Social interaction anxiety and depression symptoms are differentially related in men and women

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Abstract

Social anxiety disorder (SAD) and major depressive disorder (MDD) are highly comorbid with each other, and comorbidity exacerbates distress and impairment. The prevalence of comorbid depression is higher in women with SAD than in men with SAD, but this is based on global depression scores and cannot speak to heterogeneous individual depression symptoms. The current study bridges this gap by examining gender differences in the relationship between social interaction anxiety and individual depression symptoms. 165 community adults (113 women, 52 men) were included in a series of bootstrapped moderation analyses to examine the main and interaction effects of social interaction anxiety and gender on total depression and individual depressive symptom scores while controlling for age and racial/ethnic background. Social interaction anxiety positively predicted total and individual depression scores. Greater social interaction anxiety predicted greater self-dislike and worthlessness in men than in women. Our findings replicate the finding that social anxiety and depression are highly comorbid with respect to total scores and extend this finding to individual symptoms. Our findings also demonstrate that the relationship between social interaction anxiety and depressive symptoms can be modulated by gender identities. Men with social interaction anxiety may be more prone to distress associated with self/identity. These findings elucidate the specific ways in which social interaction anxiety relates to the constellation of depression symptoms in men and women and highlights the need for more tailored assessment and intervention for socially anxious men and women to target individual dimensions of symptom presentations.

Keywords Social anxiety disorder · Social interaction anxiety · Depression · Gender differences

Social anxiety disorder (SAD) is characterized by intense fear or anxiety in performance and/or social situations in which the individual could be watched or judged by others (American Psychiatric Association, 2013). SAD is one of the most prevalent psychiatric conditions with the second highest 12-month prevalence of 6.8% (Kessler et al., 2005b) and the fourth highest lifetime prevalence of 12.1% (Kessler et al., 2005a). Notably, SAD may show a higher ranked 12-month prevalence compared to lifetime prevalence due to its persistent nature (Beesdo-Baum et al., 2012). SAD is associated with significant impairments in functioning including school drop-out (Stein & Kean, 2000), difficulty achieving academic success (Wittchen et al., 1999),

diminished work productivity, utilization of more medical services, and unemployment (Lecrubier et al., 2000). Individuals with SAD are also more likely to be socially isolated or lacking in both friendships and romantic relationships (Montgomery et al., 1991; Rodebaugh et al., 2012; Teo et al., 2013).

SAD is often comorbid with other psychiatric conditions. Among those, MDD (tetrachoric correlation $r = .52$) and dysthymia ($r = .55$) are two of the three most common comorbid conditions based on 12-month prevalence (Kessler et al., 2005b) and lifetime prevalence (Kessler et al., 2005a). Individuals with SAD have a 1.9 to 3.5 times greater risk of experiencing comorbid MDD than non-socially anxious individuals (Beesdo et al., 2007; Stein et al., 2001). Depressive disorders are also highly prevalent, independent of SAD. MDD has the third highest 12-month prevalence of 6.7% and lifetime prevalence of 16.6% in the general population (Kessler et al., 2005a, b). Importantly, comorbid MDD is associated with greater SAD-related impairments.

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Patients with SAD have more severe SAD symptoms when they have comorbid MDD (Koyuncu et al., 2014). Individuals with SAD and comorbid MDD experience greater treatment resistance and relapse than those with SAD alone (Marie Lincoln et al., 2005). Other studies found significantly worse overall emotional, social, and psychiatric functioning among individuals with comorbid SAD and MDD compared to those with either condition alone (Aderka et al., 2012; Wersebe et al., 2018).

Gender identity plays an important role in SAD and MDD. Epidemiological studies have shown that women have a greater risk than men for having SAD and MDD. Studies reported that women are around 1.5 times more likely to have a lifetime diagnosis of SAD than men (Magee et al., 1996; Schneier et al., 1992). In addition, women are two times more likely to report lifetime onset of MDD than men (Angst & Merikangas, 1997; Kessler et al., 1993, 1997). A recent epidemiological study demonstrated that among individuals with SAD, women were more likely to have comorbid lifetime MDD than men, with 42.8% comorbid MDD in women and 35.6% comorbid MDD in men (MacKenzie & Fowler, 2013). A longitudinal study of children and adolescents indicated that girls with SAD are more likely to experience subsequent MDD than boys with SAD (Beesdo et al., 2007). It is also possible that reporting bias could impact the observed gender differences in the prevalence of SAD and MDD. Studies have suggested that men are more reluctant to report social anxiety and depression symptoms than women (Brody & Hall, 2008; Chevron et al., 1978; Moscovitch et al., 2005).

Although the prevalence of comorbid depression has been considered to be higher in women with SAD than in men, evidence suggests greater disturbance in men compared to women with SAD. A longitudinal study examined the psychiatric functioning of men and women for 15 years and found greater subjective distress in men with SAD (Merikangas et al., 2002). It has also been observed that men with SAD are more likely to seek treatment (Amies et al., 1983; Weinstock, 1999) and more prone to use alcohol and substances than women with SAD (Xu et al., 2012). Another study examined gender differences in self-esteem and found that SAD predicted more negative self-esteem in men compared to women (Glashouwer et al., 2013). It is of note that some findings demonstrate mixed results. For example, MacKenzie and Fowler (2013) reported greater self-perceived psychiatric issues and stress in women with SAD than in men with SAD. However, the same study did not find any significant gender differences in self-perceived life satisfaction between women and men.

These findings show that the degree to which SAD is associated with distress and impairment can vary between men and women. Although the impairments assessed in the previous studies were not in direct relevance to depressive symptoms, considering that depression consists of a wide range of disturbances which are characterized as emotional, cognitive, motivational, and physiological symptoms (American Psychiatric Association, 2013), it raises the possibility that the association between SAD and MDD can be different among women and men when different symptoms of depression are considered. Understanding the gender-specific vulnerabilities for depressive symptoms can guide more comprehensive clinical assessment and inform more tailored treatment for patients with these conditions.

However, to our knowledge, no studies to date have directly tested gender differences in the relationship between SAD and depression symptoms. As described above, prior studies relied on a global assessment of MDD or only focused on the prevalence of MDD. Therefore, it is still unclear how SAD and individual comorbid depression symptoms are differently associated with each other, and how these associations differ by gender.

Therefore, the current study aimed to compare cross-sectional predictive values of social anxiety on depressive symptoms in women and men. Specifically, we focused on social interaction anxiety, which is one of two different types of social anxiety along with performance anxiety. Social interaction anxiety is characterized as fear and avoidance in interpersonal exchanges (e.g., initiating and maintaining a conversation, meeting with others, etc.) On the other hand, performance anxiety refers to fear and avoidance of doing activities in front of other people (e.g., public speaking, writing, playing a musical instrument, etc.) (Mattick & Clarke, 1998). Studies have shown that social interaction anxiety is more closely associated with anhedonia, which is a specific marker of depression, whereas performance anxiety is more relevant to the symptoms of anxious physiological arousal (Clark & Watson, 1991; Hughes et al., 2006; Kashdan, 2002, 2004).

Our hypotheses were threefold. First, we predicted that social interaction anxiety would positively predict total depression scores across our sample, replicating prior findings of comorbidity between SAD and MDD. Second, we anticipated that the predictive values of social interaction anxiety on depressive symptoms would vary by gender. Based on the lack of prior studies examining relationships between SAD and individual depression symptoms, as well as mixed findings regarding gender differences in the relationships between SAD and depression, we did not have specific directional hypotheses. Third, we hypothesized that when the interaction between social interaction anxiety and gender is not significant, the main effect of social interaction anxiety would positively predict each individual depressive symptom score.

Table 1 Demographic characteristics ($N = 165$)

Category	Women		Men	
	N	%	N	%
Age ($M = 27.18$, $SD = 10.39$)				
≤ 20 years	25	22.12	11	21.15
21-30 years	64	56.64	25	48.08
> 30 years	24	21.24	16	30.77
Race/ethnicity				
White	71	62.83	28	53.85
Black or African American	6	5.31	2	3.85
Asian	16	14.16	8	15.38
Hispanic	3	2.65	4	7.69
Other or no response	17	15.04	10	19.23
Total	113	100.00	52	100.00

In the main analyses, age was entered as a continuous covariate. Race/ethnicity was dummy coded and entered as a binary covariate

Method

Participants

These data were collected in the context of two studies examining the impacts of attention bias modification training on behavioral and neural mechanisms associated with SAD.[1] Some of the data have been (Duval et al., 2018), or will be, published elsewhere. The current study aimed to specifically investigate gender differences in the relationship between self-reported symptoms of social interaction anxiety and depression, which has not been previously examined in the current sample. Participants were recruited from Midwest communities in the US and all procedures were approved by the Institutional Review Board at the University of Michigan. All participants provided written informed consent. Participants with significant medical or neurological conditions, lifetime history of bipolar I or a psychotic disorder, substance use disorder (past 12 months), non-English speaking, or inability to provide informed consent were excluded. Eligibility was determined by a telephone screen and clinical evaluation performed by a licensed psychologist. A total of 165 participants responded to a series of questionnaires assessing their demographic characteristics (i.e., age, gender, and race/ethnicity via free-response items; see Table 1), social interaction anxiety, depression, and other formal measures of psychiatric symptoms and

behavior (to be reported elsewhere). Race/ethnicity was included as a covariate in all analyses, along with age, to control for any potential confounding of these demographic characteristics and to allow for a more focused assessment of the relationships with gender. In order to examine the variance of depression symptoms across the full spectrum of social interaction anxiety scores, the current study used continuous scores of social interaction anxiety as a predictor in individuals with and without SAD.

Instruments

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998)

The SIAS is one of the most widely used social anxiety measures assessing distress in dyadic and group interactions, such as meeting and talking with other people. The questionnaire consists of 20 self-report items that are rated on a 5-point Likert scale ranging from 0 to 4. The SIAS has an internal consistency of 0.93, a specificity of 0.60, a sensitivity of 0.93, and test-retest reliability of 0.92 (Mattick & Clarke, 1998; Peters, 2000).

Beck Depression Inventory-II (BDI-II; Beck et al., 1996b)

The BDI-II is a self-report questionnaire measuring various domains of depressive symptoms including affective, cognitive, behavioral, somatic, motivational, and suicidal symptoms. The questionnaire consists of 21 items that are rated on a 4-point Likert scale ranging from 0 to 3. A meta-analytic review reported internal consistency of 0.90, specificity ranging from 0.60 to 0.92, sensitivity ranging from 0.66 to 1.00, and test-retest reliability ranging from 0.73 to 0.96 (Wang & Gorenstein, 2013). Similar to previous psychometric studies (Beck et al., 1996a; Carmody, 2005; Dolle et al., 2012; Segal et al., 2008; Whisman et al., 2000), item 9 (suicidal thoughts) and item 21 (loss of interest in sex) of the BDI-II demonstrated low item-total correlations. In our sample, the item-total correlation of item 9 was .33 and that of item 21 was .35. Following Clark and Watson (2016)'s cutoff standard for scale validation (> .40), these two items were not included in our analyses.

Statistical Analyses

Post-hoc power analysis was conducted using G*Power (Faul et al., 2007) and demonstrated that with an alpha set at .05, a sample size of 165, and eight predictors (i.e., three IVs: SIAS, gender, and interaction between SIAS and gender; five covariates: age and four dummy coded race/

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[1] The current data were collected before the COVID-19 pandemic. Note that studies comparing before- and during the pandemic report different prevalence and symptom presentations of these conditions (Ettman et al., 2020; Kim et al., 2022; Morrissette, 2021). Thus, future studies should examine impacts of the pandemic on relationships between SAD and depression.

ethnicity variables), the smallest observed power (1- β probability) was 94.69%. This indicates that the number of samples and effect sizes in the current study were adequate to detect statistically significant differences (Cohen, 2013).

Since the distribution of our data demonstrated a significant departure from normality,[2] we used PROCESS macro Model 1 with a bootstrapping method (Hayes, 2012) to examine the differential predictive values of social interaction anxiety and the moderation effect of gender on depression symptoms. Bootstrapping uses large numbers of reiterated samples instead of imposing on the original distribution of the data, and therefore, it is an effective way of estimating the underlying sampling distributions of statistics that cannot be assumed to be normal (Mooney et al., 1993). In the model, we entered age and race/ethnicity as covariates, and social interaction anxiety scores as an independent variable. Gender was entered as a moderator. Each of the 19 depressive symptom scores and total depression scores (i.e., the sum of the 19 depressive symptom scores) were entered as dependent variables. Bootstrapping was performed with 10,000 replications. In addition to the main analysis, we also conducted a series of follow-up analyses, repeating the same analyses including re-coded responses for item 16 (changes in sleep) and item 18 (changes in appetite) to capture the specific directions of the responses (i.e., positive direction: increase in sleep and appetite; negative direction: decrease in sleep and appetite) in addition to severity. Main statistical analyses were conducted via R (v4.1.0). Moderation models were fitted with 'PROCESS v4.0 for R' (Hayes, 2012), and simple slopes and confidence intervals for women and men were computed using the 'boot' package (Canty & Ripley, 2017). The outputs were visualized using the 'fmsb' package (Nakazawa & Nakazawa, 2019).

Results

Missing Data

There were only two missing values on the SIAS (0.03% missingness). Responses to the BDI-II did not include any missingness. The two missing values were imputed using multiple imputations by chained eqs. (R package 'MICE':

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[2] Shapiro-Wilk test indicated that the underlying residuals of the original data did not hold the normality assumption. The Shapiro-Wilk (W) statistics ranged from 0.75 (item 6: punishment feeling) to 0.98 (item 3: past failure) with the significant probability from <.001 to .011, respectively.

Buuren & Groothuis-Oudshoorn, 2010). For the imputation, we created 10 imputed data sets with 100 iterations.

Participant Demographics

Participants' demographic characteristics can be found in Table 1. There was no significant gender difference in age, $t(163) = -1.01$, $p = .313$, $d = 0.16$, or the frequencies of race/ethnicity, $\chi^2(4, N = 165) = 3.19$, $p = .527$. Participants' age and race/ethnicity were controlled in all analyses.

Social Interaction Anxiety and Gender Predicting Total Depression Score

We first tested whether social interaction anxiety, gender, and their interaction predicted the total depression score. There was a significant main effect of social interaction anxiety, Boot β = 5.35, Boot B = .25, Boot SE = .03, Boot 95% CI [0.18, 0.31], such that higher social interaction anxiety scores were associated with higher total depression scores. The main effect of gender, Boot β = .81, Boot B = .81, Boot SE = 1.17, Boot 95% CI [−1.44, 3.14], and the interaction between social interaction anxiety and gender, Boot β = 1.46, Boot B = .07, Boot SE = .05, Boot 95% CI [−0.03, 0.18] did not significantly predict total depression scores (Table 2).

Social Interaction Anxiety and Gender Predicting Individual Depressive Symptoms

We examine the interaction between social interaction anxiety and gender as a predictor of each depressive symptom score. There were two significant interaction effects. First, there was a significant interaction between social interaction anxiety and gender in predicting self-dislike (item 7), Boot β = .28, Boot B = .01, Boot SE = .01, Boot 95% CI [0.00, 0.02] (see Table 2). Bootstrapped simple slopes indicated that greater social interaction anxiety was associated with greater self-dislike in both women and men, with a greater slope in men, Boot β = .76, Boot B = .04, Boot SE = .01, Boot 95% CI [0.03, 0.05] than in women, Boot β = .50, Boot B = .02, Boot SE = .00, Boot 95% CI [0.02, 0.03] (see Table 3 and Fig. 1). Second, there was a significant interaction between social interaction anxiety and gender in predicting worthlessness (item 14), Boot β = .20, Boot B = .01, Boot SE = .01, Boot 95% CI [0.00, 0.02] (see Table 2) in both women and men, with a greater slope in men, Boot β = .46, Boot B = .02, Boot SE = .00, Boot 95% CI [0.01, 0.03] than in women, Boot β = .30, Boot B = .01, Boot SE = .00, Boot 95% CI [0.01, 0.02] (see Table 3 and Fig. 1).

Table 2 Bootstrapped regression model of the main and interaction effects of social interaction anxiety and gender predicting depressive symptoms ($N = 165$)

Dependent Variable	Predictor	Bootstrapped Regression Model Parameters				Model Summary		
		Boot β	Boot B	Boot SE	Boot 95% CI	R^2	F	p
Total depression scores						.42	13.86	< .001
	SIAS	**5.35**	**0.25**	**0.03**	**[0.18, 0.31]**			
	Gender	0.81	0.81	1.17	[-1.44, 3.14]			
	SIAS × Gender	1.46	0.07	0.05	[-0.03, 0.18]			
Sadness						.17	4.07	< .001
	SIAS	**0.18**	**0.01**	**0.00**	**[0.00, 0.01]**			
	Gender	-0.01	-0.01	0.09	[-0.18, 0.17]			
	SIAS × Gender	0.16	0.01	0.00	[-0.00, 0.02]			
Pessimism						.27	7.12	< .001
	SIAS	**0.36**	**0.02**	**0.00**	**[0.01, 0.02]**			
	Gender	0.03	0.03	0.11	[-0.18, 0.25]			
	SIAS × Gender	0.01	0.00	0.01	[-0.01, 0.01]			
Past failure						.40	13.02	< .001
	SIAS	**0.37**	**0.02**	**0.00**	**[0.01, 0.02]**			
	Gender	0.18	0.18	0.11	[-0.03, 0.40]			
	SIAS × Gender	0.20	0.01	0.00	[-0.00, 0.02]			
Loss of pleasure						.24	6.20	< .001
	SIAS	**0.26**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	0.16	0.16	0.09	[-0.01, 0.35]			
	SIAS × Gender	0.09	0.00	0.00	[-0.00, 0.01]			
Guilty feelings						.23	5.74	< .001
	SIAS	**0.29**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	0.04	0.04	0.09	[-0.13, 0.23]			
	SIAS × Gender	0.03	0.00	0.00	[-0.01, 0.01]			
Punishment feelings						.09	2.02	.047
	SIAS	**0.14**	**0.01**	**0.00**	**[0.00, 0.01]**			
	Gender	0.04	0.04	0.08	[-0.11, 0.20]			
	SIAS × Gender	0.05	0.00	0.00	[-0.00, 0.01]			
Self-dislike						.42	14.13	< .001
	SIAS	**0.49**	**0.02**	**0.00**	**[0.02, 0.03]**			
	Gender	**0.25**	**0.25**	**0.11**	**[0.03, 0.48]**			
	SIAS × Gender	**0.28**	**0.01**	**0.01**	**[0.00, 0.02]**			
Self-criticalness						.29	8.02	< .001
	SIAS	**0.38**	**0.02**	**0.00**	**[0.01, 0.02]**			
	Gender	0.19	0.19	0.13	[-0.05, 0.44]			
	SIAS × Gender	0.13	0.01	0.01	[-0.01, 0.02]			
Crying						.12	2.71	.008
	SIAS	**0.22**	**0.01**	**0.00**	**[0.00, 0.02]**			
	Gender	-0.17	-0.17	0.10	[-0.37, 0.01]			
	SIAS × Gender	0.02	0.00	0.01	[-0.01, 0.01]			
Agitation						.16	3.69	< .001
	SIAS	**0.24**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	0.01	0.01	0.10	[-0.18, 0.21]			
	SIAS × Gender	0.01	0.00	0.00	[-0.01, 0.01]			
Loss of interest						.22	5.42	< .001
	SIAS	**0.21**	**0.01**	**0.00**	**[0.01, 0.01]**			
	Gender	0.09	0.09	0.09	[-0.08, 0.26]			
	SIAS × Gender	0.12	0.01	0.00	[-0.00, 0.01]			
Indecisiveness						.29	8.07	< .001
	SIAS	**0.51**	**0.02**	**0.00**	**[0.02, 0.03]**			
	Gender	-0.04	-0.04	0.13	[-0.30, 0.20]			
	SIAS × Gender	0.00	0.00	0.01	[-0.01, 0.01]			

Table 2 (continued)

Dependent Variable	Predictor	Bootstrapped Regression Model Parameters				Model Summary		
		Boot β	Boot B	Boot SE	Boot 95% CI	R^2	F	p
Worthlessness						.31	8.67	< .001
	SIAS	**0.29**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	**0.22**	**0.22**	**0.10**	**[0.03, 0.42]**			
	SIAS × Gender	**0.20**	**0.01**	**0.01**	**[0.00, 0.02]**			
Loss of energy						.18	4.31	< .001
	SIAS	**0.23**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	-0.09	-0.09	0.09	[-0.26, 0.09]			
	SIAS × Gender	0.09	0.00	0.00	[-0.00, 0.01]			
Changes in sleep						.13	2.92	.005
	SIAS	**0.26**	**0.01**	**0.00**	**[0.01, 0.02]**			
	Gender	-0.03	-0.03	0.12	[-0.26, 0.21]			
	SIAS × Gender	-0.06	0.00	0.01	[-0.01, 0.01]			
Irritability						.14	3.29	.002
	SIAS	**0.14**	**0.01**	**0.00**	**[0.00, 0.01]**			
	Gender	0.11	0.11	0.10	[-0.07, 0.31]			
	SIAS × Gender	0.12	0.01	0.00	[-0.00, 0.01]			
Changes in appetite						.13	2.84	.006
	SIAS	**0.21**	**0.01**	**0.00**	**[0.00, 0.01]**			
	Gender	-0.05	-0.05	0.10	[-0.24, 0.15]			
	SIAS × Gender	0.02	0.00	0.01	[-0.01, 0.01]			
Concentration difficulty						.22	5.63	< .001
	SIAS	**0.36**	**0.02**	**0.00**	**[0.01, 0.02]**			
	Gender	-0.07	-0.07	0.11	[-0.28, 0.15]			
	SIAS × Gender	0.02	0.00	0.01	[-0.01, 0.01]			
Tiredness or fatigue						.14	3.15	.003
	SIAS	**0.21**	**0.01**	**0.00**	**[0.00, 0.01]**			
	Gender	-0.06	-0.06	0.10	[-0.24, 0.14]			
	SIAS × Gender	-0.03	0.00	0.01	[-0.01, 0.01]			

Note. Bootstrapped parameters reflect the effects of social interaction anxiety, gender and their interaction on depressive symptoms, adjusting for age and race/ethnicity; Total depression scores: scores on the BDI-II excluding item 9 (suicidal thoughts) and item 21 (loss of interest in sex); SIAS: scores on the Social Interaction Anxiety Scale; Statistically significant results are bolded (95% confidence interval)

We then repeated these analyses to include regression models predicting depression symptoms with re-coded items to reflect directional responses (item 16: changes in sleep, and item 18: changes in appetite).[3] We did not find any significant main or interaction effects on these variables.

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[3] Age and race/ethnicity controlled regression on recoded change in sleep (item 16) demonstrated that neither the main effects of social interaction anxiety, Boot β = .08, Boot B = .00, Boot SE = .01, Boot 95% CI [−0.01, 0.01] and gender, Boot β = −.21, Boot B = −.21, Boot SE = .15, Boot 95% CI [−0.50, 0.08] nor the interaction between the two variables, Boot β = −.08, Boot B = −.00, Boot SE = .01, Boot 95% CI [−0.02, 0.01] was significant, R^2 = .10, $F(8, 151)$ = 2.14, p = .036. Age and race/ethnicity controlled regression on recoded change in appetite (item 18) also indicated that neither the main effects of social interaction anxiety, Boot β = −.09, Boot B = −.00, Boot SE = .00, Boot 95% CI [−0.01, 0.00] and gender, Boot β = .11, Boot B = .11, Boot SE = .12, Boot 95% CI [−0.12, 0.35] nor the interaction between the two variables, Boot β = .10, Boot B = .01, Boot SE = .01, Boot 95% CI [−0.01, 0.02] was significant, R^2 = .03, $F(8, 150)$ = .53, p = .829.

The Main Effect of Social Interaction Anxiety on Individual Depression Symptoms

For the models where the interaction between social interaction anxiety and gender was not significant, social interaction anxiety positively predicted all of the remaining individual depression items (Table 2). These items include sadness (item 1), pessimism (item 2), past failure (item 3), loss of pleasure (item 4), guilty feelings (item 5), punishment feelings (item 6), self-criticalness (item 8), crying (item 10), agitation (item 11), loss of interest (item 12), indecisiveness (item 13), loss of energy (item 15), changes in sleep (item 16), irritability (item 17), changes in appetite (item 18), concentration difficulty (item 19), and tiredness or fatigue (item 20).

Fig. 1 Bootstrapped predictive values of social interaction anxiety on depressive symptoms in women and men. *Note*. Dots represent bootstrapped simple slopes (β) for women and men of social interaction anxiety predicting depressive symptoms (β); Statistically significant slope differences are bolded (95% confidence interval)
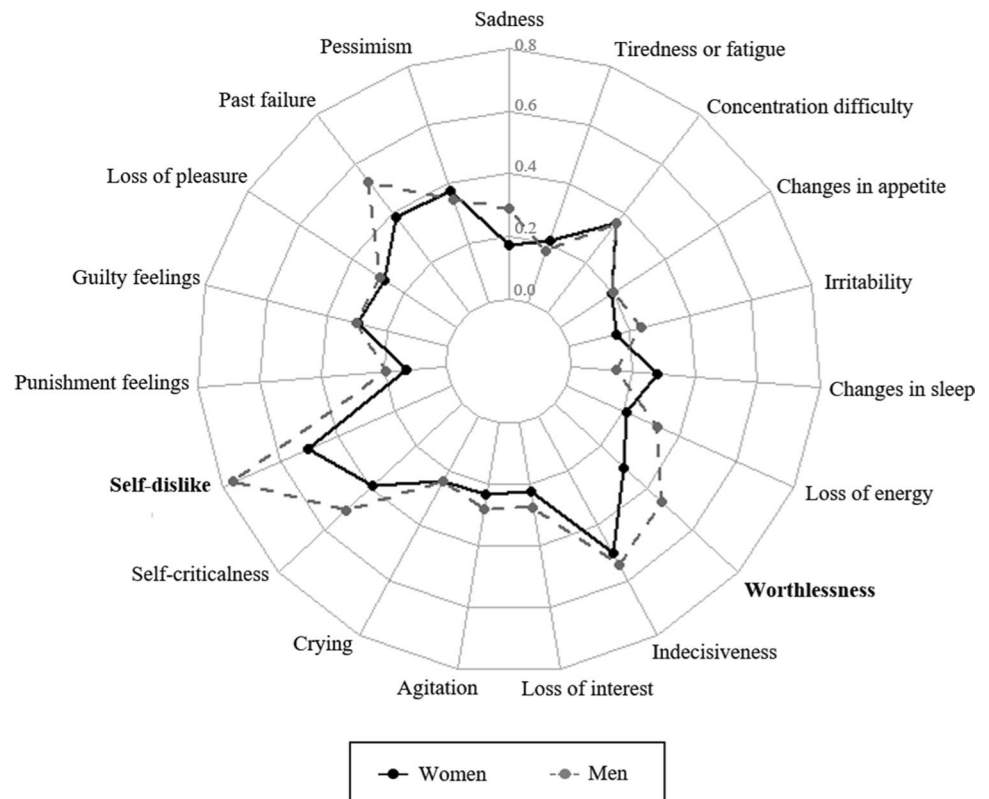
Discussion

The purpose of this study was to examine gender differences in the relationship between social anxiety and depressive symptoms. To test this, we used cross-sectional data from a community sample of adult participants. Our first hypothesis, that total social interaction anxiety would predict total depression scores was supported. This finding replicates prior findings that SAD and MDD symptoms are highly comorbid (Beesdo et al., 2007; Kessler et al., 2005b), and suggests that these relationships are present even in community samples reporting a range of social interaction anxiety and depression symptoms (Stein et al., 2001). Our second hypothesis, that the relationships between social interaction anxiety and individual depression symptoms would vary by gender was partially supported. We found strong evidence that the relationships between social interaction anxiety and both self-dislike and worthlessness were stronger in men than in women. These results are consistent with a previous finding that the relationship between low self-esteem and greater social anxiety was stronger in men than in women (Glashouwer et al., 2013). These findings also indicate that differences in the relationship between social anxiety and depression can be better understood when considering individual symptomatology of depression. Our third hypothesis that social interaction anxiety would positively predict individual depression symptoms when there was no significant

interaction with gender was supported. Specifically, higher social interaction anxiety predicted greater endorsement of each of the depressive symptoms. These results are consistent with previous findings of high comorbidity between SAD and MDD (Beesdo et al., 2007; Kessler et al., 2005b; Stein et al., 2001) and extend these results to the individual depression symptom level.

Self-dislike and worthlessness entail negative self-perception. Greater relationships between social interaction anxiety and self-dislike and worthlessness in men implicate that social interaction anxiety in men could be associated with a greater perception of self-dissatisfaction. In fact, researchers have suggested that gender stereotypes could lead to greater distress in men with social anxiety compared to women with social anxiety. Weinstock (1999) described that men are often expected to be assertive and outgoing in social settings, which might cause men to experience greater societal pressure and consequential distress when they struggle to engage in social interactions. Research suggests that shy boys are more likely to receive negative feedback from their parents and peers than shy girls (Bacon & Ashmore, 1985; Gazelle & Ladd, 2003; Rubin et al., 2009). Studies also found that boys with social anxiety were more likely to be victimized or rejected by their peers than girls with social anxiety (Erath et al., 2007; Spangler & Gazelle, 2009; Storch et al., 2005). In addition, a series of studies showed that men who were perceived to be shy in childhood developed

Table 3 Bootstrapped simple slopes of social interaction anxiety predicting depressive symptoms ($N = 165$)

Dependent Variable	Gender	Bootstrapped Simple Slope Parameters			
		Boot β	Boot B	Boot SE	Boot 95% CI
Total depression scores	W	5.44	0.25	0.03	[0.19, 0.31]
	M	6.47	0.30	0.05	[0.22, 0.40]
Sadness	W	0.17	0.01	0.00	[0.00, 0.01]
	M	0.29	0.01	0.00	[0.01, 0.02]
Pessimism	W	0.38	0.02	0.00	[0.01, 0.02]
	M	0.35	0.02	0.01	[0.01, 0.03]
Past failure	W	0.39	0.02	0.00	[0.01, 0.02]
	M	0.53	0.02	0.00	[0.02, 0.03]
Loss of pleasure	W	0.28	0.01	0.00	[0.01, 0.02]
	M	0.29	0.01	0.00	[0.01, 0.02]
Guilty feelings	W	0.30	0.01	0.00	[0.01, 0.02]
	M	0.30	0.01	0.00	[0.01, 0.02]
Punishment feelings	W	0.13	0.01	0.00	[0.00, 0.01]
	M	0.20	0.01	0.00	[0.00, 0.02]
Self-dislike	W	0.50	0.02	0.00	[0.02, 0.03]
	M	0.76	0.04	0.01	[0.03, 0.05]
Self-criticalness	W	0.39	0.02	0.00	[0.01, 0.03]
	M	0.51	0.02	0.00	[0.01, 0.03]
Crying	W	0.24	0.01	0.00	[0.00, 0.02]
	M	0.24	0.01	0.00	[0.00, 0.02]
Agitation	W	0.23	0.01	0.00	[0.01, 0.02]
	M	0.28	0.01	0.00	[0.01, 0.02]
Loss of interest	W	0.23	0.01	0.00	[0.01, 0.01]
	M	0.27	0.01	0.00	[0.01, 0.02]
Indecisiveness	W	0.50	0.02	0.00	[0.02, 0.03]
	M	0.54	0.03	0.01	[0.01, 0.04]
Worthlessness	W	0.30	0.01	0.00	[0.01, 0.02]
	M	0.46	0.02	0.00	[0.01, 0.03]
Loss of energy	W	0.21	0.01	0.00	[0.00, 0.01]
	M	0.32	0.01	0.00	[0.01, 0.02]
Changes in sleep	W	0.28	0.01	0.00	[0.01, 0.02]
	M	0.14	0.01	0.01	[0.00, 0.02]
Irritability	W	0.16	0.01	0.00	[0.00, 0.01]
	M	0.24	0.01	0.00	[0.00, 0.02]
Changes in appetite	W	0.20	0.01	0.00	[0.00, 0.01]
	M	0.20	0.01	0.01	[0.00, 0.02]
Concentration difficulty	W	0.36	0.02	0.00	[0.01, 0.02]
	M	0.36	0.02	0.01	[0.01, 0.03]
Tiredness or fatigue	W	0.21	0.01	0.00	[0.00, 0.01]
	M	0.17	0.01	0.01	[0.00, 0.02]

Bootstrapped statistical results reflect the effects of social interaction anxiety on depressive symptoms, adjusting for age and race/ethnicity; W women, M men; Total depression scores, scores on the BDI-II excluding item 9 (suicidal thoughts) and item 21 (loss of interest in sex); Statistically significant results are bolded (95% confidence interval)

greater social, occupational, and emotional impairments in their adulthood than women who were perceived as shy during childhood (Caspi et al., 1988; Colder et al., 2002; Gest, 1997).

In addition, a group of researchers (Alden & Wallace, 1991; Asher et al., 2017) postulated that self and identity discrepancy could result in greater impairments in men with SAD. According to the Identity-Discrepancy Theory (Large & Marcussen, 2000) and Self-Discrepancy Theory (Higgins, 1987), the discrepancy between one's ideal self and actual self can cause distress. A large number of studies describe the notion of an ideal identity held by men to include being assertive, dominant, and active (Doey et al., 2014; Eagly et al., 2000; Eagly & Wood, 1991). Based on these findings, researchers have suggested that men with SAD may not perceive themselves to conform to this ideal identity, and therefore experience greater distress (Alden & Wallace, 1991; Asher et al., 2017) that may result in feelings of self-dislike and worthlessness. In support of this, previous studies found that individuals with comorbid SAD and MDD have greater ideal and actual self-discrepancies than individuals with either diagnosis alone (Strauman, 1989; Weilage & Hope, 1999). A previous study compared adolescent girls and boys and found that maladaptive cognitive schemas such as perceptions of disconnection/rejection and other-directedness are closely associated with social stressors and that schemas predict later onset of depression in boys, but not in girls (Calvete et al., 2015). In summary, the findings in the present study, that greater social interaction anxiety was more predictive of self-dislike and worthlessness in men compared to women, could be reflective of discrepancies between self-perception and gender-based identity expectations. Future studies should further investigate potential relationships between self-perception and identity and patterns of SAD and MDD symptom presentations.

Several limitations should be considered when interpreting the current findings. Due to the absence of longitudinal measurements, we were not able to establish causality between social interaction anxiety, gender, and depression. Future studies should measure these constructs across multiple time points to establish directional impacts of social interaction anxiety and gender on depressive symptoms. Moreover, the participants recruited for the current study were predominantly White Americans (60%). For better generalizability, the inclusion of a greater number of individuals identifying as members of racial/ethnic minority groups is recommended. In the same vein, the participants in the current study identified with binary gender identities, and we did not assess other variables related to gender and sexual identities, such as LGBTQIA+ membership, which may also have an impact on an individual's social interactions and self-perceptions. Considering the paucity of the literature on gender minorities, and for a more comprehensive understanding of the role of gender in the link between social interaction anxiety and depressive symptomatology, the inclusion of gender minorities is highly recommended. Furthermore, future studies should consider the inclusion

of other constructs of social anxiety. While we focused on social interaction anxiety, social anxiety can also manifest in performance settings (performance anxiety). Although previous findings demonstrate that social interaction anxiety has a greater relevance to depression than performance anxiety does (Hughes et al., 2006; Kashdan, 2002, 2004), the effects of performance anxiety on depressive symptoms have not been tested with respect to gender differences, and therefore, it is still unknown whether similar relationships hold with specific subtypes of social anxiety. This can be assessed in future studies by administering questionnaires that cover broader domains of social anxiety (e.g., The Liebowitz Social Anxiety Scale (LSAS; Safren et al., 1999), The Social Phobia Diagnostic Questionnaire (SPDQ; Newman et al., 2003)) or focus on a specific component of social anxiety symptoms (e.g., the Social Phobia Scale (SPS; Mattick & Clarke, 1998), Fear of Negative Evaluation Scale (FNE; Leary, 1983)). In addition, alternative self-report and clinician-administered depression measures, like the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), the Hamilton Depression Rating Scale (HAM-D; Williams, 1988), and the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) could be used in future studies to examine constellations of depression symptoms.

Despite the limitations, our findings have implications for clinical assessment and treatment. In clinical assessment of socially anxious patients, assessing the presence of comorbid depression symptoms is important considering their high comorbidity. In addition, our data showing stronger relationships between social interaction anxiety and depressive symptoms of self-dislike, and worthlessness in men compared to women could inform assessment and clinical intervention targets for future investigations. Self-devaluation symptoms could be viable targets of intervention for socially anxious men. For example, cognitive restructuring techniques in cognitive behavioral therapy (CBT; Beck, 1979) or rational emotive behavior therapy (REBT; Ellis, 1957, 1995) can help individuals with negative self-perceptions address their symptoms. Furthermore, treatment modalities focusing on the non-judgmental perception of self, such as mindfulness-based treatment approaches including but not limited to mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990), mindfulness-based cognitive therapy (MBCT; Segal et al., 2008), acceptance and commitment therapy (ACT; Hayes et al., 2008) and mindful self-compassion programs (MSC; Germer & Neff, 2013; Neff, 2003) could be studied as potential interventions to address symptoms of self-devaluation in the context of SAD and depression.

In summary, the current study demonstrates that gender can be an important factor in understanding the relationship between social interaction anxiety and comorbid depressive symptoms. Our findings contribute to a more comprehensive understanding of the relationships between social interaction anxiety and depression symptoms at the individual symptom level and have important implications for assessment and treatment.

Data Availability Deidentified data used in the current study will be made available from the corresponding author on reasonable request.

Declarations

We declare that this manuscript is original, has not been published before, and is not currently being considered for publication elsewhere. All procedures were approved by the University of Michigan Institutional Review Board (IRBMED). All authors approved the final version of the manuscript and agree with its submission to the journal.

Informed Consent Written informed consent was obtained from all participants included in this study.

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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