Exam stress, blood sugar: a clinical paradox?

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Psychological stress is known to raise heart rate and blood pressure, but whether ordinary academic stress, not a clinical stressor, is enough to move blood glucose in someone without diabetes has had little direct evidence. A small study presented at the EASD Annual Meeting in Milan used continuous glucose monitoring to track exactly that, across a real exam period in real medical students.

KEY TAKEAWAYS

- The Pivot: Ordinary exam stress, not a clinical stress event, was enough to measurably raise blood glucose in healthy young adults with no diabetes.
- The Data: Average glucose rose from 5.35 to 5.72 mmol/L across the four days into the exam, with the written-test portion peaking at 6.14 mmol/L, all still within normal range.
- The Action: The authors frame this as a case for stress-management support during recurring high-stress academic periods, not an acute glucose concern.

Researchers at Charles University and Motol University Hospital in Prague, led by Natalia Michalcová and Dr Jan Brož, fitted 22 healthy second-year medical students (13 women, 9 men, average age 21, average BMI 21.9) with FreeStyle Libre 2 continuous glucose monitors, recording glucose every 15 minutes from seven days before a biochemistry oral exam through three days after it. Psychological stress was measured on exam day using the standardised State-Trait Anxiety Inventory, and students logged physical activity, food intake and sleep that could otherwise explain glucose changes.

Glucose rose in the run-up, and peaked on exam day

The highest average daily glucose of the entire monitoring period occurred on the exam day itself, 5.72 mmol/L, up from 5.35 mmol/L four days before the exam, a rise of 0.37 mmol/L. It dropped by 0.30 mmol/L the day after the exam, to 5.42 mmol/L. Average overnight glucose during sleep also climbed steadily in the run-up, from 4.70 mmol/L seven nights before the exam to 4.93 mmol/L the night before it.

Within exam day itself, glucose tracked the expected stress pattern of the day's different phases, highest during the written test (6.14 mmol/L), a portion of the exam students in the underlying press materials describe as the most acutely stressful segment. Glucose levels also correlated significantly with STAI anxiety scores: students who reported feeling more stressed had higher glucose before the exam and a sharper drop afterward. All monitored associations were strongly significant ($p<0.001$).

None of this was in the abnormal range, that is the point

Every glucose value recorded, including the exam-day peak, sits well within the normal range for someone without diabetes; nothing here describes acute risk. The concern the authors raise is cumulative rather than acute: medical

training involves repeated, predictable exam stress over years, not a single isolated event. "Persistently or repeatedly 'slightly raised' glucose levels could shift an individual's usual blood glucose range and potentially contribute to the development of type 2 diabetes over time," said co-author Natalia Michalcová, pointing to stress hormones like cortisol and catecholamines counteracting insulin's effects. No conflicts of interest were declared.

This observation aligns with a growing body of evidence linking psychological stress to transient glucose dysregulation, even in metabolically healthy individuals. The physiological mechanisms are well-established: acute stress triggers the release of counter-regulatory hormones such as cortisol, adrenaline, and noradrenaline. These hormones promote gluconeogenesis and glycogenolysis, increasing hepatic glucose output, while simultaneously impairing insulin sensitivity in peripheral tissues. The net effect is an elevation in circulating glucose, a response designed to provide immediate energy for a "fight or flight" scenario. While adaptive in short bursts, the chronic or repeated activation of this stress response, as suggested by the authors in the context of medical training, could lead to sustained periods of elevated glucose. This sustained elevation, even within the "normal" range, may contribute to pancreatic beta-cell fatigue and a gradual decline in insulin sensitivity over time, potentially accelerating the progression towards prediabetes and type 2 diabetes.

The study's findings, while compelling, warrant consideration of several limitations. Firstly, the sample size of 22 students is relatively small, limiting the generalizability of the results to the broader population of medical students or individuals experiencing chronic stress. Secondly, the study focused on a single, albeit significant, stressor (a biochemistry oral exam). While the authors extrapolate to repeated exam stress, direct longitudinal data on the cumulative impact of multiple stressors over years of medical training would provide stronger evidence. Thirdly, while students logged physical activity, food intake, and sleep, the self-reported nature of this data introduces potential for recall bias. More objective measures, such as actigraphy for sleep and activity, or meticulously controlled dietary intake, could strengthen the causal link between stress and glucose fluctuations. Finally, the study population comprised healthy, non-diabetic individuals with an average BMI of 21.9, suggesting a metabolically robust cohort. The glucose excursions observed might be more pronounced or have different implications in individuals with pre-existing metabolic vulnerabilities, such as those with a family history of diabetes, higher BMI, or prediabetes.

Clinical Implications and Future Directions

The study by Michalcová and Brož offers a crucial perspective for healthcare professionals, particularly those involved in the education and well-being of medical trainees. The finding that even "normal" glucose levels can be subtly yet significantly influenced by psychological stress underscores the importance of a holistic approach to metabolic health. Clinicians should be aware that individuals under chronic stress, even those without overt metabolic disease, may experience transient glucose elevations that, if persistent, could have long-term consequences. This highlights the need for proactive stress management strategies within demanding professions. Implementing resilience training, mindfulness practices, and ensuring adequate support systems for medical students could mitigate the physiological impact of academic pressures.

From a research perspective, future studies should aim to expand on these findings. Longitudinal investigations tracking glucose levels and stress markers in larger cohorts of medical students throughout their entire training period would provide invaluable data on the cumulative effects of chronic academic stress. Incorporating advanced metabolic assessments, such as oral glucose tolerance tests or HOMA-IR calculations, at various time points could offer deeper insights into changes in insulin sensitivity and beta-cell function. Furthermore, exploring interventions aimed at stress reduction – such as structured exercise programs, cognitive behavioral therapy, or even pharmacological interventions in severe cases – and their impact on glucose homeostasis in this population would be highly beneficial. Understanding the individual variability in response to stress and identifying biomarkers that predict susceptibility to stress-induced glucose dysregulation could also pave the way for personalized preventative strategies. Ultimately, this research serves as a poignant reminder that the mind and metabolism are intricately linked, and addressing psychological well-being is an integral component of maintaining long-term physiological health.

CLINICAL IMPLICATIONS

The honest headline here is "measurable, not dangerous": every value reported sits inside the normal range, and the authors say so plainly. The actual claim is about repeated exposure over a medical training career, not about any single exam being a metabolic risk event, and that distinction matters for how this should be communicated to students.

With 22 participants and one exam period, this is a small, single-institution, single-event study. It establishes that the association exists and is statistically robust within this sample, not that it generalises to all students, all exam types, or holds up as a predictor of actual future diabetes risk. The authors explicitly call for larger, longer studies before drawing conclusions about causality or long-term risk.

As a purely observational design with self-reported activity, food and sleep logs, some of the correlation could reflect changed behaviour around exams, more caffeine, disrupted sleep, less activity, rather than a direct cortisol-to-glucose pathway, though the authors' proposed mechanism (stress hormones counteracting insulin) is a well-established physiological pathway independent of this particular study.

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REFERENCES

1. Michalcová N, Brabec M, Brož J. Pre-exam stress elevates glucose levels in non-diabetic medical students: evidence from continuous glucose monitoring. Abstract 939. Presented at the European Association for the Study of Diabetes (EASD) Annual Meeting, Milan, Italy, 27 September-2 October 2026.

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