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Research paper

Somatic symptom disorder in the general population: Associations with medical status and health care utilization using the SSD-12

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ABSTRACT

Objective: Somatic Symptom Disorder (SSD) is characterized by excessive thoughts, feelings, and behaviors associated with physical symptoms. DSM-5 criteria for SSD focus on these psychological features (criterion B) rather than the presence or absence of an identifiable medical disorder. This study examines the role of medical disorder in the assessment of SSD and associations of SSD with health care utilization.
Method: Participants (N = 448, mean age 46.7 ± 16.9 years, 53.8% women) were recruited from the general community and completed the SSD-12 to quantify DSM-5 Criterion B for SSD. Participants also provided demographic and medical background information.
Results: The SSD-12 total score was elevated in individuals with a major medical disorder (N = 97: cardiovascular disease, cancer, pulmonary disease or other: SSD-12 = 11.6 ± 8.8), and also among those with medical conditions commonly treated in primary care (N = 46: e.g., migraine, asthma: SSD-12 = 8.3 ± 7.1), compared to those free of these disorders (SSD-12 = 5.8 ± 7.0), which remained significant in age- and sex-adjusted models. Normative values are reported. High SSD-12 scores (≥15) were associated with more health care utilization (adjusted OR primary care visits = 3.35, 95%CI = 1.64–6.87).
Conclusions: The SSD-12 is a useful tool for the assessment of SSD. Medical comorbidity is associated with higher SSD-12 scores. Future studies are needed to determine whether SSD is more common in medical patients or whether correction of normative values is needed for screening purposes.

1. Introduction

Somatic symptoms are highly prevalent in the general population and approximately one in five adults experiences severe disabling persistent or recurring symptoms [1–3]. Physical symptoms are typically not fully explained by “underlying” disease processes, even in patients with well-documented medical disorders [3,4]. In patients with diagnosed medical conditions, such as cardiovascular disease [5,6] or cancer [7–9], there is only a weak correlation between the severity of objectively determined anatomical or functional abnormalities and the experience of somatic symptom severity. In addition, there is a substantial group of individuals with medically unexplained persistent or recurrent symptoms (MUS). These conditions have been described using a wide range of labels, including functional disorders [3,10–12], bodily distress syndrome [13,14], and somatic symptom disorders (SSD) [15–17]. Estimates of persistent somatic symptoms range from 20%–80% in the general population and approximately 5%–7% have clinically diagnosable SSD [1–3,18,19]. In order to quantify the presence and treatment effects of MUS and/or SSD, reliable and valid tools are needed that can determine the severity and impact of these symptoms in an individual's daily life [3,20,21].

The current criteria for Somatic Symptom Disorder (SSD) in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) require the presence of somatic symptoms (criterion A), excessive thoughts, feelings or behaviors related to these symptoms (criterion B), and presence of these symptoms for > 6 months [17]. In addition, DSM-5 criteria now minimize the importance of the presence vs. absence of medical disorder in the diagnosis of SSD. The diagnosis of SSD is complicated, primarily because of the heterogeneity of its clinical presentation and the multiple factors that play a role in the development of these conditions. It is plausible that the psychological processes involved in individuals with medically unexplained symptoms differ in quality and quantity from individuals with an identifiable medical disorder that (partially) accounts for their symptoms [15], but

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to date little is known about these differences. In addition, the assessment of SSD is also complicated because of potential overlap with other mental disorders covered under the DSM-5 category of Somatic Symptom and Related Disorders (SSRD), including Illness Anxiety Disorder (similar to Hyperchondriasis), Conversion Disorder, Psychological Factors Affecting Medical Conditions, and Factitious Disorder [15]. Regarding DSM-5 criterion A for SSRD, there is a wide range of questionnaires designed to quantify the presence of somatic symptoms in the general population [22,23]. Zijlema et al. [23] evaluated 40 questionnaires and found that inventories such as the Patient Health Questionnaire (PHQ-15) [24] and the Symptom Checklist-90 somatization subscale [25] are potentially useful tools in epidemiological studies. Because a large proportion (up to 80%) of the general population has somatic symptoms (criterion A) and these symptoms are typically chronic or recurring for > 6 months (criterion C), the B criterion (i.e., the presence of excessive cognitive, affective and behavioral aspects associated with somatic symptoms) is the critical component in identifying individuals with SSD [15,26]. In order to systematically assess Criterion B for SSD, Toussaint and colleagues recently developed the Somatic Symptom Disorder – B Criteria Scale (SSD-12) with promising psychometric and validity characteristics [27].

In the present study, we examined the psychometric characteristics of the SSD-12 as a tool to measure SSD in the general population. Assessments of the B-criterion of SSD have been primarily obtained in clinical samples [27,28] and in the German general population [29]. The current study provides new information about the association between the severity of SSD with medical diagnosis and health care utilization. Because patients with (major) medical disorders may have thoughts, feelings and behaviors that are to some extent adaptive to their condition, it is likely that these psychological responses result in higher scores on the SSD B criterion. We tested the hypotheses that (1) Individuals with medical disorders have higher scores on the SSD-12 compared to individuals without medical disorders; and (2) higher SSD-12 scores will be related to more health care utilization. This study also provides normative data for the SSD-12, differentiating by age, sex, and the presence of medical disorders.

2. Methods

2.1. Participants

A total of 457 participants were recruited between January and March 2015. Details of the general recruitment and sampling methods have been described previously [30,31]. In short, participants were recruited as part of an annually distributed survey using age- and sex-stratified non-random sampling methods. Recruitment was performed by second-year students in the Psychology bachelor's program. These research assistants were free to enroll any person from the general population that they could get in contact with, with a maximum of 22 enrollees per recruiter. To minimize privacy-related challenges, recruiters did not record details about individuals who decided to decline participation. Equal numbers of men and women were enrolled and participants were recruited such that equal numbers were included in the following 6 age groups: 18–30, 31–40, 41–50, 51–60, 61–70 years and a lower frequency (half of the other age groups) for individuals aged 71 and above. Prior to taking part in this study, participants were informed that the goal of the study was to assess the interrelations between mood and behavioral factors with physical wellbeing. Additional information about this project has been outlined in prior reports [30,31].

Inclusion criteria were: age > 18 years, sufficient knowledge of the Dutch language, and consent to participate in the study. No a priori exclusion criteria were used. Of the 457 individuals who agreed to participate in this study, valid questionnaires were returned by 448 (98%) respondents and this sample was used for the present analyses (see Table 1 for participant characteristics). As a consequence of the enrollment procedures, no information is available regarding the number of individuals who declined participation. The project was approved by the Ethics Review Board of the participating institutions.

Table 1
Participant characteristics.

	Mean ± s.d. or N (%)
Age (years)	46.7 ± 16.9
Sex (female)	241 (53.8%)
Living situation	
Married/living with partner	294 (64.6%)
Partner/living apart	31 (6.9%)
No partner/living alone	101 (22.5%)
Widowed	22 (4.9%)
Education	
Elementary school	22 (4.9%)
High school	79 (17.6%)
College/professional training[a]	172 (38.4%)
University[a]	171 (38.2%)
Not reported	4 (0.9%)
Employment	
Fulltime	141 (31.5%)
Part-time	108 (24.1%)
Student	58 (12.9%)
Unemployed	28 (6.3%)
Retired	69 (15.4%)
Other employment[b]	44 (9.8%)

[a] The Dutch education system differentiates between college degrees that prepare professionals for careers such as nursing, teaching and accountancy, and careers that prepare for jobs with a more academic background such as psychology, medicine, biochemistry, typically completed with a Master's or doctoral degree.

[b] Other employment includes participants who reported having an internet-based company while not reporting being full-time employed and those who reported housekeeping as their profession.

2.2. Questionnaires

2.2.1. Somatic Symptom Disorder - B Criteria Scale (SSD-12)

The SSD-12 was used to evaluate the magnitude of individual scores on DSM-5 criterion B for SSD [27]. The Dutch translation was based on the English version of the SSD-12 and back translated by a native speaker, using standard translation methods [32]. Based on the initial validation studies [27–29], we used the SSD-12 total score as the primary outcome measure of this study (possible score range 0–48; in the original validation study a sample of 698 outpatients of a German clinic for psychosomatic disorders completed the SSD-12 [27]). The scale has a satisfactory factor structure and convergent and divergent validity with good internal consistency (Cronbach's $\alpha = 0.95$) [27]. Continuous total SSD-12 scores were used as the primary measure of criterion B for SSD; in addition we used a cut-off value of ≥15 (i.e., the sample mean + 1 standard deviation) to identify individuals with a high likelihood of clinical SSD for exploratory purposes. Based on the conceptual model of SSD, we explored the three DSM-5 based subscales (cognition, affect and behavior) as additional measures of SSRD (subscale Cronbach's $\alpha = 0.71$, 0.91 and 0.92, respectively) [27]. In the validation study by Toussaint and colleagues in a clinical sample of patients with psychosomatic disorders, the mean SSD-12 score was 20.4 (s.d. = 12.7) and the subscale scores were as follows: cognition 5.5 ± 3.6, affect 8.0 ± 5.0, and behavior 7.0 ± 5.1. In a primary care sample the mean SSD-12 score was 11.4 ± 9.0 [28] and in the general German population the mean SSD-12 score was 7.9 ± 9.3 [29].

2.3. Medical background and health care utilization

Information about the participants' medical background was obtained using a questionnaire asking about specific medical conditions [30,31]. The presence of major medical disorders (cancer,

cardiovascular disease, gastrointestinal, and pulmonary diseases) that require outpatient monitoring by specialised health care providers was assessed. Self-reported weight and height were used to calculate body mass index (BMI: kg/m^2). We also evaluated the presence of medical conditions that typically are monitored in primary care, and differentiated between cardiovascular risk factors (i.e., hypertension, Type I or Type I diabetes mellitus and BMI) and chronic disorders that often have a functional component, such as migraine headaches, asthma, allergies, acid indigestion.

As SSD is often co-occurring with other mental disorders [33–35], we also inquired about diagnosis and treatment for depression, anxiety and other mental disorders. Patients also completed questionnaires assessing these conditions for validation purposes (data not shown).

2.3.1. Health care utilization

The frequency of visits to a primary health care provider office was used as the primary index of health care utilization. The rationale for focusing on primary care visits was to optimally assess the patient-initiated health care utilization. We examined whether participants went in for a primary care visit (dichotomous variable), and the number of visits during the past year. In addition, information about hospital outpatient visits and hospitalizations was also obtained, but those are typically preceded by a referral by a primary care physician (except for emergency admissions in which case patients do not need a referral). We therefore report the occurrence of outpatient visits and hospitalization as secondary indices of health care utilization.

2.4. Covariates

We used self-reported age, sex, marital status, education and work status as potential covariates in this study. Marital status was categorized into married and/or living with partner, having a significant other or in a committed relationship but not cohabitating, living alone (single or divorced), or being widowed.

2.5. Statistical analysis

Data are presented as mean ± standard deviation (continuous variables) or frequency and percentage (categorical variables). Additional descriptive statistics are provided for the SSD-12 (median, inter-quartile range (IQR), kurtosis and skewness). Associations of demographic and clinical variables with continuous SSD-12 scores were examined using analysis of variance or Pearson correlation coefficients.

Confirmatory factor analysis was used to examine whether the three components of the SSD B criterion emerged in the data structure. We evaluated the fit of a 1-factor and a 3-factor solution and report the root mean square error of approximation (RMSEA), the Tucker-Lewis Index (TLI), and the comparative fit index (CFI) [36]. To explore SSD-12 characteristics in the present sample, the inter-item correlations are presented as well as the % explained variance for the 1-factor and 3-factor solutions which were based on a principal axis factoring fitting procedure because of the non-normal distribution of most of the SSD-12 items and oblique rotation allowing correlated factors. The internal consistency of the SSD-12 scores and the three subscales in this sample was evaluated using Cronbach's α.

Associations between demographic and medical measures variables with SSD-12 scores were examined using analyses of variance (categorical independent variables) or regression analyses (continuous variables), adjusting for age and sex. Normative data are based on the frequency distribution of the SSD-12 (80%, 85%, 90%, and 95%) for the full sample and stratified by sex, age (< 35, 35 to < 55, and ≥ 55 years), and presence or absence of medical and psychiatric disorders. The association between SSD-12 scores with health care utilization were examined using logistic regression (using the occurrence of one or more primary care visits as dependent (outcome) measure) and non-parametric Spearman correlations (for examining associations with the number of primary care visits during the past year), with the SSD-12 score as predictor variable. Secondary indices of health care utilization were the occurrence of outpatient hospital visit and hospital admission.

Missing data were handled as follows: For the SSD-12, the mean values of the completed items was imputed for missing values if participants had missing values on ≤ 3 items, and if patients had more than three missing items on the SSD-12 (N = 9/457) they were not included in this study. For medical information, missing data on specific conditions was coded as absence of that particular medical condition. Tables 1 and 2 report the number of actual observations. Multivariate models used listwise exclusion of cases with missing values, because this resulted in exclusion of < 5% of the sample.

Data were analyzed using the Statistical Package of Social Sciences (SPSS, version 23.0) and R (version 3.2.1) and two-sided p-values are reported.

Table 2
Distribution of medical variables in participants enrolled from the general community.

	Mean ± s.d. or N (%)
General major medical disease	
Any type	97 (21.7%)
Cancer	25 (5.6%)
Cardiovascular	24 (5.4%)
Gastrointestinal	20 (4.5%)
Pulmonary	16 (3.6%)
Other	12 (2.7%)
Disorders typically treated in primary care	46 (10.3%)
Cardiovascular risk factors	
Hypertension	44 (9.8%)
Diabetes mellitus (type I)	2 (0.4%)
Diabetes mellitus (type II)	11 (2.5%)
BMI (kg/m^2)	25.0 ± 4.7

3. Results

3.1. Participants

Participant characteristics are displayed in Table 1. The mean age of the sample was 46.7 ± 16.9 years and 53.8% were women. A total of 198 (44.2%) participants reported a medical or psychological disorder and the remaining 250 (55.8%) were without medical or psychological disorders. A major medical disorder requiring outpatient hospital care was present in 97 participants (25 cancer, 24 cardiovascular, 20 gastro intestinal, 16 pulmonary, 12 other diagnoses; 15 participants had multiple medical morbidities; see Table 2 for details). Forty-six (10.3%) individuals reported conditions that were mainly treated in primary care (e.g., migraine headaches, asthma, allergies). Mental disorders were present in 39 (8.7%) participants (26 depression, 12 anxiety, 1 other). One participant reported a diagnosis of comorbid somatization disorder and depression.

3.2. Psychometric characteristics of the SSD-12

Confirmatory factor analyses were used to evaluate a 1-factor versus a 3-factor solution consistent with the three SSD domains. A global 1-factor model provided a good fit for the data (RMSEA = 0.061). A model with the 3 SSD B-criterion sub-factors (cognitive, affective, behavioral) was also satisfactory (RMSEA = 0.055) and the fit was slightly better than the fit of the global 1-factor model (Table S1). Based on these results, a scale structure with the original three subscales of the SSD-12 as well as a scale structure with only one general scale are potentially useful indices of SSD. Inter-correlations between the 12 individual items ranged from r = 0.27 to r = 0.79 (median r = 0.56), with a 1-factor model explaining 60.0% and a 3-factor model 73.4% of the variance.

The mean and standard deviation of the total SSD-12 score was 7.28 ± 7.80; median = 4.0, inter-quartile range = 1–11; score range 0–40. The SSD-12 score was positively skewed (kurtosis = 1.21; skewness = 1.30). As expected, the mean SSD-12 score in the present sample selected from the general population was significantly lower than the clinical validation sample published by Toussaint et al. [27] (20.4 ± 12.7; $t(447) = 35.6$, $p < 0.001$). The descriptive statistics of the SSD-12 subscales in the present study were as follows: cognition: 2.04 ± 2.58; affect: 3.30 ± 3.13, and behavior 1.94 ± 2.72, with the affect subscale scores being higher than the cognitive and behavioral subscale scores (p's < 0.001). The internal consistency was excellent for the total SSD-12 score (Cronbach's α = 0.936) as well as for the subscales (Cronbach's α SSD-12 cognition = 0.746; affect = 0.862; behavior = 0.890).

3.3. Associations with covariates and normative values

Associations between demographic and other background measures with SSD-12 scores revealed that older age and female sex were related to higher SSD-12 scores. Specifically, a positive correlation was found between age and SSD-12 scores ($r = 0.241$, $p < 0.001$) and women had higher SDD-12 scores than men (8.18 ± 8.01 vs. 6.24 ± 7.44; $p = 0.008$). SSD-12 scores were not significantly related to education or partner status. Work status was associated with SSD-12 scores such that unemployed or people with part-time employment had higher scores, but these work-related associations were attenuated when adjusting for age and sex ($F(5,432) = 2.04$, $p = 0.072$).

Participants with mental disorders scored higher on the SSD-12 than those without mental disorders (13.0 ± 10.3 vs. 6.7 ± 7.3), which remained significant when adjusting for age and sex ($F(1,444) = 29.27$, $p < 0.001$). This is consistent with the common comorbidity of SSD with other mental disorders [33–35].

Normative values are presented in Table 3. This table shows that, for example, for the overall sample (N = 448) a SSD-12 score of up to 15 occurred in 85%, indicating that a cut-off value of ≥15 will detect 15% of the population with a high probability of meeting the DSM-5 B criterion for SSD. The table also shows that the frequency distributions show higher SSD-12 values with increasing age, female sex, medical morbidity and the presence of a mental disorder.

Table 3
Normative cutoff values for the SSD-12 for all participants and separated by sex, age and health status.

Variable (N)	Percentile			
	80%	85%	90%	95%
Overall sample (448)	13	15	19	23
Female (241)	14	17	19	24
Male (207)	11	14	17	22
Age < 35 (126)	8	11	13	18
Age 35– < 55 (169)	12	14	18	21
Age ≥ 55 (153)	16	18	23	26
Healthy (250)	9	11	12	19
Medical disorder (any)[a] (198)	17	19	23	26
Medical disorder (major)[a] (97)	19	21	25	28
Mental disorder (39)	21	25	27	29
Specific subgroups				
Female, < 35, healthy (51)	8	11	13	18
Female, 35–55, healthy (54)	12	13	16	19
Female, > 55, healthy (30)	11	13	18	24
Female, < 35, medical disorder (any)[a] (9)	13	(14)	15	(17)
Female, 35–55, medical disorder (any)[a] (33)	15	17	19	22
Female, > 55, medical disorder (any)[a] 40	18	19	23	25
Male, < 35, healthy (36)	5	6	7	9
Male, 35–55, healthy (50)	5	7	10	15
Male, > 55, healthy (29)	9	10	11	13
Male, < 35, medical disorder (any)[a] (11)	7	(12)	17	(22)
Male, 35–55, medical disorder (any)[a] (23)	12	14	17	19
Male, > 55, medical disorder (any)[a] (43)	16	21	23	26

Values ≥ the reported cutoff values are at or above the percentile category (80, 85, 90, 95).
Data in parentheses are estimates because of small sample sizes in the subcategories.
[a] Mental disorders excluded.

3.4. Medical disorders and SSD-12 scores

As is shown in Table 2, 97 participants had a diagnosed medical disorder requiring care in outpatient hospital settings. Patients with these types of medical conditions (i.e., outpatient treatment for any major medical disease) displayed significantly higher SSD-12 scores compared to individuals without such diseases (11.6 ± 8.8 vs. 6.1 ± 7.1) and this difference remained significant when adjusting for age and sex ($F(1,444) = 25.90$, $p < 0.001$). There were no substantial differences across the major medical disorders (cancer, cardiovascular, gastrointestinal and pulmonary) in the SSD-12 scores and individuals with multi-morbidity (N = 15) had similar scores as those with a single disease ($p = 0.96$). Results for the three SSD-12 subscales were parallel to the findings for the SSD-12 total score.

Findings related to other medical conditions that are predominantly treated in primary care settings (e.g., migraine headaches, asthma, allergies) showed a similar pattern of results as observed in general medical disease. These disorders (N = 46, 10.3%) were associated with higher SSD-12 scores (8.3 ± 7.1 vs. 5.8 ± 7.0), which remained significant when adjusting for age and sex ($F(1,347) = 5.26$, $p = 0.022$). A total of 9/46 were also treated for a comorbid general medical disease. Fig. 1 shows that there was an additive effect of general medical disease requiring outpatient hospital care and comorbid disorders requiring primary care on the magnitude of SSD-12 scores, but no evidence for multiplicative synergism was observed ($F_{interaction}$ $(1,442) = 0.25$, $p = 0.62$).

When examining cardiovascular risk factors, hypertension was associated with higher SSD-12 scores ($p = 0.020$), whereas diabetes ($p = 0.532$) or BMI ($p = 0.190$) were not.

3.5. Association between SSD-12 with health care utilization

A total of 296 (68.1%) participants reported having attended a primary care provider's office during the past year (for any condition), with a median frequency of 1 visit/year (IQR = 0–3; range = 0–30). Higher SSD 12 total scores were associated with an increased likelihood of having received medical care or advice in a primary care physician's office over the past year when adjusting for age, sex and the presence of a medical condition (OR = 1.061, 95%CI = 1.027–1.097 per unit). For

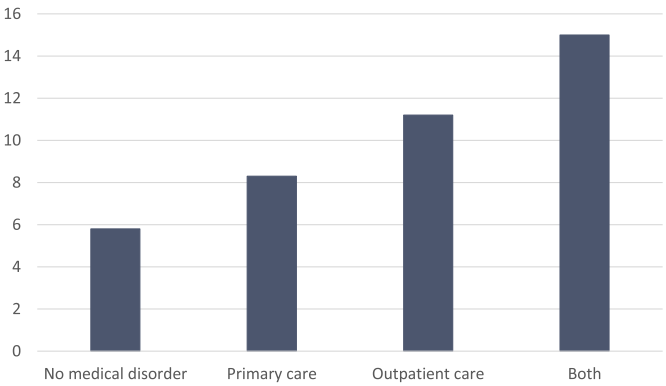

Fig. 1. Cumulative association of general medical diseases and potentially functional disorders with SSD-12 scores. $F_{main\ general\ medical\ disease} = 12.09$, $p = 0.001$; $F_{main:\ potentially\ functional\ disease}$ $(1,442) = 6.26$, $p = 0.013$ ($F_{interaction}$ $(1,442) = 0.25$, $p = 0.62$), adjusted for age and sex (standard deviations varied between 7.0 and 8.8).

those with high SSD-12 scores (i.e., 1 SD above the mean: ≥15; N = 78), there was a greater than threefold risk of having visited a primary care clinic during the past year (OR = 3.35, 95%CI = 1.64–6.87). There was also a significant correlation between the SSD-12 scores and the number of primary care provider visits (rho = 0.261), with slightly higher associations for the SSD-12 affective subscale (rho = 0.288) than the cognitive (rho = 0.190) and behavioral (rho = 0.203) subscales (all p values < 0.001).

We also examining outpatient hospital visits (N = 135) and hospital admissions (N = 42) as alternative utilization indices. High scores on the SSD-12 (≥15) were associated with more common occurrence of outpatient visits (adjusted OR = 2.13, 95%CI = 1.28–3.81) and hospital admissions (OR = 2.38, 95%CI = 1.07–4.78).

4. Discussion

This study shows that the SSD-12 has excellent psychometric properties relevant to the assessment of the DSM-5 B criterion for somatic symptom disorder. The data indicate that a 1-factor solution is optimal for this scale, which supports the interrelation of the three components of the B criterion for SSD (cognition, affect and behavior) and also the utility of using the SSD-12 total score as index of the overall level of the SSD B criterion. Individuals with medical conditions have higher SSD-12 total scores than healthy individuals, particularly those with major medical conditions such as cardiovascular disease and cancer. There is also a significant association between SSD-12 scores and health care utilization as defined by the number of general physician visits over the past year, but also outpatient hospital visits and hospitalizations, which is independent of the presence of medical morbidities.

The observed factor structure, reliability statistics and the distribution of the SSD-12 are remarkably consistent with a previous report by Toussaint and colleagues from a German population-based sample [29]. Specifically, the mean and standard deviations in the present sample are very similar to those observed in a sample drawn from the German general population [29]. This correspondence is also remarkable since the sampling strategies differed between the studies, with the study by Toussaint et al. using population-based representative sampling and the present study convenience sampling. In addition, as in prior studies, we found that the confirmatory factor analysis model fits for 3-factor vs. 1-factor models were similar [27,29]. Older age and female sex are associated with higher SSD-12 scores. In addition, the presence of a medical condition may also result in elevated SSD-12 scores. The frequencies displayed in Table 3 indicate that it may be necessary to adjust cut-off values based on age, sex and medical comorbidity (assuming that SSD is equally prevalent across these sociodemographic and clinical characteristics). In general, a cut-off value of ≥15 (i.e., 1 standard deviation above the mean, corresponding to 85% of the present sample because of the positive skewness of the scale in the general population) will be efficient if background variables are not known. Such a cut-off value may result in over-detection (i.e., false positives) of individuals aged 55 and above, women, and those with medical or psychiatric disorders, for whom a cut-off of ≥23 may be better for screening purposes. Using this cut-off score of ≥23, the 5% of the general population with the highest SSD-12 scores are identified. Given that this approximates the known prevalence of somatoform and related disorders in the general population [1–3], it seems likely that an identified sample with SSD-12 scores ≥23 will meet diagnostic criteria for SSD. For healthy individuals without medical or psychiatric disorders, a lower cut-off of ≥15 is likely to be effective for screening. Because of the lack of clinical diagnostic assessments in the present study, it is not possible to rule out the fact that SSD is more prevalent in individuals with medical disorders, similar to the higher prevalence of depression in patients with medical disorders, and that standard cut-off values should be used in this population as well. Additional epidemiological and clinical research is needed to establish these cut-off values using structured diagnostic interviews that also include the DSM-5 A and C criteria for SSD. In addition to such DSM-based or ICD-based interviews, other interview techniques may provide useful insights into SSD and related conditions [37,38].

The new approach in the DSM-5 regarding SDD no longer requires absence of a medical disorder that can account for somatic complaints [17] (see also [39]). This change has several advantages, but also comes with new challenges for the screening, diagnosis and treatment of SSD [15]. The present study shows that the presence of a medical disorder significantly increases SSD-12 scores, because patients with these conditions are likely to have thoughts, emotions and behaviors related to these diseases. Alternatively, patients with medical disorders may have a higher prevalence of SSD. The highest SSD-12 values were found for individuals with mental disorders, followed by those with major medical disorders requiring hospital-based outpatient care such as cardiovascular disease and cancer. But also individuals with medical conditions that are commonly treated in primary care settings and those with hypertension had elevated SSD-12 scores. It may therefore be necessary to adjust SSD-12 cut-off values if this questionnaire is used for screening purposes. The SSD-12 can also be used to monitor intra-individual changes in SSD severity and be useful in physician-patient communications about the impact of disease-related symptoms on psychological wellbeing, particularly the cognitive, affective and behavioral consequences of patients' symptoms.

The findings of this study need to be considered in the context of several limitations. The cross-sectional design precludes causal inferences and medical information was based on self-report. It is therefore possible that individuals scoring high on the SSD-12 have a reporting bias that results in over-estimation of medical conditions. Individuals with conditions that require medical care may also subsequently report higher scores on the SSD-12. Future studies are needed that use longitudinal designs and structured clinical interviews. To establish the validity of the SSD-12, these studies should also evaluate the DSM-5 A and C criteria for SSD. The analyses in this study were not corrected for multiple statistical testing and the interpretation of demographic and clinical correlates of SSD-12 scores (e.g., hypertension) should be considered preliminary and require replication in future investigations. For health care utilization, we focused on primary care visits because those are entirely driven by patients' self-referrals, whereas outpatient visits are typically contingent upon primary care referrals. However, the pattern of results was consistent across the various indices of health care utilization. Another limitation is that participants in this study were not drawn from a random sample of the population and we have no information about the number or characteristics of those individuals, who elected not to participate in the study; these factors may have resulted in selection bias. These objections are outweighed to some extent by the representative prevalence of medical conditions compared to general population statistics, and the multivariate adjusted models revealed a strong association between SSD-12 scores with health care utilization even when adjusting for medical morbidity.

In conclusion, the present findings indicate that the SSD-12 is a reliable instrument that is useful for the assessment of the severity of SSD-related symptoms that reflect the DSM-5 B criterion. Patients with medical disorders have elevated SSD-12 scores, which may reflect false positives due to the questionnaire or indeed point to a higher prevalence of SSD in the setting of medical illness. It is possible that the psychological aspects of SSD (i.e., criterion B characteristics) lead to increased distress and dysfunctioning in the affected patients, who may benefit from multidisciplinary interventions. Several studies have shown positive effects of psychological and behavioral interventions on somatic complaints and quality of life in patients with SSD (and the corresponding somatoform disorders as defined in the previous versions of the DSM) [40–42], whereas the reported effects of pharmacological treatments are mixed [43]. The SSD-12 may be a useful tool to differentiate responders from non-responders to treatment. Recent evidence

suggests that neurocognitive problems can complicate the assessment and treatment of SSD [44]. In addition, SSD is associated with dysregulation of both the central [45] and the autonomic [46] nervous system, whereas alterations in processing of bodily signals may play a critical role [4]. These findings indicate that substantial challenges remain in the diagnosis and treatment of SSD, particularly in patients with comorbid medical conditions. The SSD-12 is a pragmatic tool [47] for the initial assessment of the DSM-5 B criterion of SSD and could be used in combination with other inventories that quantify the presence and severity of symptoms (criterion A) such as the PHQ-15 [24] to identify individuals with SSD. In addition, the SSD-12 can be used for monitoring of changes in SSD severity during the course of treatment.

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