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Doctor of Physical Therapy

The Impact of Wearable Motion Sensing Technology on Physical Activity in Older Adults: A Systematic Review

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Background

- Despite well-known evidence to support the benefits of daily physical activity, older adults are reported as the most inactive population.
- For older adults, increasing activity may reduce the risk of certain conditions, help maintain weight, strengthen bones and muscles, improve mental health and overall function, decrease falls risk and healthcare costs, and increase life expectancy.
- Walking may be a relatively safe and efficient way to meet the recommended amounts of physical activity.
- Self-monitoring of walking may be done easily with small, unobtrusive wearable activity trackers.

Purpose

In this systematic review, we examine how wearing different trackers (pedometers and accelerometers) may impact physical activity levels in older adults.

Terminology

Pedometer: Tracks steps in one plane of motion based on trunk swing as you walk

Accelerometer: Tracks steps by combining motions from three planes as you walk

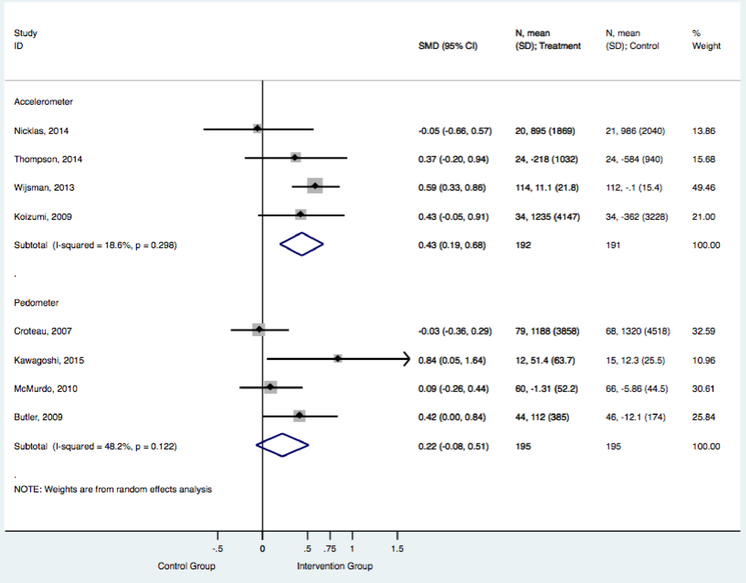
Methods

- MEDLINE, Embase, and CINAHL
- Only randomized controlled trials included
- Over 75% of participants ≥65 years old
- Used wearable trackers to increase physical activity
- Random-effects models used to produce standardized mean differences (SMDs)
- Heterogeneity measured using I^2

Results

Author	Population	Device Name	Feedback Given	Compliance
ACCELEROMETERS				
Koizumi, 2009[20]	Older Adults (68)	Kenz Lifecorder	Intervention group was given their total step counts and minutes walking every 2 weeks	Not Reported
Nicklas, 2014[22]	Older Adults (48)	Lifecorder Plus	Constant pedometer feedback through self-monitoring	Intervention: 90% ± 16.0 Comparator: 91% ± 8.0
Thompson, 2014[24]	Older Adults (49)	Control: MSR Electronics GmbH; Intervention: Fitbit	Control: no feedback to the subject was provided; Intervention: constant feedback	Not Reported
Wijsman, 2013[25]	Older Adults (235)	GENEActive	Constant pedometer feedback through self-monitoring	Intervention: 91.2% Comparator: Not Reported
PEDOMETERS				
Butler, 2009[16]	Cardiac Rehab Patients (110)	Yamax Digiwalker 700B	Constant pedometer feedback through self-monitoring	Not Reported
Croteau, 2007[18]	Older Adults (147)	Yamax Digi-Walker SW-200	Constant pedometer feedback through self-monitoring	Not Reported
Kawagoshi, 2015[19]	Older COPD patients (27)	Kens Lifecorder EX	Average daily PA feedback monthly from PR staff, 11 times during intervention year	Intervention & Comparator: 80.4% ± 13.3
McMurdo, 2010[21]	Older Women (204)	Omcron HJ-113	Constant pedometer feedback through self-monitoring	Intervention & Comparators: 100%
ACCELEROMETERS & PEDOMETERS				
Cadmus-Bertram, 2015[17]	Overweight, Postmenopausal Women (51)	Fitbit™ & ActiGraph GT3X+	Constant pedometer feedback through self-monitoring	Intervention & Comparator: 96%

Nine studies met eligibility criteria; four used accelerometers, four used pedometers, and one compared accelerometers to pedometers. These nine studies yielded 939 participants. Of those that reported compliance, researchers achieved over 80% participant compliance. Using pooled data, we found a statistically significant effect of physical activity increase while using accelerometers (SMD=0.43 (95%CI 0.19 - 0.68), I^2=1.6%, p=.298), but not when using pedometers (SMD=0.22 (95%CI -0.08 – 0.51), I^2=48.2%, p=.122).

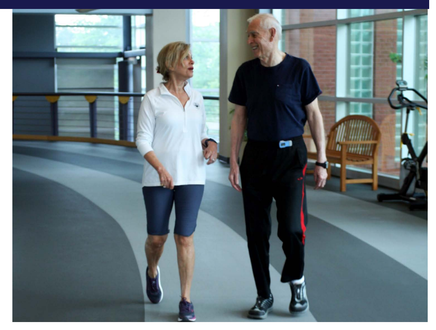


Conclusions

- Intervention groups using an accelerometer resulted in statistically significant as well as clinical improvements of physical activity levels.
- The use of pedometers did not demonstrate a statistically or clinically important increase.
- Results for accelerometers are consistent with previous systematic reviews.
- While anecdotal reports suggest older adults have challenges with technology, evidence shows that with well-designed interfaces and proper training, older adults can use newer technology to improve their physical activity.

Clinical Relevance

- Accelerometers may be a useful approach for promoting physical activity in older adults and thereby reduce sequelae of sedentary behavior.



- Despite potential cost and technological barriers, the downstream benefits of increased physical activity through accelerometer use may be worth the upfront investment.

Acknowledgements / References

We would like to thank Leila Ledbetter, MLIS and Jamie Conklin, MLIS for their assistance in developing the search strategy.

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