



## Research report

# The impact of lifestyle factors on the 2-year course of depressive and/or anxiety disorders



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## ABSTRACT

**Background:** Although depressed and anxious patients often show an unhealthy lifestyle, much is still unclear about its impact on the natural course of disorders. This study will examine whether physical activity, smoking and alcohol consumption predicted the 2-year course of depressive and/or anxiety disorders.

**Methods:** In a large sample of depressed and/or anxious patients ( $n=1275$ ), we examined whether baseline physical activity, smoking and alcohol consumption independently predicted the course of disorders at 2-year follow-up. The persistence of DSM-IV depressive and/or anxiety disorders (primary outcome) and the severity of depressive and anxiety symptoms (secondary outcomes) were considered. Confounding effects of baseline severity of psychopathology, sociodemographics, somatic health indicators and treatment factors were taken into account.

**Results:** The persistence of disorders was significantly increased in patients with low physical activity (61.2%), but not moderate physical activity (54.4%), compared to patients with high physical activity (49.2%). This association remained significant after adjustment for baseline severity of psychopathology, other lifestyle factors (smoking and alcohol consumption), sociodemographics, somatic health indicators and treatment factors. Similar results were found for the course of depressive and anxiety symptoms. Neither smoking nor alcohol consumption was related to the course of depressive and/or anxiety disorders.

**Limitations:** Assessments of lifestyle factors were based on self-report and may be subject to recall and social desirability bias.

**Conclusions:** Low physical activity, but not heavy smoking or alcohol consumption, was a strong and independent risk factor of an unfavorable course of depressive and/or anxiety disorders and may be an important therapeutic target in treatment.

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## 1. Introduction

Depressive and anxiety disorders constitute an important public health burden worldwide (World Health Organization, 2001, 2003) due to their substantial impact on physical, social and occupational functioning (Judd et al., 2000; Wittchen et al., 2011) as well as their persistent course (Piccinelli and Wilkinson, 1994; Pollack and Otto, 1997; Judd et al., 1998; Keller, 2006; Rhebergen et al., 2009; Penninx et al., 2011). To optimize treatment of these disorders, it is essential to

improve our understanding of processes that are involved in their natural course. An essential step would be to identify risk factors that predict unfavorable outcomes for depressive and anxiety disorders.

Previous studies have shown that depressed or anxious patients often show an unhealthy lifestyle such as low physical activity (Martinsen et al., 1989; Patten et al., 2009; Roshanaei-Moghaddam et al., 2009), heavy smoking (Lasser et al., 2000) and heavy alcohol consumption (Hartka et al., 1991; Dixit and Crum, 2000). Although several studies focussed on the prospective association between lifestyle factors and the onset of disorders (Brown et al., 2005; Haynes et al., 2005; Kang and Lee, 2010; Boden et al., 2010), only very few studies have prospectively examined their impact on the course of disorders in patients with a DSM-IV diagnosis of a depressive and/or anxiety disorder (Beard et al., 2007; Haynes et al., 2008; Ten Have et al., 2011). In addition,

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these studies did not take into account the interrelatedness of lifestyle factors or the confounding effects of other factors such as sociodemographics, somatic health indicators and treatment factors.

Our study will include a large sample of patients with depressive and/or anxiety disorders ( $n=1275$ ). In this sample, we will not only examine the direct effects of several major lifestyle factors (i.e., physical activity, smoking and alcohol consumption) on the 2-year course of disorders, but we will also test whether these factors are independent risk factors. In addition, this study is sufficiently powered to examine confounding effects of sociodemographics, somatic health indicators and treatment factors.

## 2. Methods

### 2.1. Study sample

Data were derived from the Netherlands Study of Depression and Anxiety (NESDA), an ongoing cohort study aimed at examining the long-term course and consequences of depressive and anxiety disorders in the adult (18–65 years) population. A total of 2981 persons were included at the baseline assessment in 2004–2007, consisting of healthy controls (23%), persons with a prior history (22%), and persons with a current (55%) depressive and/or anxiety disorder. To represent various settings and stages of psychopathology, participants were recruited from community (19%), primary care (54%) and outpatient mental health care services (27%). Community-based participants had previously been identified in a population-based study; primary care participants were identified through a three-stage screening procedure (involving the Kessler-10 (Kessler et al., 2002) and the short-form Composite International Diagnostic Interview (CIDI) psychiatric interview by phone) conducted among a random sample of patients of 65 General Practitioners; and mental healthcare participants were recruited consecutively when newly enrolled at one of the 17 participating mental health organization locations. Persons with insufficient command of the Dutch language or a primary clinical diagnosis of bipolar disorder, obsessive compulsive disorder, severe substance use disorder, psychotic disorder or organic psychiatric disorder, as reported by them or their mental health practitioner, were excluded. The research protocol was approved by the Ethical Committees of participating universities and all participants provided written informed consent. A detailed description of the NESDA study design, sampling procedures and response rates can be found elsewhere (Penninx et al., 2008; Van der Veen et al., 2009).

Assessments, including a structured diagnostic interview and paper-and-pencil questionnaires, were conducted at baseline ( $n=2981$ ) as well as 2-year follow-up (response:  $n=2596$ , 87.1%; see Lamers et al., 2012 for sociodemographic and psychiatric predictors of non-response). To examine the course of depressive and/or anxiety disorders, we selected all patients with a major depressive disorder, dysthymia, social phobia, panic disorder and/or generalized anxiety disorder that was present within the six months prior to the baseline assessment ( $n=1641$ ). Diagnoses of psychiatric disorders were established with the Composite International Diagnostic Interview (CIDI, version 2.1; Wittchen et al., 1991), administered by specially trained research staff. The CIDI establishes diagnoses according to criteria of the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) and has shown high interrater and test–retest reliability as well as high validity for depressive and anxiety disorders (Wittchen et al., 1991). Of those 1641 patients with a depressive and/or anxiety disorder, 1275 patients (77.7%) had complete data on lifestyle factors at baseline (excluded:  $n=128$ ) as well as complete outcome data at 2-year

follow-up (additionally excluded:  $n=238$ ) and formed the sample for the present analyses. Non-responders were more often women (71.3% versus 65.7%;  $p=0.05$ ) and less educated (11.0 versus 12.0 years;  $p<0.001$ ) than responders, whereas age ( $p=0.48$ ) was not associated with non-response.

### 2.2. Measures

#### 2.2.1. Outcomes

To examine the 2-year course of depressive and/or anxiety disorders, we considered the persistence of disorders (primary outcome) as well as the severity of symptoms (secondary outcomes) at 2-year follow-up.

*2.2.1.1. Persistence of disorders at 2-year follow-up (primary outcome).* In our sample of patients with a depressive and/or anxiety disorder in the six months prior to the baseline assessment, the disorders were considered persistent when a participant still had a depressive or anxiety disorder in the six months before the 2-year follow-up assessment. The presence of depressive and anxiety disorders was established with the CIDI.

*2.2.1.2. Severity of symptoms at 2-year follow-up (secondary outcomes).* In addition, we separately focussed on the severity of depressive symptoms and the severity of anxiety symptoms at 2-year follow-up (secondary outcomes). The severity of depressive symptoms was assessed by the 30-item self-report Inventory of Depressive Symptoms (IDS; Rush et al., 1996), whereas the severity of anxiety symptoms was assessed by the 21-item self-report Beck Anxiety Inventory (BAI; Beck et al., 1988). Both questionnaires assessed the severity of symptoms in the week prior to the 2-year follow-up assessment. Data from both measures were checked on the presence of outliers and visual inspection of the normal probability plots showed that residuals were normally distributed. As analyses on the severity of symptoms at follow-up were adjusted for the severity of symptoms at baseline (see section on additional baseline characteristics), we also tested whether residuals of the two measures were independent. The residuals of both the severity of depressive symptoms and the severity of anxiety symptoms showed no serial correlation (i.e., independence) as indicated by the Durbin–Watson statistics of around two (i.e., 1.93 for depressive symptoms and 2.01 for anxiety symptoms).

#### 2.2.2. Lifestyle factors

Physical activity, smoking and alcohol consumption were considered as baseline lifestyle factors that may predict the 2-year course of depressive and/or anxiety disorders.

*2.2.2.1. Physical activity.* Physical activity in the past week was assessed with the International Physical Activity Questionnaire (IPAQ; Booth, 2000; Craig et al., 2003), a seven-item self-report questionnaire that is valid and reliable in measuring physical activity in adult populations (Kurtze et al., 2008; Van Poppel et al., 2010). Based on the time spent on walking as well as moderate and vigorous intensity physical activity, patients with high (reference), moderate and low physical activity can be distinguished (see the official website of the IPAQ: [www.ipaq.ki.se](http://www.ipaq.ki.se)). High physical activity was defined as three or more days of vigorous intensity activities accumulating at least 1500 MET-min/week; or five or more days of any combination of walking, moderate or vigorous intensity activities achieving a minimum of at least 3000 MET-min/week. Moderate physical activity indicated three or more days of vigorous intensity activity of at least 20 minutes; or five or more days of moderate intensity activity or walking of at least 30 min/day;

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