



## How can we ensure adolescents wear and return accelerometers when taking part in research studies?

O'Kane, M., Carlin, A., Gallagher, A. M., & Murphy, M. H. (2024). How can we ensure adolescents wear and return accelerometers when taking part in research studies? *The Sport and Exercise Scientist*, (79), 20-22.

[Link to publication record in Ulster University Research Portal](#)

**Published in:**  
The Sport and Exercise Scientist

**Publication Status:**  
Published (in print/issue): 01/03/2024

**Document Version**  
Author Accepted version

### **General rights**

The copyright and moral rights to the output are retained by the output author(s), unless otherwise stated by the document licence.

Unless otherwise stated, users are permitted to download a copy of the output for personal study or non-commercial research and are permitted to freely distribute the URL of the output. They are not permitted to alter, reproduce, distribute or make any commercial use of the output without obtaining the permission of the author(s).

If the document is licenced under Creative Commons, the rights of users of the documents can be found at <https://creativecommons.org/share-your-work/licenses/>.

### **Take down policy**

The Research Portal is Ulster University's institutional repository that provides access to Ulster's research outputs. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact [pure-support@ulster.ac.uk](mailto:pure-support@ulster.ac.uk)

## **How can we ensure adolescents wear and return accelerometers when taking part in research studies?**

*Dr Maria O’Kane, Dr Angela Carlin, Prof Alison Gallagher & Prof Marie Murphy outline practical strategies to encourage adolescents to wear and return accelerometers.*

### **Introduction**

Accelerometers can be used to measure physical activity (PA) by recording accelerations of the body over defined periods of time. Advances in the measurement of PA mean that accelerometer devices have evolved and are becoming lighter and less expensive. These devices are often used within large-scale research studies to provide a practical, reliable, and valid means of measuring the volume and intensity of PA (Reilly *et al.*, 2008). Despite the many advantages there are inherent challenges associated with using accelerometers, particularly among children and adolescents. Compliance with wear-time criteria can be problematic and high proportions of missing accelerometer data has implications for research quality (Howie and Straker, 2016). The non-return of devices can also be challenging among this population group (Kirby *et al.*, 2012).

### **Use of accelerometers in the Walking In Schools (WISH) Study**

In a recent school-based randomised controlled trial, the WISH Study, which tested the effectiveness of a peer-led, walking intervention, 589 girls aged 12-14 years were recruited from eighteen schools (O’Kane *et al.*, 2020). The primary outcome was total PA at the end of the intervention and on four occasions (T0-T3), pupils were asked to wear the ActiGraph accelerometer (GT3x) for 7 days. The device was placed on an elastic waist band and pupils were asked to wear the accelerometer on their right hip at all times, removing it only for bathing, water-based activities and when asleep. Pupils were included in the analysis if they had  $\geq 2$  valid weekdays of data (500 min/day) (Sebire *et al.*, 2018).

### **Strategies employed to maximise accelerometer returns and minimise the amount of missing data:**

Prior to the study commencement, a comprehensive inventory was set-up to accurately track the location of and any technical issues with the accelerometers. All accelerometers were labelled with the contact information of the research team should a device be lost. During school recruitment visits, the data collection methods were outlined. Pupils could look at, feel, and try on an accelerometer, discuss when/how they would be worn and ask questions before registering for the study. The importance of wearing the accelerometer and the incentives that would be provided when devices were returned was explained. In advance of the first data collection appointment, accelerometers were pre-assigned to participants by the research team. To prevent any potential embarrassment due to the allocation of the incorrect waistband size, as pupils entered the room, a member of the research team visually assessed each pupil and for anyone that may have required a different size of waist band (i.e. smaller/larger), a new accelerometer was assigned without the pupil’s knowledge. For subsequent data collection appointments, the size of waistband (small/medium/large) required by each pupil was on record and assigned. At data collection appointments, pupils were asked to try on their accelerometer for comfort and fit and it was possible to swap the accelerometer if there were any issues.

Accelerometers were set up to flash until the following morning when data collection would begin. The contact details for the Research Team were provided, and pupils were advised to ask their parent/guardian to contact the Trial Manager if the device continued to flash (indicating a technical issue). Accelerometers were distributed face-to-face within schools and clear verbal instructions were provided on when to wear the device, how to look after the device and when and to whom they should be returned. On each occasion, pupils were

provided with “an accelerometer pack’, labelled with their name and school, a wear-time log, written instructions, and a note on coloured paper informing participants when, where and to whom to return the accelerometer. Labelled boxes were left with the staff contact responsible for collecting the monitors.

Ethical approval was in place to send text messages to the parent/guardian on the last day of each data collection period to detail where and to whom the devices should be returned. Throughout the study, we liaised closely with school staff and when necessary, school staff contacted the pupils’ parent/guardian to retrieve accelerometers. At each timepoint, the devices were collected from schools as soon as possible and preferably within 1 week meaning there was less time for devices to be misplaced.

Incentives were provided when pupils returned accelerometers. These incentives were chosen (water bottles/earphones/power-banks) and designed (hoodies) by the Youth Advisory Group (YAG) (Gallagher *et al.*, 2023) (total cost £15/pupil). Incentives were delivered to schools once accelerometers had been downloaded for that specific timepoint. School staff were asked to distribute the incentives. Attached to the incentive for each pupil was a label with the pupil’s name, school, and a message specific to the number of days the accelerometer had been worn for that timepoint (Table 1). The messages acknowledged/praised those who had complied with the wear-time protocol and provided encouragement for those with lower levels to improve their wear-time during the next data collection period.

Wear-time (days)	Message to pupil
7	“When we downloaded the data, we can see that you wore the device for the full 7 days. This is brilliant, thank you!”
5-6	When we downloaded the data, we can see that you wore the device for [5 or 6] days. Thank you for wearing the device as much as you did, this is really helpful for our research!”
3-4	“When we downloaded the data, we can see that you wore the device for [3 or 4] days. Next time, please try to wear the device for the full 7 days. Thank you!”
1-2	“When we downloaded the data, we can see that you wore it for [1 or 2] days. Next time, please try to wear the device for the full 7 days. We need the devices to be worn more than [1 or 2] days. Thank you!”
0	“When we downloaded the data, we can see that you haven’t wore the device. Next time, please try to wear the device for the full 7 days. Thank you.”

Table 1: Messages to pupils based on accelerometer wear-time.

Using the wear-time data from the previous timepoint, schools were ranked from 1-18 based on the percentage of pupils who met wear-time criteria and could be included in the analysis. This ‘leaderboard of wear-time’ was used to generate competition and encourage pupils to wear the monitor. It was emphasised that this leaderboard was unrelated to levels of PA and focused on wear-time.

### How effective were the strategies implemented?

In total, n2213 accelerometer devices were issued over a 12-month period. Only n3 (0.14%) devices were unreturned. The median overall wear-time was between 5 and 6 days at each time point. The number of pupils meeting the wear-time criteria ( $\geq 2$  weekdays) ranged from 91% at baseline, to 84% at the end of the intervention. Interestingly, the median wear-time for the control group was higher by one day than the intervention group at T0, T1, and T2. There were no differences in age, height, weight, BMI z-scores, waist circumference, hip circumference, and waist-to-hip ratio between pupils who met and those who did not meet the minimum wear-time criteria. Accelerometer data was available for 74% of participants at T0 and T2, compared to 69% (Girls Active Project, (Harrington *et al.*, 2018)) and 64% of participants (Plan A, (Sebire *et al.*, 2018) as reported in similar studies.

## Summary

The use of accelerometers to measure PA is challenging in this population group. However, a multi-faceted approach like the one implemented within the WISH Study can encourage adherence to the wear-time protocol and ensure devices are returned. Of key importance in this context was the provision of incentives (chosen by the YAG), clear return instructions and reminder text-messages to parents/guardians.

## References

Gallagher AM, *et al.* (2023) “Including us, talking to us and creating a safe environment” - Youth Patient & Public Involvement (PPI) and the Walking In ScHools (WISH) Study: Lessons learned. *Health Expectations*, 27: e13885.

Harrington DM, *et al.* (2018) Effectiveness of the ‘Girls Active’ school-based physical activity programme: A cluster randomised controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity*, 15:40.

Howie EK, Straker LM. (2016) Rates of attrition, non-compliance and missingness in randomized controlled trials of child physical activity interventions using accelerometers: A brief methodological review. *Journal of Science and Medicine in Sport*, 19, 830–6.

Kirby J, *et al.* (2012) Young People’s Views on Accelerometer Use in Physical Activity Research: Findings from a User Involvement Investigation. *ISRN Obesity*, 1–7.

O’Kane SM, *et al.* (2020) A study protocol for a clustered randomised controlled trial to evaluate the effectiveness of a peer-led school-based walking intervention on adolescent girls’ physical activity: The Walking in ScHools (WISH) study. *BMC Public Health*, 20: 541.

Reilly JJ, *et al.* (2008) Objective measurement of physical activity and sedentary behaviour: review with new data. *Archives of Disease in Childhood*, 93, 614–9.

Sebire SJ, *et al.* (2018) Results of a feasibility cluster randomised controlled trial of a peer led school-based intervention to increase the physical activity of adolescent girls (PLAN-A). *International Journal of Behavioral Nutrition and Physical Activity*, 15, 1-13.



**Dr Maria O'Kane**

---

Lecturer in Healthcare Science/Health Physiology at Ulster University.



**Dr Angela Carlin**

---

Lecturer in Exercise and Health (Physiology) at Ulster University.



**Prof Alison Gallagher**

---

Professor of Public Health Nutrition at Ulster University and Head of the Doctoral College (Coleraine/Magee).



**Prof Marie Murphy FBASES**

---

Professor of Physical Activity for Health (Ulster University) and Director of the Physical Activity for Health Research Centre (PAHRC) at the University of Edinburgh.

**Photo caption (1):** 'Accelerometer packs' distributed for data collection as part of the WISH Study

**Photo courtesy:** Dr Maria O'Kane