-months. $p = 0.720$

Results

A total of 234 adolescents (152 girls, 82 boys) provided complete data at both assessment periods. Daily steps and MVPA significantly decreased among the combined ($-1,421 \pm 252$ steps/day, $p < 0.001$; -5.6 ± 1.2 min/day, respectively, $p < 0.001$) and comparison groups ($-1,985 \pm 367$ steps/day, $p < 0.001$; -7.2 ± 1.7 min/day, respectively, $p < 0.001$) from baseline to 4-months. Baseline adjusted between-group comparisons for change in steps/day (difference: 211 ± 495 steps/day, $p = 0.679$) and MVPA (difference: 0.9 ± 2.6 min/day, $p = 0.720$) were not statistically significant.

Conclusion

Neither of the interventions evaluated increased or maintained levels of step-defined physical activity across the 4-month intervention period. It remains unclear whether longer durations of face-to-face and/or virtual space learning interventions can elicit positive changes in adolescents' physical activity. As such, future research is warranted to evaluate the effectiveness of the aforementioned intervention modalities over longer durations (e.g., 1 years, 2 years, etc.).

References

- [1] Adult Obesity Facts. (2015, September 21). Retrieved May 04, 2016, from <http://www.cdc.gov/obesity/data/adult.html>
- [2] Childhood Obesity Facts. (2015, June 19). Retrieved May 4, 2016, from <http://www.cdc.gov/obesity/data/childhood.html>
- [3] Adult Obesity Causes & Consequences. (2015, June 16). Retrieved May 04, 2016, from <http://www.cdc.gov/obesity/adult/causes.html>