The gender difference in depressive prevalence is due to high prevalence
of somatic depression among women who do not have depressed relatives

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ABSTRACT

Background: Given that several studies have found the gender difference in depression to be rooted in psychosocial forces and others have shown the difference to be due to a gender difference in somatic depression, we compared the gender difference in somatic depression among respondents who reported no relative depressed with that of all other depressed respondents.

Methods: Respondents in a representative sample from the Zurich study who met criteria for somatic depression and reported no relatives (first-degree, or parents, or mothers, or fathers in separate analyses) with depression were compared to other depressed respondents as to gender.

Results: The gender difference in the prevalence of depression among respondents with somatic depression who reported no relatives with depression (whether the relatives were all first-degree, or any parent, or mothers only or fathers only) was significantly greater than the gender difference in depression among other respondents

Limitations: The measure of depression among relatives was based upon reports of the respondents.

Conclusion: All or almost all of the gender difference in depression in this representative sample is due to a gender difference in somatic depression among respondents who reported no depressed relative. Somatic depression may be a disorder distinct from depression without significant additional somatic symptomatology. If so, it is likely that it should be treated differently.

Keywords: depression; gender differences; epidemiology; family; nosology

1. Introduction

A higher prevalence of depression among females compared to males has long been recognized (Kessler et al., 1994). One line of research suggests that the gender difference is due to a higher prevalence among women of specific subtypes of depression such as atypical or somatic depression (Halbreich and Kahn, 2007). Several studies have supported this hypothesis and one demonstrated that the higher female prevalence of depression was due to a gender difference in somatic depression while the gender difference in atypical depression was almost completely due to its overlap with somatic depression (Silverstein et al., 2013).

Another line of research involves several studies that suggest that the gender difference in depression is due to a higher prevalence among women of depression rooted in psychosocial processes (Ge, Conger and Elder, 2001; Hankin, 2009), in particular psychosocial issues related to gender roles (Cespedes and Huey, 2008; Kuehner, 2003).

Bringing together these two lines of research, studies that relied on a self-report measure of depressive symptoms (CES-D) demonstrated that the gender difference in depression was due to a high prevalence of somatic depression among women who have been exposed to attitudes and treatment from parents suggesting that women are at a disadvantage compared to men (see Silverstein and Lynch, 1998). Some of these studies used respondents' reports of the attitudes of their parents but some related respondents' self-reports of depression to reports of attitudes suggestive of gender limitations made by their parents.

One study of female high school students found reports of feeling disadvantaged by being female made by their mothers to be related to daughters' reports of somatic depression but not to their reports of depression that did not meet criteria for somatic depression. In contrast, mothers' self-reported depression was related to daughters' reports of non-somatic depression but, when mothers' reports of gender disadvantage were held constant, not to daughters' reports of somatic depression (Silverstein and Blumenthal, 1997).

It is important to make clear that, as noted by Rutter et al. (2003) and many others, no disorders are completely psychosocial or completely endogenous and, as discussed below, there is no reason to believe that women who develop depression related to psychosocial issues never have parents who are depressed. Nonetheless, the studies cited above suggest the hypothesis that the gender difference in the prevalence of depression may be largely due to the higher prevalence among women compared to men of somatic depression that is not related to the depression of their mothers and, by extension, possibly their fathers and other relatives. That hypothesis is tested here on data from a representative sample.

2. Methods

All procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The project received prior approval (1978) from the Ethical Committee of the Zurich University Psychiatric Hospital. The Zurich Cohort Study comprises a cohort of 4547 people (2201 men; 2346 women) representative of the canton of Zurich in Switzerland in 1978. At that time, the male participants were 19 years old (at mandatory conscription) and the female participants were 20 years old (complete electoral register). The response rate for men was 99.7%. Women were identified at the age of 20 by the complete electoral register; half of the women chosen randomly received mailed questionnaires, and 75% of them responded.

A screening scale for physical and emotional symptoms, the Symptom Checklist 90-R (Derogatis, 1977) was administered to prospective study participants. To enrich the probability of psychiatric syndromes, a stratification procedure based on over-sampling of those whose score exceeded the 85th centile of the Symptom Checklist 90-R global severity index score was applied. In total, 591 participants (292 men, 299 women) were selected for interview. Two thirds of the interview sample comprised high scorers and one third were randomly selected from the remainder of the initial sample (global severity index scores below the 85th centile). The prevalence estimates reported at each wave of the study were weighted to yield unbiased population estimates, as described by Eich et al. (2003).

The interview sample had face to face interviews at ages 21 (1979), 23 (1981), 28 (1986), 30 (1988), 35 (1993), 41 (1999), and 50 years (2008) for women; men were one year younger at all interviews. The entire cohort was contacted at each wave irrespective of participation at the previous interview wave. Over 30 years, 43% of the cohort participated in all seven interviews, 55% in six interviews, 66% in five interviews, 75% in four interviews, 83% in three interviews, and 91% in at least two interviews. On average, about 10% of the participants dropped out at each interview wave. Previous analyses showed that those who dropped out did not differ significantly from those who continued to participate with respect to psychiatrically relevant demographic characteristics. (Eich et al., 2003).

Medical residents and clinical psychologists with extensive clinical training administered the Structured Psychopathological Interview and Rating of the Social Consequences for Epidemiology (SPIKE), with modules for 13 psychiatric and 12 somatic syndromes, in the participants' homes. The interviews took 1-4 hours. (Angst et

al., 2005). Screening probes based solely on the major phenomenological features of each syndrome (such as depressed, irritable, sad mood) were administered for each of the 25 syndromes. Separate modules covered the descriptive phenomenology of psychiatric syndromes including depression, fears/phobias, panic attacks, generalised anxiety, hypomania, obsessive-compulsive disorder, eating behaviours, post-traumatic stress, behaviour problems, suicidality, and alcohol, tobacco, and drug use. The successive versions of SPIKE have enabled application of the diagnostic criteria for DSM-III (*Diagnostic and Statistical Manual of Mental Disorders*, third edition), DSM-III-R, and DSM-IV (American Psychiatric Association, 1980; 1987; 1994).

The interview on depression concentrated on the past twelve months. The diagnoses, on which the statistics rely, were all maximised over 7 interviews covering one year (ever yes/no). The critical symptoms had to present in the same year. Each respondent was only included one time in the analysis even if the respondent met criteria for depression/somatic depression in multiple interviews.

As in the earliest studies of somatic depression, respondents with somatic depression met criteria for depression and reported three of: headaches, breathing difficulty, fatigue, body image problems (want to be thinner or unhappy with body shape), eating problems (regular fasting, bingeing, or intentional vomiting), and sleep problems (trouble falling or staying asleep). The findings that led to all of the above symptoms being included in the criteria for somatic depression are described elsewhere (Silverstein, 2013; Silverstein and Perlick, 1995). Respondents with non-somatic depression met criteria for DSM major depression but did not report at least three of the somatic symptoms listed above. Depression among the parents and siblings of respondents was measured by asking respondents whether their parents (1981), parents or siblings (1986) or children (2008) suffered from depression.

2.1 Statistical Methods

The analyses reported here of the Zurich data were weighted to be representative of the general population. Respondents were divided into four groups, non-somatic respondents who reported at least one parent, sibling, or child with depression, non-somatic respondents who had no first-degree relative with depression, somatic respondents who had at least one relative with depression, and somatic respondents who had no relative with depression. In order to disaggregate the findings, these analyses were repeated substituting for respondents' reports of depression among all first-degree relatives, their reports of depression of either parent, of mothers only and of fathers only. To specifically investigate the role played by somatic depression among respondents who reported no relatives (in different categories of relative in different analyses) with depression in leading to a gender difference in the prevalence of depression, the

respondents in this group (somatic with no depressed relatives) were compared statistically the other three groups combined into one using χ^2 with Yates correction (but the data for all groups separately are presented in the tables). No non-depressed respondents were included in the analysis so the statistical significance of the results was not influenced by the widely reported gender difference in overall depression. Furthermore, by combining into one group all respondents with non-somatic depression and the respondents with somatic depression who reported depressed relatives, the results of the statistical analyses were not influenced by the gender differences between these groups but only by the difference between the somatic depression with no depressed relatives group and all other depressed respondents.

3. Results

The number of depressed female and male respondents in the four somatic/nonsomatic depression X first-degree relatives with/without depression groups is shown in Table 1A. Of these depressed respondents, almost one quarter (23.2 %) of the females exhibited somatic depression and reported no parents, siblings or children with depression. This is many times more than the fewer than one out of 30 (3.1%) depressed males in that group. The 2 (male vs. female) X 2 (somatic depression with no depressed relatives vs. the other three groups combined) comparison was significant, $\chi^2 (1, n=582) = 42.5, p<.0001$. Also informative is the proportion of depressed male and female respondents in each of the groups. The proportion of males in the non-somatic group who reported relatives with depression (54.3 %) is much higher than the proportion of females (33.6 %), the proportion of males in the non-somatic group who did not report relatives with depression (27.2%) is almost identical to the proportion of females in the same group (28.9%), as is the proportion of males (15.5%) and females (14.4%) in the group with somatic depression who reported relatives with depression. The group of respondents among which women report more depression than comparable men is those with somatic depression who do not report any relatives with depression.

Insert Tables 1 and 2 about here

Similar results were found for the analyses of particular subsets of relatives. In the analysis of reporting any parent depressed shown in Table 1B, twenty six percent of females compared to only fourteen percent of males fell into the category of somatic depression with no parent reported to be depressed, $\chi^2 (1, n=582) = 13.71, p<.001$. In this analysis a higher proportion of females than males was also found among respondents who reported somatic depression and at least one depressed parent. The same was found for the analysis of mothers alone, shown in Table 2A. Thirty

percent of females fell into the category of reporting somatic depression and mother not depressed compared to fifteen percent of males ($\chi^2 (1, n=582) = 16.01, p<.0001$). In the analysis of fathers alone, shown in Table 2B, thirty two percent of female respondents fell into the category of reporting somatic depression and father not depressed compared to seventeen percent of male respondents, $\chi^2 (1, n=582) = 20.03, p<.0001$. Like the analysis of first-degree relatives, in the analysis of fathers alone no group other than that of somatic depression with father not depressed exhibited a female preponderance.

4. Discussion

Before discussing the implications of the results reported here it is important to emphasize two points. First, the major limitation of this study is that the measure of the depression exhibited by relatives used here relies on reports made by the respondents, not the relatives. Until further research is done using similar comparisons made on research interview diagnoses of depression exhibited by relatives, the conclusions discussed below remain tentative.

Second, as mentioned above, there is no reason to believe that women who develop depression related to psychosocial issues cannot have parents who are depressed. The self-report CES-D study cited above found that some mothers of depressed high school females reported feeling disadvantaged by their gender as well as high levels of depressive symptoms. When the scores on the scale of gender disadvantage were held constant, the mothers' depression did not relate to the daughters' somatic depression. The Zurich study analyzed here did not have a measure of maternal reports of gender disadvantage. As a result, it was not possible to disentangle whether the mother depression was related to a psychosocial process involving gender roles. So it is not surprising that in the analyses of both parents combined and of mothers alone, respondents in the category of somatic depression with a depressed relative exhibited some female preponderance. The strongest test of the hypothesis given the available data, however, relied on investigating whether the prevalence of somatic depression among respondents without relatives they reported to be depressed was higher among females whereas the prevalence of all other depression combined was not..

This is exactly what was found in these analyses of a representative population in the Zurich study. The higher prevalence of depression among female respondents was due to a subtype of depression that appears (based on respondents' reports of depression among relatives) to have a low genetic loading. This tentatively supports the hypotheses that: 1. Current criteria for depression may conflate the existence of at least two distinct disorders, somatic and non-somatic depression: 2. The gender difference in depression may be based on a large difference in one of these disorders, but not the other; 3. The disorder that is largely responsible for this gender difference may be rooted more in

psychosocial processes rather than a high genetic loading for depression. These important possibilities deserve further investigation.

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Table 1

The relationship between gender and depression with and without significant somatic symptomatology
among respondents with and without depressed relatives in a representative sample

A. First-degree relatives

	Non-Somatic		Somatic		Total
	Depression		Depression		N
	With depressed relatives	Without depressed relatives	With depressed relatives	Without depressed relatives	
Males	124.7 (54.3%) ^a	62.5 (27.2%)	35.6 (15.5%)	7(3.1%)	229.8
Females	118.4 (33.6%)	101.4 (28.8%)	50.6 (14.4%)	81.8 (23.2%)	352.2

B. Either parent

	Non-Somatic		Somatic		Total
	Depression		Depression		N
	With depressed parents	Without depressed parents	With depressed parents	Without depressed parents	
Males	94.1 (41%) ^a	93.1 (41%)	11 (4.7%)	31.6 (13.7%)	229.8
Females	88.8 (25.2%)	131 (37.2%)	42.6 (12.1%)	89.8 (25.5%)	352.2

^a Numbers in parentheses represent the percentage of respondents in each row (depressed males or depressed females) in each of the four columns (somatic/non-somatic X having/not having depressed relatives groups)

Table 2

The relationship between gender and depression with and without significant somatic symptomatology among respondents with and without depressed mothers only or fathers only in a representative sample

A. Mothers

	Non-Somatic		Somatic		Total
	Depression		Depression		N
	With depressed	Without depressed	With depressed	Without depressed	
	mothers	mothers	mothers	mothers	
Males	68.5 (29.8%) ^a	118.7 (51.7%)	8 (3.5%)	34.6(15%)	229.8
Females	82.8 (23.5%)	137 (38.9%)	26.3 (7.5%)	106.1 (30.1%)	352.2

B. Fathers

	Non-Somatic		Somatic		Total
	Depression		Depression		N
	With depressed fathers	Without depressed fathers	With depressed fathers	Without depressed fathers	
Males	27.6 (12%) ^a	159.6 (69%)	8 (3.5%)	34.6 (15.1%)	229.8
Females	7 (2%)	212.8 (60.4%)	19.3 (5.5%)	113.1 (32.1%)	352.2

^a Numbers in parentheses represent the percentage of respondents in each row (depressed males or depressed females) in each of the four columns (somatic/non-somatic X having/not having depressed relatives groups)

Contributors

Brett Silverstein and Jules Angst wrote the manuscript and performed the statistical analyses.

Jules Angst, Vladeta Ajdacic-Gross and Wulf Rossler collected the data for the Zurich Study.

All contributors have approved the manuscript.

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