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Differential associations of specific depressive and anxiety disorders with somatic symptoms

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ABSTRACT

Objective: Previous studies have shown that depressive and anxiety disorders are strongly related to somatic symptoms, but much is unclear about the specificity of this association. This study examines the associations of specific depressive and anxiety disorders with somatic symptoms, and whether these associations are independent of comorbid depressive and anxiety disorders.

Methods: Cross-sectional data were derived from The Netherlands Study of Depression and Anxiety (NESDA). A total of 2008 persons (mean age: 41.6 years, 64.9% women) were included, consisting of 1367 patients with a past-month DSM-diagnosis (established with the Composite International Diagnostic Interview [CIDI]) of depressive disorder (major depressive disorder, dysthymic disorder) and/or anxiety disorder (generalized anxiety disorder, social phobia, panic disorder, agoraphobia), and 641 controls. Somatic symptoms were assessed with the somatization scale of the Four-Dimensional Symptom Questionnaire (4DSQ), and included cardiopulmonary, musculoskeletal, gastrointestinal, and general symptoms. Analyses were adjusted for covariates such as chronic somatic diseases, sociodemographics, and lifestyle factors.

Results: All clusters of somatic symptoms were more prevalent in patients with depressive and/or anxiety disorders than in controls (all $p < .001$). Multivariable logistic regression analyses showed that all types of depressive and anxiety disorders were independently related to somatic symptoms, except for dysthymic disorder. Major depressive disorder showed the strongest associations. Associations remained similar after adjustment for covariates.

Conclusion: This study demonstrated that depressive and anxiety disorders show strong and partly differential associations with somatic symptoms. Future research should investigate whether an adequate consideration and treatment of somatic symptoms in depressed and/or anxious patients improve treatment outcomes.

Introduction

Depressive and anxiety disorders are among the most common mental disorders in the general population [1,2], with 12-month prevalence rates ranging from 1.8% for panic disorder to 6.9% for major depressive disorder [3]. The burden of disease is high, as the disorders affect social, personal, and occupational functioning [4–6], and constitute a considerable economic burden on society [6,7].

Extensive evidence suggests that depressive and anxiety disorders are strongly related to somatic symptoms [8–12]. Two pediatric studies, for example, showed that nearly all somatic symptoms were more prevalent in patients with a depressive and/or anxiety disorder than in controls [9,11]. In addition, somatic symptoms have been shown to be associated with at least a twofold increased risk of having a depressive and/or anxiety disorder [8,12,13]. The co-occurrence of depressive and anxiety disorders with somatic symptoms is associated with more functional disability, higher medical care utilization, and higher costs than the pathologies apart [14,15]. Both for clinical and scientific reasons, it is important to improve our understanding of this association.

Three mechanisms have been hypothesized to explain the association of depressive and anxiety disorders with somatic symptoms. First, in the antecedent hypothesis, depressive and anxiety disorders cause the onset of somatic symptoms [16–19] via, for example, an increased awareness and an altered perception of physical sensations [20,21]. Second, according to the consequence hypothesis, somatic symptoms predict the onset of depressive and anxiety disorders [18,22–25], as, for example, the bodily inconvenience and physical limitations of somatic symptoms might cause symptoms of depression and anxiety [26,27]. Third, in the common etiology hypothesis, shared etiological factors (e.g., environmental, psychological, and biological factors) independently cause the onset of depressive and anxiety disorders as well as somatic symptoms [18,27,28].

Although the co-occurrence of depressive and anxiety disorders with somatic symptoms has often been reported, little is known about the specificity of this association. For example, it is unclear whether

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the association is conditional on the type of depressive or anxiety disorder. In addition, previous studies have speculated that depressive disorders may be more strongly associated with pain symptoms such as musculoskeletal symptoms [29,30], whereas anxiety disorders might show stronger associations with cardiopulmonary symptoms [12,31]. Developing a better understanding of the specificity of the association may provide important insights into its etiology, and could be of help in developing therapies for patients with depressive and/or anxiety disorders as well as somatic symptoms.

Previous studies examining the specificity of associations have an important limitation, as they have often not considered the comorbidity of different depressive and anxiety disorders [13,32]. This is problematic, since depressive and anxiety disorders often co-occur [33,34], and, as a consequence of the confounding effects of comorbid disorders, previous studies could incorrectly have reported similar associations across specific depressive and anxiety disorders. In addition, it would be important to take into account the effects of covariates [13,29,35]. As depressive and anxiety disorders are associated with somatic diseases [36], and somatic symptoms are often consequences of somatic diseases [13], it is essential to get insight into the effects of these diseases by adjusting for their presence. Similarly, it would be important to take into account the effects of sociodemographics and lifestyle factors, as these factors have shown associations with the presence of depressive and anxiety disorders [37] and somatic symptoms [13,38,39].

The present study focuses on the associations of specific depressive and anxiety disorders with somatic symptoms by using a large dataset of patients with DSM-IV depressive and/or anxiety disorders (N = 1367) as well as healthy controls (N = 641). The aims of this study are:

a. To examine the associations of specific depressive disorders (i.e., major depressive disorder and dysthymic disorder) and anxiety disorders (i.e., generalized anxiety disorder, social phobia, panic disorder, and agoraphobia) with different clusters of somatic symptoms;
b. To determine whether these associations are independent of comorbid depressive and anxiety disorders;
c. To determine whether these associations can be explained by the potentially confounding effects of chronic somatic diseases, sociodemographics, and lifestyle factors.

Methods

Study sample

Data were derived from the baseline measurements of The Netherlands Study of Depression and Anxiety (NESDA), an ongoing cohort study aimed at examining the development and long-term prognosis of depressive and anxiety disorders among adults (18–65 years). For the baseline assessment, 2981 persons were included, consisting of healthy controls (N = 625, 22%), persons with a current (past-month) depressive and/or anxiety disorder (N = 1411, 47%), and persons with a prior history of a depressive and/or anxiety disorder (N = 918, 31%). To represent various settings and developmental stages of psychopathology, recruitment took place in the community (19%), primary care (54%), and specialized mental health care (27%). Exclusion criteria were a primary clinical diagnosis of psychotic disorder, obsessive–compulsive disorder, bipolar disorder or severe substance use disorder, and insufficient command of the Dutch language. The baseline assessment consisted of an extended face-to-face interview, including a standardized diagnostic psychiatric interview, as well as paper-and-pencil questionnaires. The research protocol was approved by the Ethical Committee of the three participating universities, and all participants gave written informed consent. A detailed description of the NESDA study design can be found elsewhere [40].

For the present study, we selected both healthy controls without a lifetime depressive or anxiety disorder (N = 652), and patients with a current (past-month) depressive and/or anxiety disorder (N = 1411). Participants with missing data on somatic symptoms (N = 55, 2.7%) were excluded, resulting in a total sample of 2008 persons. Persons with valid data on somatic symptoms were less likely to have an anxiety disorder (p = .04) compared to non-responders, whereas age (p = .75), gender (p = .67), education (p = .60), and depressive disorder (p = .17) were not associated with non-response.

Depressive and anxiety disorders

Lifetime and current diagnoses of depressive and anxiety disorders were established with the Composite International Diagnostic Interview (CIDI) [41], version 2.1. The CIDI is a reliable instrument, which classifies diagnoses according to the DSM-IV criteria [42], and was administered by specially trained research staff. The following types of disorders were distinguished: major depressive disorder, dysthymic disorder, generalized anxiety disorder, social phobia, panic disorder, and agoraphobia.

Somatic symptoms

The presence of somatic symptoms was measured with the somatization scale of the Four-Dimensional Symptom Questionnaire (4DSQ) [43]. This scale assesses the frequency of experiencing 16 somatic symptoms in the past week (scores ranging from 1 = never to 5 = very often or constantly). Based on previous studies [30,44], four clusters of somatic symptoms were distinguished: cardiopulmonary symptoms (i.e., excessive perspiration, pain in chest, palpitations, pressure or tight feeling in chest, shortness of breath), musculoskeletal symptoms (i.e., back pain, neck pain, muscle pain, tingling in fingers), gastrointestinal symptoms (i.e., bloated feeling in abdomen, nausea or upset stomach, pain in abdomen or stomach area), and general symptoms (i.e., dizziness or feeling lightheaded, fainting, headache). The symptom 'blurred vision or spots in front of your eyes' was excluded, since it did not fit the clusters of somatic symptoms [44]. A specific cluster of somatic symptoms was considered present when at least one of its symptoms was experienced regularly or more often (score 3 or higher).

Covariates

Analyses were adjusted for the potential effects of chronic somatic diseases, sociodemographics and lifestyle factors. First of all, the number of self-reported chronic diseases for which persons received treatment was considered. For the assessment, participants were asked whether they had specific diseases (i.e., lung disease, heart disease, diabetes mellitus, CVA, arthritis, osteoarthritis, rheumatic complaints, tumor, hypertension, gastrointestinal ulcer or disorder, liver disease, epilepsy, chronic fatigue syndrome, allergy, thyroid gland disease, injury) or potential additional chronic somatic diseases that were not explicitly asked, and whether they received treatment for the reported diseases. Sociodemographics included age (in years), gender, education (in years), partner status (partner versus no partner), and working status (employed versus unemployed). Lifestyle factors included smoking status (never, former, current; assessed by self-report), alcohol use (defined as the total score on the Alcohol Use Disorders Identification Test [45]), and physical activity (measured with the International Physical Activity Questionnaire in MET-minutes [ratio of energy expenditure during activity compared with rest times the number of minutes performing the activity] a week [46]).

Statistical analyses

Analyses were conducted using SPSS version 20.0 (SPSS Inc, Chicago, Illinois). Characteristics of the study sample were summarized using descriptive statistics. Subsequently, χ^2 analyses were used to compare the prevalence of all clusters of somatic symptoms in patients with any

depressive or anxiety disorder with healthy controls. To explore whether associations with somatic symptoms were conditional on the type of depressive or anxiety disorder, χ^2 analyses were performed for all specific depressive and anxiety disorders separately versus healthy controls (i.e., separate models for major depressive disorder, dysthymic disorder, generalized anxiety disorder, social phobia, panic disorder, and agoraphobia versus healthy controls). Crosstabs were used to describe comorbidity patterns between specific depressive and anxiety disorders. To determine whether specific depressive and anxiety disorders showed independent associations with somatic symptoms, multivariable logistic regression analyses were performed including all types of depressive and anxiety disorders as independent variables in a single model. Differences in odds ratios were considered significant when the odds ratio of one association showed no overlap with the 95% confidence interval of the other association, and vice versa. To get insight in the potential effects of multicollinearity, variance inflation factors (VIFs) were calculated for all depressive and anxiety disorders. Finally, analyses were adjusted for chronic somatic diseases, sociodemographics, and lifestyle factors.

Results

Sample

The characteristics of our sample (N = 2008) are presented in Table 1. Of the whole sample, 641 (32%) persons were healthy controls, and 1367 (68%) persons had a current depressive and/or anxiety disorder. Mean age was 41.6 years (SD = 13.1), and 64.9% were women. The prevalence of somatic symptoms ranged from 35.1% for gastrointestinal symptoms to 55.2% for musculoskeletal symptoms.

Associations of depressive and anxiety disorders with somatic symptoms

Fig. 1 summarizes the prevalence of all clusters of somatic symptoms in healthy controls, and patients with depressive and anxiety disorders. The prevalence of all clusters of somatic symptoms was significantly (all $p < .001$) higher in patients with any depressive and anxiety disorder than in healthy controls (e.g., gastrointestinal symptoms: 45.6% versus 12.6%; musculoskeletal symptoms: 66.0% versus 32.1%). The same pattern of results was found for all types of depressive and anxiety disorders, suggesting that associations were similar across specific disorders.

Table 1
Sample characteristics (N = 2008).

	N (%)/mean (SD)[a]
Sociodemographics	
Age in years	41.6 (13.1)
Female gender	1303 (64.9%)
Education in years	12.0 (3.3)
Having a partner	1368 (68.1%)
Being employed	1146 (57.1%)
Lifestyle factors	
Smoking status	
Never	586 (29.2%)
Former	647 (32.2%)
Current	775 (38.6%)
Alcohol usage (score AUDIT questionnaire)	4.8 (4.8)
Physical activity (in 1,000 MET-minutes/week)	3.6 (3.1)
Chronic somatic diseases	
Number of chronic somatic diseases	0.6 (0.9)
Depressive and/or anxiety disorder	
Any depressive and/or anxiety disorder (general)	
Absent	641 (31.9%)
Present	1367 (68.1%)
Type of depressive or anxiety disorder	
Major depressive disorder	775 (38.6%)
Dysthymic disorder	272 (13.5%)
Generalized anxiety disorder	378 (18.8%)
Social phobia	539 (26.8%)
Panic disorder	495 (24.7%)
Agoraphobia	498 (24.8%)
Cluster of somatic symptoms	
Cardiopulmonary symptoms	842 (41.9%)
Musculoskeletal symptoms	1108 (55.2%)
Gastrointestinal symptoms	705 (35.1%)
General symptoms	751 (37.4%)

[a] Based on descriptive statistics.

Independent associations of depressive and anxiety disorders with somatic symptoms

Table 2 shows the comorbidity rates between specific depressive and anxiety disorders. Comorbidity rates ranged from 18.7% for comorbid dysthymic disorder in agoraphobic patients to 82.0% for comorbid major depressive disorder in dysthymic patients. As comorbidity rates were high, we examined whether specific depressive and anxiety disorders showed independent associations with somatic symptoms by performing multivariable logistic regression analyses including all types of depressive and anxiety disorders as independent variables in a single model (see Table 3). Variance inflation factor (VIF) values for all depressive and anxiety disorders were between 1.10 and 1.62, indicating that the model was unlikely to be affected by high multicollinearity. Major depressive disorder consistently showed strong and significant associations with all clusters of somatic symptoms. In addition, generalized anxiety disorder, social phobia, and panic disorder were also significantly associated with all clusters of somatic symptoms (all $p \leq .01$), while agoraphobia was significantly related to cardiopulmonary, musculoskeletal, and general symptoms but not gastrointestinal symptoms. Dysthymic disorder was not related to any cluster of somatic symptoms. The associations of major depressive disorder were stronger than associations of all other specific depressive and anxiety disorders. In general, associations were similar for all clusters of somatic symptoms. However, generalized anxiety disorder was more strongly related to cardiopulmonary symptoms (OR = 2.12, 95% CI = 1.64–2.74) than to gastrointestinal symptoms (OR = 1.61, 95% CI = 1.25–2.07).

Impact of covariates

Subsequently, we examined whether associations of specific depressive and anxiety disorders with somatic symptoms could be explained by the effects of covariates (see Table 3). Adjustment for chronic somatic diseases did not substantially change results. In addition, associations generally remained similar after additional adjustment for sociodemographics and lifestyle factors. However, odds ratios slightly decreased, and, consequently, the association between agoraphobia and musculoskeletal symptoms lost significance (OR = 1.42, p = .02 decreased to OR = 1.29, p = .09), whereas dysthymic disorder became significantly associated with gastrointestinal symptoms (OR = 1.32, p = .07 increased to OR = 1.39, p = .04).

Discussion

The present study showed that all depressive and anxiety disorders, except for dysthymic disorder, were independently associated with all clusters of somatic symptoms. In general, associations were similar across specific depressive and anxiety disorders, although major depressive disorder showed the strongest associations with all somatic symptom clusters. Adjustment for chronic somatic diseases, sociodemographics, and lifestyle factors did not substantially change results.

This study has both strengths and limitations. To our knowledge, this is the first study to examine independent associations of depressive and anxiety disorders with different clusters of somatic symptoms. The importance of taking into account comorbid depressive and anxiety disorders has been demonstrated clearly in this study, as the comorbidity across disorders was high (i.e.,18.7%–82.0%), and the associations differed significantly between disorders. Another strength is the large sample of 2008 persons, consisting of patients with specific types of depressive and anxiety disorders (N = 1367) and controls (N = 641). In addition, psychiatric diagnoses were established with a well validated psychiatric interview among all participants. When interpreting our results, it is also important to keep some limitations in mind. First, as the recruitment of patients with depressive and anxiety disorders largely took place in primary care and specialized mental health care, patients from our sample may have had more severe psychiatric problems, and, consequently, more co-occurring somatic symptoms than patients from the community. Therefore, our results cannot be generalized to the general population. Another limitation is that we dichotomized data on somatic symptoms, and we only considered self-rated somatic symptoms in the past week. Furthermore, participants were not asked to grade the severity of their somatic symptoms, so even mild symptoms with limited clinical significance may have been reported. However, excluding such mild symptoms from analyses would probably not have

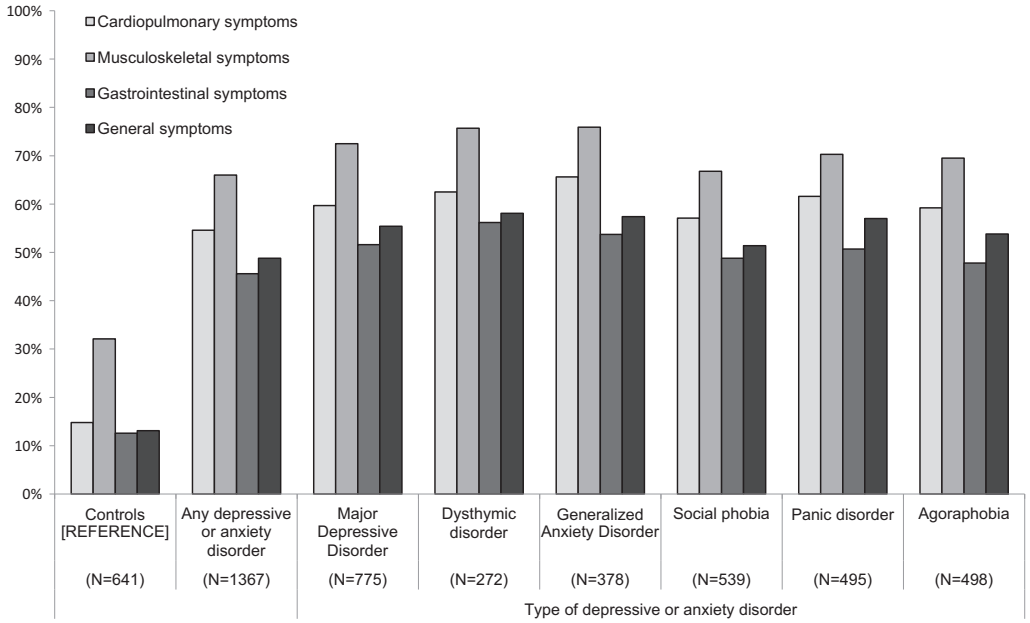

Fig. 1. Prevalence of clusters of somatic symptoms across controls and patients with a depressive and/or anxiety disorder.

changed our conclusion about the strong association of depressive and anxiety disorders with somatic symptoms, since persons with depressive and anxiety disorders have a tendency to report more severe somatic symptoms than persons without these disorders [8]. In addition, the assessment of covariates was based on self-report only, which could have affected data on somatic diseases and lifestyle factors, as these factors may be influenced by recall bias and reporting bias, respectively. Furthermore, as the assessment of somatic diseases included only somatic diseases with a chronic course, the effects of acute somatic diseases (e.g., acute respiratory tract or gastrointestinal infections) were not taken into account. Still, it is highly unlikely that the found associations between depressive and anxiety disorders and somatic symptoms were based on the presence of somatic diseases, as the self-report of somatic diseases has shown to be accurate [47], and the number of somatic symptoms reported in this study was substantially higher than could be explained by somatic diseases alone.

The association between depressive and anxiety disorders with somatic symptoms has been reported by a number of previous studies [13–17,19,29,48,49]. However, these studies have shown mixed results regarding the specificity of associations. For example, Means-Christensen et al. [29] demonstrated that major depressive disorder was associated with more types of pain symptoms than generalized anxiety disorder, panic disorder, and social phobia, whereas other studies mainly reported similar symptom counts across all specific depressive and anxiety disorders [13,32]. As these studies often did not take into account the effects of comorbid depressive and anxiety disorders, one possible explanation for these inconsistencies might be the different comorbidity rates across studies. The independent associations of specific depressive and anxiety disorders with specific types of somatic symptoms have, to the best of our knowledge, so far not been described in the literature. The only exception to this is the study by Beesdo et al. [35], who have examined independent associations of specific depressive and anxiety disorders with pain, and showed, consistent with our study, that nearly all specific depressive and anxiety disorders were independently associated with functional (medically insufficiently explained) pain symptoms. However, contrary to our results, a significant association of dysthymic disorder with functional pain, and a non-significant relation of social phobia and agoraphobia with functional pain were found. These inconsistencies may be explained by different definitions of depressive and anxiety disorders as well as somatic symptoms. As Beesdo et al. [35] assessed depressive and anxiety disorders during the past 12 months, in contrast to the one-month diagnoses in the current study, this could, for example, have resulted in differences in the severity of psychopathology across our studies. Furthermore, Beesdo et al. [35] considered lifetime pain symptoms, which are associated with recall bias, and, consequently, are less reliable and consistent than symptoms in the past week, as suggested by previous research [50,51].

Several explanations for our results should be discussed. First, the association between depressive and anxiety disorders and somatic symptoms could have resulted from symptom overlap; that is, diagnostic criteria for depressive and anxiety disorders include somatic symptoms (e.g., cardiopulmonary symptoms are criteria for panic disorder) [42]. However, as non-overlapping somatic symptoms also showed strong associations with depressive and anxiety disorders, the association between depressive and anxiety disorders and

Table 2
Comorbidity across specific depressive and anxiety disorders.

	Comorbid disorder					
	Major depressive disorder	Dysthymic disorder	Generalized anxiety disorder	Social phobia	Panic disorder	Agoraphobia
Major depressive disorder (N = 775)	–	28.8%	31.2%	32.4%	30.5%	27.6%
Dysthymic disorder (N = 272)	82.0%	–	44.5%	43.8%	36.4%	34.2%
Generalized anxiety disorder (N = 378)	64.0%	32.0%	–	41.8%	36.5%	36.5%
Social phobia (N = 539)	46.6%	22.1%	29.3%	–	41.0%	40.1%
Panic disorder (N = 495)	47.7%	20.0%	27.9%	44.6%	–	70.5%
Agoraphobia (N = 498)	43.0%	18.7%	27.7%	43.4%	70.1%	–

Table 3
Independent associations of specific depressive and anxiety disorders with clusters of somatic symptoms.

Depressive or anxiety disorder	Cardiopulmonary symptoms			Musculoskeletal symptoms			Gastrointestinal symptoms			General symptoms		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Adjusted for all types of depressive and anxiety disorders[a]												
Major depressive disorder	2.74	2.22–3.38	<.001	2.69	2.18–3.32	<.001	2.63	2.13–3.24	<.001	2.93	2.37–3.62	<.001
Dysthymic disorder	1.14	0.84–1.55	.39	1.33	0.96–1.85	.09	1.33	0.99–1.79	.06	1.20	0.89–1.62	.23
Generalized anxiety disorder	2.12	1.64–2.74	<.001	1.99	1.51–2.61	<.001	1.61	1.25–2.07	<.001	1.68	1.31–2.17	<.001
Social phobia	1.67	1.33–2.08	<.001	1.42	1.13–1.77	.003	1.65	1.32–2.06	<.001	1.58	1.26–1.97	<.001
Panic disorder	1.80	1.37–2.38	<.001	1.45	1.09–1.93	.01	1.64	1.24–2.16	<.001	1.91	1.45–2.52	<.001
Agoraphobia	1.56	1.18–2.06	.002	1.57	1.19–2.08	.002	1.28	0.97–1.68	.09	1.47	1.12–1.94	.006
Additionally adjusted for chronic somatic diseases[b]												
Major depressive disorder	2.65	2.15–3.28	<.001	2.60	2.09–3.22	<.001	2.54	2.06–3.14	<.001	2.86	2.32–3.54	<.001
Dysthymic disorder	1.12	0.83–1.53	.46	1.32	0.95–1.84	.10	1.32	0.98–1.77	.07	1.19	0.88–1.60	.26
Generalized anxiety disorder	2.08	1.60–2.70	<.001	1.93	1.46–2.55	<.001	1.58	1.22–2.03	<.001	1.66	1.29–2.14	<.001
Social phobia	1.70	1.36–2.13	<.001	1.44	1.14–1.81	.002	1.68	1.34–2.10	<.001	1.59	1.27–1.99	<.001
Panic disorder	1.88	1.42–2.49	<.001	1.53	1.15–2.05	.004	1.69	1.28–2.24	<.001	1.95	1.48–2.58	<.001
Agoraphobia	1.44	1.09–1.91	.01	1.42	1.06–1.89	.02	1.19	0.90–1.57	.24	1.41	1.07–1.87	.02
Additionally adjusted for sociodemographics and lifestyle factors[c]												
Major depressive disorder	2.53	2.04–3.14	<.001	2.42	1.94–3.02	<.001	2.34	1.88–2.91	<.001	2.66	2.14–3.30	<.001
Dysthymic disorder	1.09	0.80–1.49	.60	1.30	0.93–1.83	.13	1.39	1.02–1.88	.04	1.25	0.92–1.70	.16
Generalized anxiety disorder	2.05	1.58–2.67	<.001	1.90	1.43–2.52	<.001	1.58	1.22–2.04	.001	1.65	1.28–2.14	<.001
Social phobia	1.66	1.32–2.08	<.001	1.41	1.12–1.78	.004	1.62	1.29–2.04	<.001	1.56	1.24–1.96	<.001
Panic disorder	1.83	1.38–2.42	<.001	1.44	1.07–1.93	.02	1.56	1.17–2.08	.002	1.82	1.37–2.41	<.001
Agoraphobia	1.38	1.04–1.83	.03	1.29	0.96–1.73	.09	1.13	0.85–1.51	.39	1.34	1.01–1.79	.04

[a] Based on multivariable logistic regression analyses including all types of depressive and anxiety disorders.
[b] Based on multivariable logistic regression analyses including all types of depressive and anxiety disorders and chronic somatic diseases.
[c] Based on multivariable logistic regression analyses including all types of depressive and anxiety disorders, chronic somatic diseases, age, gender, education, partner status, working status, smoking status, alcohol usage, and physical activity.

somatic symptoms is unlikely to be explained solely by overlapping symptoms.

In addition, this study found that depressive and anxiety disorders generally showed similar associations with somatic symptoms, although some differences were observed. Major depressive disorder showed the strongest associations, while all anxiety disorders showed moderate associations, and dysthymic disorder was not related to somatic symptoms. These differences in associations might be explained by variance in the severity of psychopathology [11]. For example, in the antecedent hypothesis, more severe depressive and anxiety disorders may cause more somatic symptoms, whereas in the consequence hypothesis, more somatic symptoms might cause more severe depression and/or anxiety. In the current study, the severity of psychopathology may have differed across specific depressive and anxiety disorders, as, for example, a diagnosis of major depressive disorder requires more and more frequent symptoms than a diagnosis of dysthymic disorder [42]. Although the severity of psychopathology of specific depressive and anxiety disorders is difficult to compare, a previous study showed that current major depressive disorder was associated with higher functional impairment than current generalized anxiety disorder, social phobia, panic disorder, and agoraphobia [52], indicating that psychopathology of major depressive disorder might be more severe than psychopathology of all anxiety disorders. However, as the mentioned study did not examine dysthymic disorder, we are not able to draw conclusions about this explanation.

A second hypothesis concerning the specificity of associations, is whether depressive disorders show differential associations with specific clusters of somatic symptoms than anxiety disorders. Our results showed that associations with depressive and anxiety disorders were similar across specific clusters of somatic symptoms, suggesting that depressive and anxiety disorders are not differentially associated with specific types of somatic symptoms. However, it is important to note that we were not able to take into account the co-occurrence of somatic symptom clusters. In our sample, the percentage of persons reporting only one cluster of somatic symptoms ranged from 7.6% for those reporting general symptoms to 19.5% for those reporting musculoskeletal symptoms. Future studies should include more persons with only one somatic symptom cluster, which would enable them to explicitly consider associations independent of co-occurring somatic symptoms.

Another issue that should be discussed is the origin of somatic symptoms in this study. Somatic symptoms can be consequences of organic pathology, but previous studies have shown that up to two thirds of somatic symptoms could not be fully explained by a medical condition [13,53]. These functional somatic symptoms are strongly associated with both depressive and anxiety disorders [12,27]. As the somatization scale of the 4DSQ is a proper indicator of the general practitioner's suspicion of somatization [43], and the prevalence of somatic symptoms in our study was substantially higher than can be explained by medical conditions, we suggest that a major proportion of the somatic symptoms reported in the current study are indeed functional somatic symptoms. Consequently, we suggest that functional somatic symptoms had an important role in the associations of depressive and anxiety disorders with somatic symptoms.

Previous studies have shown that somatic symptoms are associated with an unfavorable course of depressive and anxiety disorders [54–57]. An adequate consideration and treatment of somatic symptoms in patients with depressive and anxiety disorders might therefore improve the outcome of these patients. Validated screening instruments are available for a systematic assessment of somatic symptoms [58]. In addition, several treatment options such as cognitive behavioral therapy [59,60] and mindfulness [61–63] have shown to be effective for depressive and anxiety disorders as well as somatic symptoms. Future studies should examine whether systematic screening for somatic symptoms and treatment of these symptoms in patients with depressive and anxiety disorders results in better treatment outcomes and reduced health care utilization and costs.

Conclusions

Depressive and anxiety disorders are strongly related to somatic symptoms and these associations show some differences across specific depressive and anxiety disorders. Further research is needed to examine potential explanations for the variation in independent associations across specific depressive and anxiety disorders as well as to study

whether an adequate consideration of somatic symptoms in patients with depressive and anxiety disorders improves treatment outcomes.

Conflicts of interest

L. Boschloo has received speaking fees and an unrestricted grant from Astra Zeneca. No other author report competing interest.

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