



Depressive and anxiety disorders: Associated with losing or gaining weight over 2 years?

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ABSTRACT

This longitudinal study examines to what extent different depressive and anxiety disorders and clinical characteristics are associated with subsequent weight change, while controlling for baseline weight, sociodemographics, health status, psychotropic medication use and (un)healthy lifestyle factors. Data are from a sample of 2447 respondents aged 18–65 years of the Netherlands Study of Depression and Anxiety (NESDA). Baseline depressive disorders and anxiety disorders were determined with the Composite International Diagnostic Interview (CIDI). Weight at baseline and after 2 years was measured and analyzed as continuous change score (mean change in weight 1 kg) and in categories of significant weight loss (< 1 S.D. weight change equaling < 4 kg), weight maintenance and weight gain (> 1 S.D., > 6 kg). After full adjustment for covariates baseline comorbid anxiety and depressive disorder and baseline Major Depressive Disorder (MDD) were associated with significant 2-year weight gain. Both current and remitted MDD at baseline and a baseline dysthymia, but none of the anxiety disorders, were associated with significant weight loss. This longitudinal study confirms a U-curved link between depression and weight change over 2 years. Furthermore, a dose–response effect of depression severity on 2-year weight gain was found.

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1. Introduction

Recent evidence has linked mental disorders and obesity – two highly prevalent conditions – together. For instance, there is convincing evidence that depression is associated with obesity and vice versa (Atlantis and Baker, 2008; de Wit et al., 2010a, 2010b; Luppino et al., 2010), although associations with underweight have also been found (Seidell et al., 1999; Flegal et al., 2007). In line with this, de Wit et al. (2009) and Zhao et al. (2009) found a U-curved association between depression and Body Mass Index (BMI). Although it has been less studied, there is also evidence for an association between anxiety and obesity (Garipey et al., 2010). Both weight gain and loss are associated with elevated health risks (Must et al., 1999; Newman et al., 2001; Field et al., 2001; Adams et al., 2006). Although weight change can also be beneficial for physical health outcomes for instance when overweight or obese adults lose weight (Resnick et al., 2000; Moore et al., 2005), the evidence for improvement on psychological wellbeing is less convincing (Koster et al., 2010;

Jackson et al., 2014). Prospective studies in the adult population have found that baseline depression and anxiety symptoms predicted weight gain at follow-up (Forman-Hoffman et al., 2007; Brumpton et al., 2013) and some recent studies found evidence for a bi-directional association between depression and weight gain (Koster et al., 2010; Singh et al., 2014). Patients with depressive and anxiety disorders however, constitute a very heterogeneous population, it is important to identify specific clinical factors (e.g. severity, subtype, age of onset, chronicity) that are associated with weight change in order to identify those who are most at risk. Recent studies found evidence that especially persons with atypical features have an elevated risk of weight gain (Leviton et al., 2012; Lasserre et al., 2014), which underlines the importance of investigating clinical characteristics. To further unravel the interplay between mental disorders and such a U-curved association with weight change, further longitudinal studies are necessary.

There is evidence that unhealthy lifestyles such as smoking, alcohol consumption and being both socially and physically inactive in adults is associated with having a depressive or anxiety disorder as well as with abnormal Body Mass Index (BMI) (van Gool et al., 2003; Berlin, 2008; Strine et al., 2008; de Wit et al., 2010a, 2010b). Hence, people with mental disorders might change

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weight as a result of adopting an unhealthy lifestyle. Therefore lifestyle behaviors are considered to be potential mediators in the association between depression and anxiety disorders and obesity (Friedman and Brownell, 1995). Nevertheless there are few studies that consider the influence of such lifestyle factors when studying the association between weight change and mental disorders. Some recent cross-sectional and longitudinal studies suggest that depressive and anxiety symptoms are associated with weight independently from lifestyle factors (physical activity, smoking and alcohol consumption) suggesting that there is no or a limited influence of lifestyle factors (Zhao et al., 2009). Furthermore the use of psychotropic medications, often prescribed for depressive and anxiety disorders, might be an additional explanatory risk factor for weight change (Virk et al., 2004; Demyttenaere and Jaspers, 2008; Vieweg et al., 2008; Hasnain and Vieweg, 2013). Underlying shared biological abnormalities such as inflammation, leptin or HPA-axis dysregulations could further play a linking role between mental health and weight change (Bjorntorp, 2001; Bornstein et al., 2006; Pasco et al., 2008; Vreeburg et al., 2009; Milaneschi et al., 2012).

There are previous studies that have investigated the association between weight change and mental disorders in the adult population, however most studies included adolescents (Haukka et al., 2001; Blaine, 2008; Liem et al., 2008; Luppino et al., 2010). Few of the large-scale studies examining mental health and weight associations have used well-defined DSM-IV depressive and anxiety diagnoses. Neither has the combined effect of depressive and anxiety disorders or the influence of specific characteristics of depressive and anxiety disorders (severity, subtype, chronicity, age of onset) been examined in longitudinal associations with weight change.

Based on previous research we expect to find an association between depressive and anxiety disorders and weight gain (Atlantis and Baker, 2008; de Wit et al., 2010a, 2010b; Luppino et al., 2010; Gariepy et al., 2010; Koster et al., 2010; Brumpton et al., 2013; Singh et al., 2014) and an association between depressive disorders and weight loss (de Wit et al., 2009; Zhao et al., 2009) over a 2-year period. When studying the association, the extent to which specific clinical characteristics (severity, subtype, chronicity, age of onset, and the use of psychotropic medication) determine the association with subsequent weight loss and gain will be examined and the role of sociodemographics as well as (un)healthy lifestyle factors will be taken into account.

2. Methods

2.1. Study sample

Baseline and 2-year follow up data for this study were retrieved from the Netherlands Study of Depression and Anxiety (NESDA), a longitudinal cohort study designed to examine the long-term course of depressive and anxiety disorders. The total sample at baseline consists of 2981 respondents aged 18–65 years, of whom 1979 (66.4%) were females and 97% had the Dutch nationality. At baseline, a total of 1701 (57.1%) subjects had a current (6-month recency) anxiety or depressive disorder, 627 (21.0%) subjects had a remitted (lifetime but not current) anxiety or depressive disorder and there were 652 (21.9%) controls without a lifetime depressive or anxiety disorder. Respondents were recruited from the general population, in general practices and in mental health organizations. Exclusion criteria of the study were 1) a primary clinical diagnosis of a psychiatric disorder not subject of NESDA, e.g. psychotic disorder, obsessive compulsive disorder, or severe addiction disorder and 2) not being fluent in Dutch language. A detailed description of the baseline and 2-year follow up data collection procedures and study design of NESDA has been reported elsewhere (Penninx et al., 2008; Lamers et al., 2012).

The NESDA study protocol was approved centrally by the Ethical Review Committee of the VU University Medical Center and by the local review boards of each participating center. All respondents gave written informed consent. Both baseline and 2-year follow up assessment included a 4-h interview and self-reported data on mental health diagnoses, weight and height measures, lifestyle factors and sociodemographics at a

clinical site. For our longitudinal analyses we could not include a total of 534 persons of the original sample because they either dropped out at the 2-year follow up measure (non-response = 12.9%; $N = 385$), or had missing values on our main outcome variables ($N = 149$). These non-responders were younger, less educated, from non-European origin and more often suffering from depression, especially comorbid depressive and anxiety disorder and higher symptom severity (Lamers et al., 2012).

2.2. Depressive and anxiety disorders and clinical characteristics

At baseline the DSM-IV Composite International Diagnostic interview (CIDI, WHO version 2.1) was used to measure depressive and anxiety disorders: Major Depressive Disorder (MDD), Dysthymia, Generalized Anxiety Disorder (GAD), Social phobia, Panic disorder and Agoraphobia. The CIDI has proven to be a reliable and valid instrument to assess depressive and anxiety disorders (Wittchen, 1994). All respondents were assessed by specially trained clinical research staff at a clinical site (Penninx et al., 2008; Lamers et al., 2012).

We used a 5-category indicator to classify depressive and anxiety disorder status: healthy controls, remitted depressive or anxiety disorder (lifetime but not present in past six months), depressive disorder only (in past six months), anxiety disorder only (in past six months) and comorbid depressive and anxiety disorder (in past six months). In order to examine the role of specific disorders we used a 3-category indicator for each type of assessed disorder: healthy controls, remitted disorder (in lifetime but not present in past six months) and current disorder (in past six months).

Additionally considered clinical characteristics were severity, subtype, age of onset and duration. Severity of depressive symptoms was measured using the 28-item Inventory of Depressive Symptomatology (IDS) to obtain a score between 0 and 84. We used continuous as well as categorized severity scores of the IDS: none (0–13), mild (14–25), moderate (26–38), severe (39–48) very severe (49–84) (Rush et al., 1996, 2003). Severity of anxiety was measured with the 21-item Beck Anxiety Inventory (BAI) (Beck et al., 1988). The presence of symptoms of atypical depression and melancholic depression were assessed with the IDS as done before (van Reedt Dortland et al., 2010). Atypical depression is characterized by mood reactivity and at least 2 symptoms of vegetative reversal (including overeating, oversleeping, severe fatigue or leaden paralysis, and a history of rejection sensitivity) (Stewart and Thase, 2007). Melancholic depression is characterized by lack of mood reactivity or loss of pleasure and at least 3 symptoms of distinct mood quality (including mood worse in the morning, early morning awakening, psychomotor retardation or agitation, anorexia/weight loss and guilt feelings) (Kahn et al., 2008). Age of onset of the disorder was assessed with the CIDI interview. The Life Chart interview (Lyketsos et al., 1994) was used to determine chronicity of the disorders in terms of the percentage of time in the 4 years prior to baseline that respondents had depressive and/or anxiety symptoms. Psychotropic medication use was based on drug container inspection of drugs used in the past month, and classified according to the WHO ATC classification.

Antidepressants were categorized as selective serotonin reuptake inhibitors (SSRIs) (ATC code N06AB), tricyclic antidepressants (TCAs) (ATC code N06AA), and other antidepressants (ATC codes N06AF and N06AX), anti-anxiety medication was categorized as Benzodiazepine use (no use/ infrequent use/ frequent use) (ACT code N05BA).

2.3. Weight assessment

At baseline and 2-year follow up, weight and height were measured by trained clinical research staff at a clinical site (Penninx et al., 2008; Lamers et al., 2012). Because psychopathology is associated with both high and low BMI the possibility exists of a U-shaped association between psychopathology and weight change (de Wit et al., 2009). Therefore we used a three category indicator for weight change (weight loss, weight maintenance and weight gain). Respondents were categorized by either clinically significant weight gain or weight loss when they changed at least 1 standard deviation ($S.D. = 5$ kg) weight between baseline and follow up measure, calculated from the mean weight change (Mean = 1 kg weight gain) of the total sample (Newman et al., 2001; Stevens et al., 2006). We conducted additional analyses using a continuous indicator of weight change by calculating 2-year follow up weight minus baseline weight in order to obtain further confirmation of specific findings. A positive score indicates total kilograms weight gain and a negative score indicates total kilograms weight loss of a person.

2.4. Covariates

Baseline covariates included gender, age (continuous), years of education (continuous) and baseline height and weight. Baseline health status was measured by number of chronic diseases for which one receives medical treatment including lung disease, osteoarthritis, cancer, gastrointestinal disease, liver disease, epilepsy, thyroid disease. Lifestyle indicators included smoking status (never, current, former), alcohol intake (amount of alcoholic drinks a day), physical activity (continuous) and social activity (continuous). Physical activity was measured with the International Physical Activity Questionnaire (IPAQ), which has proven to be a valid and reliable instrument to measure physical activity (Craig et al., 2003;

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