

Physical Function Outcomes in People with Type 2 Diabetes: What is the Impact of Type 2 Diabetes Duration Above and Beyond Chronological Age?

Authors: *Malak Hamza,^{1,2} Dimitris Papamargaritis,¹⁻³ Andrew P. Hall,⁴ Tom Yates,^{1,2} Melanie J. Davies,^{1,2} Joseph Henson^{1,2}

1. Diabetes Research Centre, University of Leicester, UK
2. National Institute for Health and Care Research (NIHR) Leicester Biomedical Research Centre, University Hospitals of Leicester NHS Trust and University of Leicester, UK
3. Department of Diabetes and Endocrinology, Kettering General Hospital, University Hospitals of Northamptonshire NHS Group, UK
4. Hanning Sleep Laboratory, University Hospitals of Leicester, UK

*Correspondence to Malak.hamza@leicester.ac.uk

Disclosure: Papamargaritis has received grants or contracts from Novo Nordisk, Novo Nordisk UK Research Foundation, the Academy of Medical Sciences/Diabetes UK, Health Education East Midlands, and the National Institute for Health and Care Research (NIHR), with payments to the institution; payment or honoraria for lectures, presentations, speakers' bureaus, manuscript writing, or educational events from Novo Nordisk, Eli Lilly, Boehringer Ingelheim, and Johnson and Johnson, with payments to the author; support for attending meetings and/or travel from Novo Nordisk; has participated on a data safety monitoring board or advisory board for Recordati; is an operational member for the Association for the Study of Obesity; and is a member of the Academic Subcommittee for the Association of British Clinical Diabetologists. Yates has received an investigator-initiated research grant from AstraZeneca, with payment to the institution; a contracted research grant from the Reinsurance Group of America, with payment to the institution; and consulting fees from Regeneron, with payment to the author. Davies has received grants or contracts from AstraZeneca, Boehringer Ingelheim, and Novo Nordisk, with payments to the author; consulting fees from Boehringer Ingelheim, Eli Lilly, Novo Nordisk, and Sanofi; payment or honoraria for lectures, presentations, speakers' bureaus, manuscript writing, or educational events from AstraZeneca, Boehringer Ingelheim, Novo Nordisk, Sanofi, and Eli Lilly; support for attending meetings and/or travel from Boehringer Ingelheim, Eli Lilly, Novo Nordisk, Amgen, AstraZeneca, Biomea Fusion, Regeneron, and Zealand Pharma; and has participated on a data safety monitoring board or advisory board for Amgen, AstraZeneca, Biomea Fusion, Sanofi, Zealand Pharma, Carmot/Roche, Regeneron, EktaH, AbbVie, GSK, and Daewoong

Pharmaceutical. Hamza has received support for attending meetings and/or travel from the Leicester Diabetes Research Centre, University of Leicester. The other authors have declared no conflicts of interest.

Acknowledgements: This research is funded by the National Institute for Health and Care Research (NIHR) Leicester Biomedical Research Centre (BRC). The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care. The authors would like to thank the participants for taking the time to participate, as well as the members of the Leicester Diabetes Centre Patient and Public Forum for their valuable input in the study design. The authors also acknowledge the contributions of the collaborating research sites, Sahar Khodabakhsh, Leicester Diabetes Centre, University Hospitals of Leicester NHS Trust, UK, for her continued oversight of the trial, and Mike Bonar, Creative Director at the Leicester Diabetes Research Centre, UK, for designing and creating the figure.

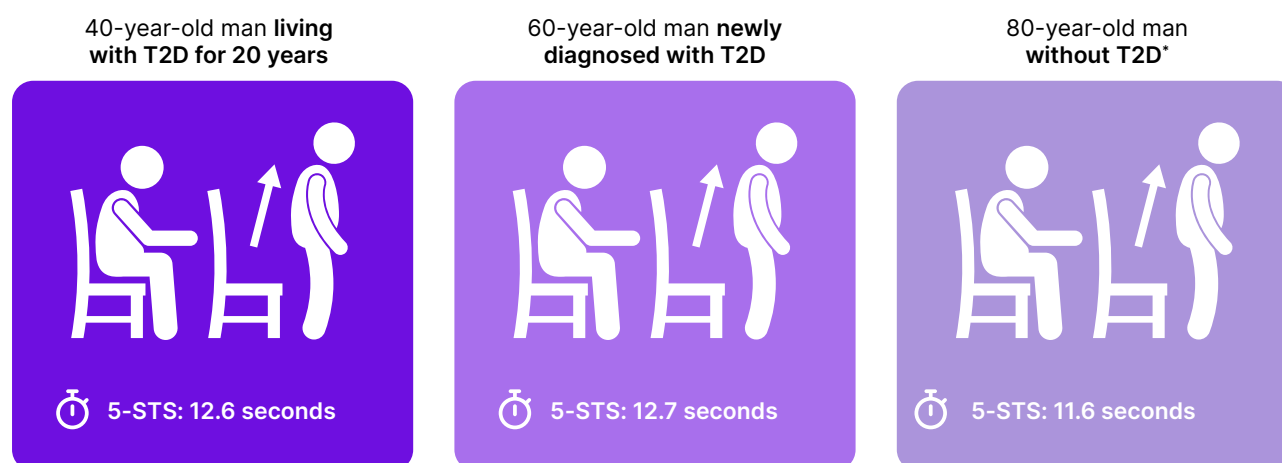
Keywords: Frailty, physical function, Type 2 diabetes (T2D).

Citation: EMJ Diabet. 2025;13[1]:39-41.
<https://doi.org/10.33590/emjdiabet/JULV2437>

BACKGROUND AND AIMS

Physical function decline is an increasingly recognised concern among individuals with long-term conditions such as Type 2 diabetes (T2D).¹ This decline often coexists with obesity and is now observed at younger ages, reflecting the rising prevalence of early-onset T2D and its associated complications.² These trends contribute to elevated risks of sarcopenia and frailty, with significant implications for long-term morbidity.³ Despite growing awareness, the relationship between the duration of T2D and physical function outcomes remains unexplored. Understanding the association is critical for identifying individuals at greatest risk and informing targeted interventions. The aim of this study was to evaluate the association between T2D duration and physical function outcomes, independent of chronological age.⁴

Figure 1: Five-repetition chair sit-to-stand test in association with Type 2 diabetes duration.



*Data presented as mean.⁷

5-STST: five-repetition sit-to-stand; T2D: Type 2 diabetes.

MATERIALS AND METHODS

The authors analysed data from individuals with T2D in the CODEC study, a cross-sectional, multisite, observational trial exploring chronotype and health outcomes in the UK in individuals with T2D.⁵ Physical function was assessed using the short performance physical battery (SPPB), 4-metre gait speed, five-repetition chair sit-to-stand (5-STST), 60-second chair sit-to-stand (STS-60), handgrip strength (sex-specific), and the Duke Activity Status Index (DASI). Associations between self-reported T2D duration and physical function outcomes were evaluated using linear regression models, adjusted for age, sex, and ethnicity.

RESULTS

A total of 1,204 participants were included (mean age: 65±12 years; age at diagnosis: 54±14 years; HbA1c: 53±15.2 mmol/mol [7±1.4%]; T2D duration: 11±11 years; BMI: 31±7 kg/m²). The cohort was predominantly White (84%), with 12% South Asian representation. Baseline physical function scores were an SPPB score of 11±3 points, a gait speed of 4.2±2 seconds, a 5-STST

of 14±4 seconds, an STS-60 of 22±8 repetitions, a handgrip strength of 38±12 kg in men and 23±9 kg in women, and a DASI score of 43±24 points. Longer T2D duration was significantly associated with poorer physical function across all measures, independent of age, sex, and ethnicity. Specifically, each 10-year increase in T2D duration was associated with:

- a 0.3-point lower SPPB score (95% CI: -0.41--0.11; p<0.001);
- a 0.2-second slower gait speed (95% CI: 0.06-0.30; p=0.003);
- a 0.6-second longer 5-STST time (95% CI: 0.12-1.01; p=0.013);
- 0.7 fewer repetitions in STS-60 (95% CI: -1.29--0.02; p=0.043);
- a 1.02 kg lower handgrip strength in men (95% CI: -1.87--0.16; p=0.020) and a 0.8 kg lower handgrip strength in women (95% CI: -1.64-0.08; p=0.074); and
- a 1.9-point lower DASI score (95% CI: -2.94--0.77; p<0.001).

To contextualise, a 40-year-old man living with T2D for 20 years would be expected to have a 5-STST time of approximately 12.6 seconds (Figure 1). This indicates that, by midlife, he has already experienced a clinically significant decline in physical

function.⁶ This estimate is comparable to that of a 60-year-old man with newly diagnosed T2D (12.7 seconds) and both closely resemble the normative value for an 80-year-old man without T2D (11.6 seconds; [Figure 1](#)).⁷

CONCLUSION

The authors' findings illustrate the cumulative impact of T2D duration on physical function, independent of chronological age. This highlights the need for greater awareness among healthcare professionals and patients regarding the long-term functional consequences of T2D. Future research should focus on evaluating the effectiveness of pharmacological, nutritional, and exercise-based interventions in preserving physical function and improving long-term outcomes in this population.

References

1. 61st EASD Annual Meeting of the European Association for the Study of Diabetes: Vienna, Austria, 15-19 September 2025. *Diabetologia*. 2025;68(Suppl 1):1-754.
2. Ahmad E et al. Type 2 diabetes and impaired physical function: a growing problem. *Diabetology*. 2022;3(1):30-45.
3. Wong E et al. Diabetes and risk of physical disability in adults: a systematic review and meta-analysis. *Lancet Diabetes Endocrinol*. 2013;1(2):106-14.
4. Hamza et al. Physical function outcomes in people with type 2 diabetes (T2D): what is the impact of T2D duration above and beyond chronological age? Abstract 211. EASD Annual Meeting, 15-19 September, 2025.
5. Brady EM et al. Rationale and design of a cross-sectional study to investigate and describe the chronotype of patients with type 2 diabetes and the effect on glycaemic control: the CODEC study. *BMJ Open*. 2019;9(11):e027773.
6. Jones SE et al. The five-repetition sit-to-stand test as a functional outcome measure in COPD. *Thorax*. 2013;68(11):1015-20.
7. Landi F et al. Normative values of muscle strength across ages in a 'real world' population: results from the longevity check-up 7+ project. *J Cachexia Sarcopenia Muscle*. 2020;11(6):1562-9.