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# Depressive symptoms are associated with physical inactivity in patients with type 2 diabetes. The DIAZOB Primary Care Diabetes study

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Koopmans B, Pouwer F, de Bie RA, van Rooij ES, Leusink GL and Pop VJ. Depressive symptoms are associated with physical inactivity in patients with type 2 diabetes. The DIAZOB Primary Care Diabetes study. *Family Practice* 2009; Pages 1–3 of 3.

**Background.** Depression is a common complication of type 2 diabetes, associated with poor disease outcomes such as impaired glycaemic control, cardiovascular disease and increased mortality. The mechanisms behind these associations are unclear. Depression might contribute to poor disease outcomes through decreased physical activity.

**Objective.** To test whether type 2 diabetes patients with elevated depression scores are more often physically inactive.

**Methods.** Demographic features, clinical factors, level of physical inactivity and depressive symptoms were assessed in 2646 primary care patients with type 2 diabetes. Sequential multiple logistic regression analyses [odds ratio, 95% confidence interval (CI)] were performed to test the association between depressive symptoms and physical inactivity.

**Results.** About 48% of the respondents were physically inactive. Elevated depressive symptoms were found in 14% of the respondents. After adjustment for potential confounders, the odds for being physically inactive were almost doubled in depressed patients with type 2 diabetes 1.74 (95% CI 1.32–2.31).

**Conclusions.** Presence of depressive symptoms almost doubles the likelihood of physical inactivity in patients with type 2 diabetes. Longitudinal studies are needed to investigate whether physical inactivity forms the link between depression and poor disease outcomes.

**Keywords.** Depression, physical activity, type 2 diabetes.

## Background

In a recent meta-analysis, the prevalence of depression was significantly higher in patients with type 2 diabetes compared to those without [18% versus 10%, odds ratio (OR) = 1.6, 95% confidence interval (CI) 1.2–2.0].<sup>1</sup> The relationship between diabetes and depression is complex and probably bidirectional, and mechanisms linking both conditions are still unclear.<sup>2,3</sup> In prospective studies and meta-analyses, depressive symptoms were associated with a range of adverse health outcomes including disability,<sup>4</sup> impaired glycaemic control,<sup>5</sup> impaired quality of life,<sup>6</sup> morbidity<sup>7</sup> and mortality<sup>8</sup> in patients with diabetes.

These poor health outcomes may be mediated through physical inactivity. Research concerning the association between depression and physical inactivity in patients with type 2 diabetes patients is scarce.<sup>9,10</sup> Therefore, the aim of this study was to examine the association between depressive symptoms and physical inactivity in primary care patients with type 2 diabetes.

## Methods

### Subjects

The current study was performed using baseline data from an ongoing diabetes management project in

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general practice called 'DIAZOB' (Diabetes Care Zuidoost Brabant). In this project, the participants are, apart from their regular three monthly diabetes control, annually assessed for biological, demographic, psychosocial and lifestyle factors. All 3300 patients with type 2 diabetes from 100 GPs in the Eindhoven region, The Netherlands, were asked by their nurse practitioner to join this project, during their regular diabetes check-up. After exclusion of respondents who gave no informed consent and after excluding records due to missing data, 2646 participants (80%) were included in the final analysis.

#### Assessments

Demographic variables were assessed during a nurse-led interview. Glycated haemoglobin (HbA<sub>1c</sub>) levels and body mass index (BMI) values were determined at the regional primary care diagnostic institute.

**Physical inactivity.** Physical inactivity was assessed during a nurse-led interview. The nurse practitioner asked the patient how many hours per week one spends on 'active' physical activity (like e.g. walking, cycling, stair climbing, gardening, other than sports). Answer categories were as follows: 'never', '1–2 hours', 'between 2 and 4 hours', 'between 4 and 6 hours' and 'over 6 hours' per week. Since national public health recommendations indicate moderate physical activity for at least 30 minutes on preferably all days of the week,<sup>11</sup> respondents who said they were physically active for 4 or less hours/week were labelled 'inactive', the others as active.

**Depressive symptoms.** Depressive symptoms were patient reported and assessed using a validated Dutch version of the Edinburgh Depression Scale.<sup>12–14</sup> This is a 10-item self-rating scale in which each item is scored on a four-point Likert scale. Total scores range from 0 to 30 points, with a score of over 11 points indicating elevated depressive symptoms.

#### Statistical analyses

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 16. Sequential multiple logistic regression analyses (OR, 95% CI) were performed to assess the relative importance of depressive symptoms and potential confounders to physical inactivity by entering the following sets of independent variables: (i) age, female sex, being single, low education; (ii) depressive symptoms; and (iii) BMI.

## Results

The sample was predominantly Caucasian (98%), with a roughly equal sex distribution. The average age was 68 years, the average HbA<sub>1c</sub> level was 6.7% and the average BMI was 29.6. The majority of respondents had a low level of education (62%) and lived with a partner (72%). About half (49%) of the respondents were classified as physically inactive. Elevated depressive symptoms were found in 14% of all respondents.

In Table 1, the results of the sequential multiple regression analyses are shown. In the final model, physical inactivity was predicted by depressive symptoms (OR = 1.74), higher BMI (OR = 1.04), older age (OR = 1.02), female sex (OR = 1.27) and being single (OR = 1.32).

## Conclusions

Some 49% of the respondents were physically inactive. Similar to findings in the general population, physical inactivity was related to older age, being female, being without a partner and having a high BMI. The prevalence of elevated depressive symptoms in the entire sample was 14%, which was 4% point lower than the prevalence reported in the meta-analysis by Ali *et al.*<sup>1</sup> Key finding of the present study is that participants who reported elevated depressive symptoms had

TABLE 1 Sequential multiple logistic regression predicting physical inactivity by demographic features, depression and BMI (n = 2646)

	Model 1: demographics only	Model 2: final model. Depressive symptoms corrected for demographics	Model 3: final model. Depressive symptoms corrected for demographics and BMI
I Demographic features			
Age	<b>1.01 (1.00–1.02)</b>	<b>1.01 (1.00–1.02)</b>	<b>1.02 (1.01–1.03)</b>
Female sex	<b>1.40 (1.15–1.70)</b>	<b>1.36 (1.12–1.65)</b>	<b>1.28 (1.04–1.55)</b>
Low education	1.05 (0.86–1.29)	1.09 (0.89–1.34)	1.11 (0.91–1.37)
Being single	<b>1.38 (1.10–1.71)</b>	<b>1.34 (1.07–1.66)</b>	<b>1.32 (1.06–1.65)</b>
II Depressive symptoms			
EDS score >11		<b>1.73 (1.31–2.29)</b>	<b>1.74 (1.32–2.31)</b>
III BMI			
Higher BMI			<b>1.04 (1.02–1.06)</b>
Goodness of fit [chi-square (d.f.), P-value]	23.55 (8), 0.003	14.66 (8), 0.066	10.63 (8), 0.223

Bold depicts that ORs are significant. EDS, Edinburgh Depression Scale.

a 70% increased likelihood of being physically inactive. This finding corresponds with the results of two previous studies in patients with type 2 diabetes<sup>9,10</sup> or the general population.<sup>15</sup> Various key symptoms of depression such as fatigue, lack of motivation, low self-esteem, having difficulty with problem solving and feelings of helplessness might explain why depressed patients are more often physically inactive.<sup>15</sup>

Strengths of our study are the large number of diabetes patients included and the fact that the study sample was conducted in a representative sample of primary care diabetes patients.

Some limitations need to be mentioned. Due to its cross-sectional design, no causal relationships can be determined between physical inactivity and depressive symptoms. Another limitation involved the self-reporting of physical activity. The single item by which physical activity was assessed was phrased in general terms and did not include information about intensity, which may have caused bias towards overestimation. However, this may be compensated by the relatively strict cut-off point used for physical activity.

The findings of the current study show that depression is common in patients with type 2 diabetes and that depression is associated with physical inactivity. Other studies have shown that physical activity is associated with improved glycaemic control and decreased cardiovascular risk and hence reduced morbidity and mortality in diabetes.<sup>16</sup> It is therefore conceivable that patients with type 2 diabetes and co-morbid depressive symptoms will benefit from tailored interventions addressing their activity level, even more since it was found in other studies that physical activity interventions had long-term antidepressive effects.<sup>17,18</sup> Longitudinal studies are now needed to test whether decreased physical activity is one of the factors that link depression with subsequent poor health outcomes in type 2 diabetes. Randomized studies are needed to test whether interventions that increased the level of physical activity have antidepressive effects in patients with diabetes who suffer from co-morbid depression.

## Declaration

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Conflicts of interest: None.

## References

- 1 Ali S, Stone MA, Peters JL, Davies MJ, Khunti K. The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. *Diabet Med* 2006; **23**: 1165–1173.
- 2 Golden SH, Lazo M, Carnethon M *et al*. Examining a bidirectional association between depressive symptoms and diabetes. *J Am Med Assoc* 2008; **299**: 2751–2759.
- 3 Knol MJ, Heerdink ER, Egberts AC *et al*. Depressive symptoms in subjects with diagnosed and undiagnosed type 2 diabetes. *Psychosom Med* 2007; **69**: 300–305.
- 4 Von Korff M, Katon W, Lin EH *et al*. Potentially modifiable factors associated with disability among people with diabetes. *Psychosom Med* 2005; **67**: 233–240.
- 5 Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM, Clouse RE. Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care* 2000; **23**: 934–942.
- 6 Schram M, Baan CA, Pouwer F. Depression and quality of life in patients with diabetes: a systematic review from the European Depression in Diabetes (EDID) Research Consortium. *Curr Diabetes Rev* 2009; in press.
- 7 Black SA, Markides KS, Ray LA. Depression predicts increased incidence of adverse health outcomes in older Mexican Americans with type 2 diabetes. *Diabetes Care* 2003; **26**: 2822–2828.
- 8 Katon WJ, Rutter C, Simon G *et al*. The association of comorbid depression with mortality in patients with type 2 diabetes. *Diabetes Care* 2005; **28**: 2668–2672.
- 9 Lin EH, Katon W, Von Korff M *et al*. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care* 2004; **27**: 2154–2160.
- 10 Morrato EH, Hill JO, Wyatt HR, Ghushchyan V, Sullivan PW. Physical activity in U.S. adults with diabetes and at risk for developing diabetes, 2003. *Diabetes Care* 2007; **30**: 203–209.
- 11 Kemper HCG, Ooijendijk WTM, Stiggelbout M. Consensus over de Nederlandse norm voor gezond bewegen. *T Soc Geneesk* 2000; **78**: 180–183.
- 12 Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987; **150**: 782–786.
- 13 Cox JL, Chapman G, Murray D, Jones P. Validation of the Edinburgh Postnatal Depression Scale (EPDS) in non-postnatal women. *J Affect Disord* 1996; **39**: 185–189.
- 14 Pop VJ, Komproe IH, van Son MJ. Characteristics of the Edinburgh Post Natal Depression Scale in The Netherlands. *J Affect Disord* 1992; **26**: 105–110.
- 15 Seime RJ, Vickers KS. The challenges of treating depression with exercise: from evidence to practice. *Clin Psychol Sci Pract* 2006; **13**: 194–197.
- 16 Albright A, Franz M, Hornsby G *et al*. American College of Sports Medicine position stand. Exercise and type 2 diabetes. *Med Sci Sports Exerc* 2000; **32**: 1345–1360.
- 17 McAuley E, Blissmer B, Marquez DX, Jerome GJ, Kramer AF, Katula J. Social relations, physical activity, and well-being in older adults. *Prev Med* 2000; **31**: 608–617.
- 18 Motl RW, Konopack JF, McAuley E, Elavsky S, Jerome GJ, Marquez DX. Depressive symptoms among older adults: long-term reduction after a physical activity intervention. *J Behav Med* 2005; **28**: 385–394.