
Citation:

Reilly, C and Stavropoulos-Kalinoglou, A and Clifton, I and Price, O (2020) Evaluating the validity of a smartphone step-counter in adults with asthma: a proof-of-concept study. In: EAACI Digital Congress 2020, 06 June 2020 - 08 June 2020. (Unpublished)

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/7256/>

Document Version:

Conference or Workshop Item (Accepted Version)

Poster presentation

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

EVALUATING THE VALIDITY OF A SMARTPHONE STEP-COUNTER IN ADULTS WITH ASTHMA: A PROOF-OF-CONCEPT STUDY

Caroline Reilly¹ MSc, Antonios Stavropoulos-Kalinoglou¹ PhD, Ian J. Clifton² FRCP MD,
Oliver J. Price¹ PhD.

¹Carnegie School of Sport, Leeds Beckett University, Leeds, United Kingdom (UK); ²Leeds Teaching Hospitals NHS Trust, Department of Respiratory Medicine, Leeds, UK.

Introduction: Regular physical activity and structured exercise are often reported to be associated with improved asthma control - however the majority of published evidence is limited by short-term studies employing subjective measures of assessment (i.e. self-report / questionnaires). Modern smartphones typically include built-in activity sensors (i.e. possess the capability to monitor daily step-count) and thus may offer a cost-effective and pragmatic solution to the assessment of physical activity in clinical practice and/or research trials. The primary aim of this proof-of-concept study was therefore to evaluate the validity of the iPhone® (Apple Inc, USA) step-counter in adults with asthma and healthy controls.

Methods: The study was conducted as a cross-sectional laboratory based-trial. Ten healthy adults with no prior history of respiratory disease and ten adults with a prior physician diagnosis of asthma were enrolled. All completed baseline clinical assessment followed by a standardised walking treadmill challenge consisting of 3 x 3-minute stages at pre-determined speeds: 2.5kph, 5.0kph and 7.5kph. Steps were recorded using the following devices: (i) Yamax Digiwalker™ SW-200 Pedometer (Yamax, UK), (ii) iPhone® step-counter (upper body arm-band), (iii) iPhone® step-counter (lower body trouser pocket) - and evaluated against a video-verified manual step-count (i.e. gold-standard comparator) conducted by the investigator (CR).

Results: No difference was observed in manual total step-count between individuals with asthma (1018 steps) and healthy controls (1038 steps) ($P=0.44$). The iPhone® step-counter (both upper and lower body) provided close agreement with video-verified manual step-count, and importantly, outperformed the Yamax Digiwalker® SW-200 Pedometer across the majority of test stages. Specifically, the iPhone® (lower body) correlated strongly ($r = 0.96$; $P<0.006$) and produced the highest level of agreement with video-verified total step-count (mean bias: -11; limits of agreement: -43 to 21) (Table 1).

Conclusion: Our findings indicate that the iPhone® provides an accurate estimate of step-count in adults with asthma and healthy controls completing a standardised laboratory-based treadmill test. Prior to implementation, further research is required to determine the validity and reliability of this approach during daily active / free living conditions.

Table 1. Comparison of step-count devices during a standardised walking treadmill challenge.

Device (speed)	Step-count (mean SD)	P-value	ICC	Mean bias	LOA
Video-verified manual count (2.5kph)	253 (18)	-	-	-	-
iPhone upper	242 (42)	0.24	r = 0.33	-11	-89 to 67
iPhone lower	253 (21)	0.99	r = 0.77	0	-27 to 27
Digiwalker	179 (70)	<0.0001	r = 0.37	-74	-203 to 55
Video-verified manual count (5.0kph)	337 (17)	-	-	-	-
iPhone upper	336 (18)	0.86	r = 0.88	-1	-17 to 16
iPhone lower	333 (16)	0.003	r = 0.96	-4	-14 to 6
Digiwalker	329 (28)	0.23	r = 0.40	-8	-59 to 44
Video-verified manual count (7.5kph)	439 (29)	-	-	-	-
iPhone upper	431 (30)	0.009	r = 0.91	-8	-33 to 17
iPhone lower	430 (35)	0.009	r = 0.93	-9	-33 to 17
Digiwalker	433 (31)	0.004	r = 0.97	-6	-20 to 9
Video-verified manual count (total)	1028 (56)	-	-	-	-
iPhone upper	1009 (67)	0.08	r = 0.74	-19	-108 to 70
iPhone lower	1017 (58)	0.006	r = 0.96	-11	-43 to 21
Digiwalker	942 (99)	<0.0001	r = 0.66	-86	-233 to 60

Definition of abbreviations: ICC, Intra-class correlation; LOA, Limits of agreement