



Physical Activity in Patients With Type 2 Diabetes: The Case for Objective Measurement in Routine Clinical Care

<https://doi.org/10.2337/dc17-2041>

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To perform at least 150 min of moderate-to-vigorous physical activity (MVPA) per week is a major aim in type 2 diabetes treatment (1), but actual measurements are not routinely performed in clinical practice. We questioned whether subjective assessment of physical activity is accurate to guide lifestyle advices.

We compared the results of the Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH) (2) and the Fitbit Flex accelerometer (3) in 50 patients with type 2 diabetes included in the Diabetes and Lifestyle Cohort Twente (DIALECT) trial, which was approved by the local institutional review board METC-Twente (NL57219.044.16) (4).

Patients wore the Fitbit for 7 consecutive days and were instructed to maintain their usual activities. Raw Fitbit data (steps/min) were organized into ready variables by an algorithm written in MATLAB (MathWorks, Natick, MA). MVPA was defined as ≥ 95 steps/min (5). Patients maintained a diary regarding activities not detected by the Fitbit (i.e., cycling, swimming, and fitness). Data are presented as median (interquartile range). The association between log-transformed measured minutes of MVPA was tested using linear regression analyses and the difference between MVPA with the Wilcoxon test for paired nonparametric data.

Median age was 70 (63–76) years, median diabetes duration was 16 (10–21) years, 74% of the patients were male, 82% used insulin, and 84% had microvascular and 42% had macrovascular complications. According to SQUASH, patients had 165 [0–645] min of MVPA/week, and 20 participants (40%) adhered to the American Diabetes Association (ADA) recommendation of ≥ 150 min of MVPA/week (1) (Fig. 1). Fitbit data of >5 days were available in all patients. Median total steps per day were 4,277 (2,588–6,407), and 86% were able to reach ≥ 95 steps/min at some point during the measurement period. Based on the Fitbit data, patients had 23 (5–41) min of MVPA/week, and 1 (2%) participant adhered to the ADA guideline. When nonregistered activity was added, the figures increased to 31 (5–72) min of MVPA/week and 7 (14%) patients fulfilling the guideline. There was an association between SQUASH-assessed minutes of MVPA/week and Fitbit-assessed minutes of MVPA/week ($\beta = 0.54$, $P < 0.001$) (Fig. 1); however, the number of SQUASH-assessed minutes of MVPA/week was significantly and substantially higher ($P < 0.001$).

Subjective assessment grossly overestimated weekly MVPA compared with objective assessment. When self-reporting, roughly half of the patients seem to meet the MVPA recommendations, whereas objective measurements indicate this

number is 14%, at best. A limitation is that the Fitbit Flex, while validated for measuring steps, does not register other activities. Currently, several types of activity trackers with additional functionalities have become available, and future research should evaluate which tracker is most appropriate for clinical use. Although it has not been tested as to whether overestimation of activity occurs in a wider array of patients with diabetes, the findings presented here clearly point out the importance of using objective measurements of activity. We propose to incorporate objective measurements of physical activity in the standard care for patients with type 2 diabetes. Such measurements can not only identify individuals at risk but also increase patient's awareness of physical inactivity and help to evaluate interventions.

Acknowledgments. The authors thank Ilse Hagedoorn, Michèle Lankheet, Rosan Nobbenhuis, and Yvette van den Berkhof, Ziekenhuisgroep Twente, for their contribution to patient inclusion. The authors thank Rene Vlaskamp, Ziekenhuisgroep Twente, for his assistance in making the information en communication infrastructure available for Fitbit. **Funding.** This study was financially supported by a grant from the Pioneers in Health Care Innovation Fund, Twente.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.

Author Contributions. N.O. and C.M.G. included the patients. N.O., C.M.G., and G.D.L. wrote the

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Received 29 September 2017 and accepted 14 January 2018.

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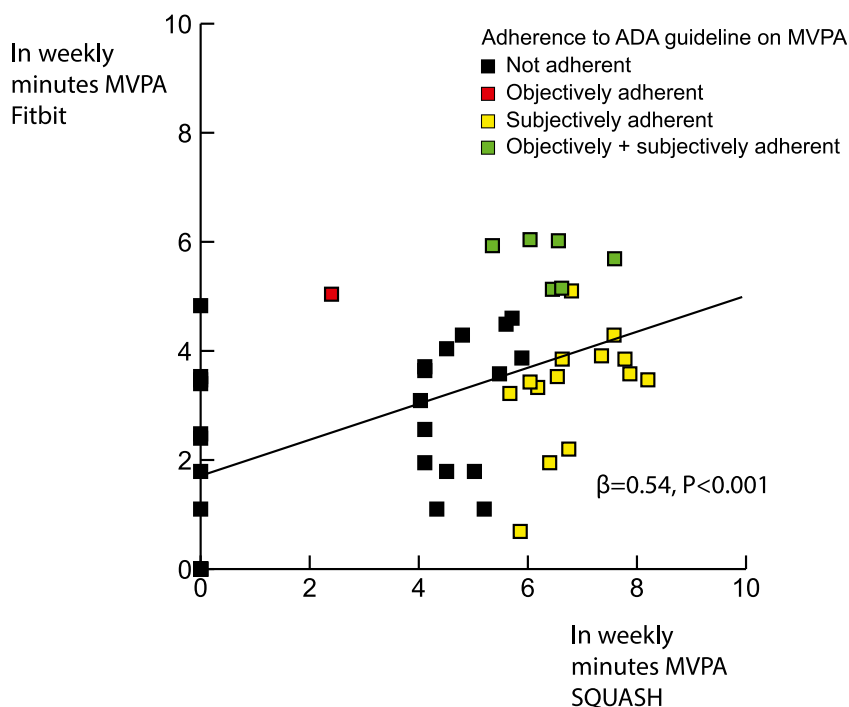


Figure 1—Minutes of MVPA measured with SQUASH versus minutes of MVPA measured with Fitbit. There was a correlation between measured minutes of MVPA between the two methods. However, in the majority of patients, the absolute number of weekly minutes of MVPA was substantially higher using the SQUASH results.

manuscript. N.O. and N.R. analyzed the data. B.-J.F.v.B., H.H., S.J.L.B., G.N., and M.M.R.V.-H. contributed to the discussion and reviewed the manuscript. B.-J.F.v.B., H.H., S.J.L.B., G.N., M.M.R.V.-H, and G.D.L. designed the study. G.D.L. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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