

# Exploring the Relationship Between Social Anxiety and Bulimic Symptoms: Mediational Effects of Perfectionism Among Females

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**Abstract** Previous findings indicate that social anxiety and bulimia co-occur at high rates; one mechanism that has been proposed to link these symptom clusters is perfectionism (Silgado et al. in *Cogn Ther Res* 34(5):487–492, 2010). We tested mediational models among 167 female undergraduates in which maladaptive evaluative perfectionism concerns (MEPC; i.e., critical self-evaluative perfectionism) mediated the relationship between social anxiety and bulimic symptoms. Results from a first model indicated that MEPC mediated the relationship between *fear of public scrutiny* and bulimia symptoms. This indirect effect was significant above and beyond the indirect effects of maladaptive body-image cognitions and perfectionism specific to pure personal standards. A second model was tested with MEPC mediating the relationship between *social interaction anxiety* and bulimia symptoms. Similar results were obtained; however, in this model, a significant direct effect remained after partialing out the indirect effect of the mediators. Theoretical implications are discussed.

**Keywords** Social anxiety · Bulimia · Perfectionism · Eating disorders · Anxiety disorders

## Introduction

Anxiety and eating disorders co-occur at high rates (Godart et al. 2002; Swinbourne and Touyz 2007). Social anxiety

disorder (SAD) in particular has been reported to be one of the most frequent co-occurring anxiety disorders with eating disorders (Swinbourne and Touyz 2007). As many as 67.8 % of individuals with bulimia nervosa (BN) qualify for a comorbid diagnosis of SAD (Hinrichson et al. 2003), which is far greater than the lifetime prevalence of SAD in the general population (12 %; Kessler et al. 2005). Past research has examined a number of elements that are proposed to account for this high rate of comorbidity.

One such element is perfectionism, which has been linked extensively to a wide range of psychological disorders (Egan et al. 2011). Egan et al. (2011) argued that perfectionism can be accompanied by overly critical self-evaluations when performance does not meet excessively high standards, and that this maladaptive cycle can become pathological. Others characterize perfectionism as becoming maladaptive when individuals evaluate themselves exclusively based on the pursuit of excessively high standards in a given salient domain (e.g., physical appearance; Shafran et al. 2002) despite the occurrence of negative consequences as a result of setting such standards. Shafran et al. (2002) term this tendency ‘clinical perfectionism’ (p. 778). Perfectionism has been studied in conjunction with both SAD and BN. Among patients with BN, perfectionism is believed to be related to an overemphasis on attractive physical appearance (Brewerton et al. 1995). For example, women who reported that their bodies do not conform to thin-ideals were more likely to endorse bulimic symptoms (Cash and Szymanski 1995).

Furthermore, Antony et al. (1998) reported that SAD and concern over mistakes (CM) and socially-prescribed perfectionism are positively related, and Egan et al. (2011) reported that perfectionism can contribute to the maintenance of SAD. Interestingly, no studies known to the authors have reported that personal standards are positively

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related to SAD (Egan et al. 2011), and others have reported a negative relationship between these constructs (Shumaker and Rodebaugh 2009). Thus, among individuals with both SAD and perfectionistic tendencies, it has been proposed that these individuals may have unrealistically ideal expectations for how social interactions or performances should unfold, thereby leading to negative self-evaluation when these standards are not met (Hope et al. 2000). Empirical studies have reported indirect support of this idea (Lundh and Öst 2001). Some research suggests that perfectionism may not be a unitary construct. Shumaker and Rodebaugh (2009) have reported that pure personal standards (PPS), a widely recognized facet of perfectionism, is *inversely* related to social anxiety. DiBartolo et al. (2004) define PPS as perfectionism that does not derive from unhealthy psychological functioning, but rather is positively related to self-perceived competency.

Shumaker and Rodebaugh (2009) also documented a robust positive relationship between social anxiety and maladaptive evaluative perfectionism concerns (MEPC). According to Frost et al. (1993), MEPC refers to critical self-evaluation, and others in addition to Shumaker and Rodebaugh (2009) have reported MEPC to be related to poor psychological functioning (DiBartolo et al. 2008). DiBartolo et al. indicated that MEPC was positively related to psychological symptoms such as fear of negative evaluation [FNE; a core facet of SAD (Heimberg et al. 2010)] and depression, and negatively related to trait positive affect. DiBartolo et al. (2004) reported that PPS may be positively related to adaptive outcomes such as competency in job and school settings, which is consistent with Shumaker and Rodebaugh's (2009) findings, which indicated that PPS were negatively related to social anxiety severity. These results highlight the importance of theoretically and psychometrically distinguishing between adaptive versus maladaptive perfectionism. Given that SAD, BN, and maladaptive perfectionism share a similar negative self-evaluation component, it may be the case that MEPC is an important factor linking SAD and BN, whereas PPS may not serve as a linking factor between SAD and BN. It also remains to be seen whether MEPC is a unique mediator between SAD and BN above and beyond potentially related constructs such as maladaptive body-image cognitions (MBIC).

Silgado et al. (2010) examined the relationship between SAD and BN by testing if perfectionism may interact with social anxiety symptoms to produce varying levels of bulimic symptoms. They tested this hypothesis by comparing a non-treatment-seeking SAD sample to a matched normal control sample. They reported that individuals high in both social anxiety and perfectionism reported the highest levels of bulimic behaviors. They concluded that perfectionism may serve as a factor that links SAD and BN,

and which accounts for some of the overlap across these disorders.

Another important issue in understanding the link between SAD, BN, and perfectionism pertains to the chronology of these constructs. Bulik et al. (1996) reported that the average age of onset for an anxiety disorder is roughly 8 years of age, whereas the average age of onset for BN is 20. This finding, along with the high correlation between SAD and BN (Swinbourne and Touyz 2007), has led some researchers to argue that anxiety disorders serve as a genetically-induced mediator for eating disorders (Kaye et al. 2004); others have argued that anxiety disorders may simply be a risk factor for the later development of an eating disorder (Bulik et al. 1996). Brewerton et al. (1995) and Godart et al. (2002) both reported that, among patients diagnosed with both SAD and BN, 90 % experienced the emergence of SAD *before* BN, suggesting that, at the very least, SAD represents a type of predisposing vulnerability to the later development of BN. It should be noted however, that one study conducted by Buckner et al. (2010) employed a longitudinal design with a clinical sample and found that, among adolescents (generally 16 years of age) with BN, but not SAD, BN predicted risk for SAD at age 30. While potentially suggestive of a different chronological relationship between SAD and BN, these results should be considered in light of the method in which participants were selected for this analysis. Specifically, including participants with BN but not SAD at time 1 (i.e., age 16) may have resulted in a group of individuals that is not representative of the vast majority (90 %; Brewerton et al. 1995) of people who experience both disorders in the reverse chronological order (i.e., SAD before BN; Brewerton et al. 1995). Thus, while the findings of Buckner et al. (2010) are informative with regard to a subpopulation of individuals with comorbid bulimia and SAD, the generalizability of their findings to the typical chronological development of SAD and BN must be weighed cautiously. Perfectionism has also been reported to serve as a predisposing risk factor for BN. In two prospective studies, researchers reported that perfectionism predicts later bulimic symptoms (Steele et al. 2007; Vohs et al. 1999). Together, the above findings suggest that SAD and perfectionism may both serve as risk factors for BN, and that social anxiety and perfectionism may interact to explain significant variance in bulimic symptoms (Silgado et al. 2010).

Additional theory highlights a chronological relationship between SAD and perfectionism. First, cognitive-behavioral models of SAD have characterized perfectionism as a maintaining factor for SAD (Heimberg et al. 1995). Thus, patients with existing SAD have perfectionistic expectations which prime hypervigilance to cues of evaluation, which in turn leads to greater social anxiety and avoidance.

Furthermore, Lundh and Öst (2001) reported that perfectionism scores among SAD patients declined significantly following cognitive-behavioral therapy (CBT) targeting social anxiety, and that treatment non-responders had significantly higher levels of perfectionism than treatment responders. Thus, perfectionism may be associated with treatment non-response, at least with regard to CBT for SAD. These results suggest that perfectionism may be dependent upon social anxiety symptoms (at least, for individuals with problematic social anxiety). The authors know of no findings demonstrating that perfectionism specifically increases vulnerability to the development of SAD; rather, there are plentiful data in the transdiagnostic literature which characterize perfectionism as a *maintaining* factor of SAD (Egan et al. 2011). While perfectionism is cited as a transdiagnostic risk factor for other disorders such as eating disorders and depression, findings highlighting perfectionism as a risk factor for SAD are currently lacking. However, evidence for perfectionism as a maintaining factor of SAD is provided by findings that perfectionism may depend upon variability in SAD, but not necessarily vice versa (Lundh and Öst 2001).

Ashbaugh et al. (2007) demonstrated that CM and *doubts about actions* (i.e., two widely recognized facets of perfectionism; see Frost et al. 1990) decreased significantly following CBT for SAD, and that the magnitude of this change predicted post-treatment SAD severity above and beyond pre-treatment SAD severity. Furthermore, there are data suggesting that targeting perfectionism directly in treatment leads to subsequent reduction of Axis I symptoms (e.g., anxiety, depression), although some of these studies used single case experimental designs (Egan and Hine 2008; Glover et al. 2007). Findings from one randomized controlled trial indicated that CBT for perfectionism significantly reduced co-occurring psychopathology. However, it is important to note that these studies did not focus on SAD patients specifically, but rather on mixed samples of patients with various anxiety disorders (Riley et al. 2007), although a subsample (25 %) of participants in one of these studies was diagnosed with SAD as either a primary or comorbid diagnosis (Riley et al. 2007). Along similar lines, Steele and Wade (2008) reported that CBT for perfectionism and CBT for BN were both efficacious in reducing BN symptoms, but that CBT for perfectionism reduced additional Axis I psychopathology beyond BN, whereas CBT for BN did not. Taken together, the findings reviewed above are consistent with the notion that perfectionism is, to some extent, dependent upon variability in SAD; however, research to date has not examined this issue directly.

A separate body of research posits that, in general, eating and anxiety disorders derive from risk factors that are common to both, and that it may not necessarily be the

case that eating disorders are mediated by anxiety disorders (Pallister and Waller 2008). Pallister and Waller propose a generalized harm avoidance tendency as a possible shared risk factor, suggesting that the same cognitive and behavioral processes that one uses to avoid anxiety-provoking situations (e.g., humiliating oneself) may be the same type of processes that are used to avoid eating disorder-related fears (e.g., gaining a large amount of weight). While we acknowledge this notion as a plausible alternative to the mediational model which we propose in the present study, we believe that the findings reviewed above documenting the typical chronological relationship between SAD and BN may represent a complementary rather than a mutually exclusive path to explain variance in eating disorders such as bulimia. Future longitudinal research is needed to make valid inferences about the etiological progression of SAD, BN, and perfectionism.

### Current Study

The current study employed a series of analyses in order to clarify the relationships between social anxiety (i.e., social interaction anxiety and fear of public scrutiny), MEPC, and bulimia. According to previous findings, there is some indirect support for a sequential relationship between the development of social anxiety symptoms, perfectionism, and bulimia symptoms, though no study to date has evaluated this hypothesis directly. Thus, the current study had two primary aims: (1) To replicate previous findings regarding the cross-sectional relationships between social anxiety (i.e., social interaction anxiety and fear of public scrutiny), perfectionism, and bulimia. Specifically, it was hypothesized that: (1a) social anxiety (i.e., social interaction anxiety and fear of public scrutiny) would be positively related to MEPC; (1b) social anxiety would be negatively related to perfectionism specific to PPS; (1c) bulimic symptoms would be positively related to MEPC; and (1d) social anxiety symptoms would be positively related to bulimic symptoms. The second aim of the present study was: (2) to test cross-sectional mediational models involving social anxiety (i.e., social interaction anxiety and fear of public scrutiny), perfectionism, and bulimic symptoms, which were informed by data reflecting the typical developmental sequence of these constructs (Swinbourne and Touyz 2007). Specifically, it was hypothesized that MEPC would mediate the relationship between social anxiety and bulimia symptoms above and beyond (a) MBIC and (b) PPS. The authors acknowledge the limitations of using mediation techniques within a cross-sectional dataset for reasons outlined by Maxwell and Cole (2007). The current study does not claim to make any causal conclusions based on these analyses; rather the current study seeks to provide empirical justification for future research incorporating

prospective designs which are necessary to make any causal claims.

## Methods

### Participants

One hundred, sixty-seven female undergraduates completed a series of questionnaires in exchange for partial course credit. This sample was targeted because of the high occurrence of EDs among female undergraduates (Heatherton et al. 1995). All participants provided informed consent before completing any study measures. A summary of the sample characteristics may be found in Table 1.

### Measures

#### *Social Phobia Scale (SPS; Mattick and Clarke 1998)*

The SPS is a 20-item self-report measure designed to assess distress associated with being observed by others while engaging in various social activities (i.e., eating, writing, using public restrooms, standing in line). Mattick and Clarke (1998) reported that the SPS demonstrates excellent psychometric properties. SPS scores were entered as the independent variable in one of our hypothesized multiple mediational models (see “[Procedure](#)”).

**Table 1** Summary of sample demographics and study measure scores

	<i>N</i> = 167
Demographics	
Race	89.8 % Caucasian 10.2 % non-Caucasian
Age	19.16 (1.35)
Measure scores	
Fear of public scrutiny	18.13 (13.45)
Social interaction anxiety	18.75 (12.04)
Bulimia symptoms	14.62 (5.51)
Maladaptive evaluative concerns	55.99 (15.55)
Pure personal standards	16.39 (4.34)
Maladaptive body-image cognitions	63.08 (34.99)

Standard deviations reported in parentheses; *n*'s vary from 161 to 167 due to missing data; fear of public scrutiny = Social Phobia Scale (SPS), social interaction anxiety = Social Interaction Anxiety Scale–straightforward (SIAS–S); maladaptive evaluative concerns = Frost Multidimensional Perfectionism Scale–maladaptive evaluative concerns (FMPS–MEC); pure personal standards = Frost Multidimensional Perfectionism Scale–pure personal standards (FMPS–PPS); maladaptive body-image cognitions = assessment of body-image cognitive distortions (ABCD), bulimia symptoms = eating disorders inventory-II, bulimia scale (EDI-II–B)

*Social Interaction Anxiety Scale, Straightforward Items (SIAS–S; Mattick and Clarke 1998; Rodebaugh et al. 2007)*

The Social Interaction Anxiety Scale (SIAS; Mattick and Clarke 1998) is a 20-item self-report instrument that measures anxiety experienced as a result of group or dyadic social interactions. Rodebaugh et al. (2007) have reported that the 17 straightforwardly-worded items of the SIAS are superior in terms of their validity than the reverse-scored items, and so recommend scoring the SIAS using only these straightforwardly-worded items (i.e., SIAS–S). The SIAS–S has been shown to demonstrate excellent psychometric properties (Rodebaugh et al. 2011, including construct and factorial validity, across both undergraduate and clinical samples. SIAS–S scores were entered as the independent variable in one of our hypothesized multiple mediational models (see “[Procedure](#)”).

#### *Assessment of Body-Image Cognitive Distortions (ABCD; Jakatdar et al. 2006)*

The ABCD is a 37-item self-report measure that was designed to measure the occurrence of thoughts related to errors or exaggerations that individuals may experience pertaining to body image in different situations. The ABCD was also found to relate significantly to a wide range of other measures assessing body-image and weight preoccupation, providing support for convergent validity. The ABCD was used in the current study in order to capture the unique meditational effect of maladaptive evaluative perfectionism above and beyond the construct tapped by this measure (i.e., MBIC).

#### *Eating Disorder Inventory-II, Bulimia scale (EDI-II–B; Garner et al. 1983)*

The EDI-II–B is a 7-item self-report measure that is designed to measure self-reported eating behaviors that are related to BN. The EDI-II–B has demonstrated good psychometric properties, and EDI-II–B scores reliably differentiated between individuals with and without eating disorders (Garner et al. 1983).

#### *Frost's Multidimensional Perfectionism Scale (FMPS; Frost et al. 1990)*

The FMPS is a 35-item self-report measure that assesses different *dimensions of perfectionism* identified by Frost et al. (1990), including CM (FMPS–CM), doubting one's actions (FMPS–D), organization (FMPS–O), personal standards (FMPS–PS), and beliefs about parental expectations and criticism (FMPS–PE and –PC, respectively). Frost et al. (1993) reported that the FMPS may measure

two aspects of perfectionism: PPS and maladaptive evaluative concerns (MEC). They reported that MEC is comprised of the CM, doubting one's actions, parental criticism, and parental expectations subscales of the FMPS, while PPS is comprised of five of the original seven PS items. DiBartolo et al. (2008) reported that MEC is related to poor psychological outcomes, while DiBartolo et al. (2004) reported that PPS is positively related to healthy psychological functioning. The FMPS has demonstrated strong convergent and discriminant validity.

## Procedure

Participants completed the above measures, and were compensated with partial academic credit. All analyses were conducted using PASW (SPSS, Inc., 2009, Chicago, IL, USA) statistical software. We conducted multiple mediation analyses using the PROCESS<sup>1</sup> macro designed by Preacher and Hayes (2008) for PASW. Multiple mediation allows several mediator variables to be assessed in parallel (i.e., simultaneously), and employs a bootstrapping approach which yields nonparametric approximations of each mediator's sampling distribution of the indirect effects. A bootstrapped confidence interval (CI) is generated for this sampling distribution, and is reflective of the chosen Type I error rate ( $\alpha$ ). If this CI does not overlap with 0 (i.e., there is less than  $\alpha$  chance that the indirect effect is zero), then the null hypothesis is rejected, and a significant indirect effect has been detected. Given that regular CIs are inherently symmetrical, any application of such to a non-parametric sampling distribution may lead to greater frequency of Type I errors and power issues (Preacher and Hayes 2008). This problem may be mitigated by adjusting the percentile values of each bootstrapped indirect effect within the CI. A similar procedure was used in the present study before examining indirect effect CIs. For a detailed review of bias correction procedures, see Efron and Tibshirani (1993).

In the first multiple mediational model tested, fear of public scrutiny (SPS) was entered as the independent variable, maladaptive evaluative perfectionism (FMPS–MEC) was entered as the mediator variable, body-image cognitive distortions (ABCD), and perfectionism specific to PPS (FMPS–PPS) were entered into the model, but not directly examined,<sup>2</sup> and bulimic symptomatology was entered as the

dependent variable. In a second multiple mediational model, social interaction anxiety (SIAS) was substituted as the independent variable, and all other aspects of the previously described model were retained.

## Results

### Preliminary Analyses

Sample descriptive statistics are reported in Table 1. All variables included in study analyses exhibited normal levels of skewness and kurtosis.

### Study Aim 1

A summary of correlational results may be found in Table 2. In order to account for family-wise Type I error inflation, we applied an alpha correction based on the total number of comparisons per measure. Each measure was correlated with five others; thus, our alpha correction was  $\alpha = .05/5 = .01$ . Consistent with hypotheses 1a and 1d, social anxiety (i.e., fear of public scrutiny and social interaction anxiety [SPS and SIAS scores]) related positively to MEPC (i.e., FMPS–MEC scores), and bulimic symptoms (i.e., EDI-II–B scores), respectively. Inconsistent with hypothesis 1b, social anxiety was unrelated to PPS (i.e., FMPS–PPS scores), though the correlation was in the expected (negative) direction. Consistent with hypothesis 1c, bulimic symptoms were positively associated with MEPC.

**Table 2** Bivariate correlations between study variables

Measure	1	2	3	4	5	6
1. Fear of public scrutiny	.93					
2. Social interaction anxiety	.82*	.93				
3. Maladaptive body-image cognitions	.52*	.48*	.98			
4. Bulimia symptoms	.38*	.42*	.55*	.80		
5. Maladaptive evaluative concerns	.28*	.22*	.45*	.40*	.92	
6. Pure personal standards	-.07	-.11	.16	.09	.41*	.86

\*  $p < .01$  (a Bonferroni correction was applied; see “Study Aim 1”),  $n$ 's vary from 160 to 167 due to missing data; internal consistency estimates in diagonal; fear of public scrutiny = Social Phobia Scale (SPS), social interaction anxiety = Social Interaction Anxiety Scale–straightforward (SIAS–S), maladaptive evaluative concerns = Frost Multidimensional Perfectionism Scale–maladaptive evaluative concerns (FMPS–MEC), pure personal standards = Frost Multidimensional Perfectionism Scale–personal standards (FMPS–PPS), maladaptive body-image cognitions = assessment of body-image cognitive distortions (ABCD), bulimia symptoms = eating disorders inventory-II, bulimia scale (EDI-II–B)

<sup>1</sup> This macro is available at no cost, and may be downloaded from the following link: <http://www.afhayes.com/spss-sas-and-mplus-macros-and-code.html>.

<sup>2</sup> Body-image cognitive distortions and personal standards were entered into the model but not examined directly because we were interested in determining the *unique* indirect effect of maladaptive perfectionism between social interaction anxiety and bulimia symptoms, above and beyond negative body-image cognitions and pure personal standards.

## Study Aim 2

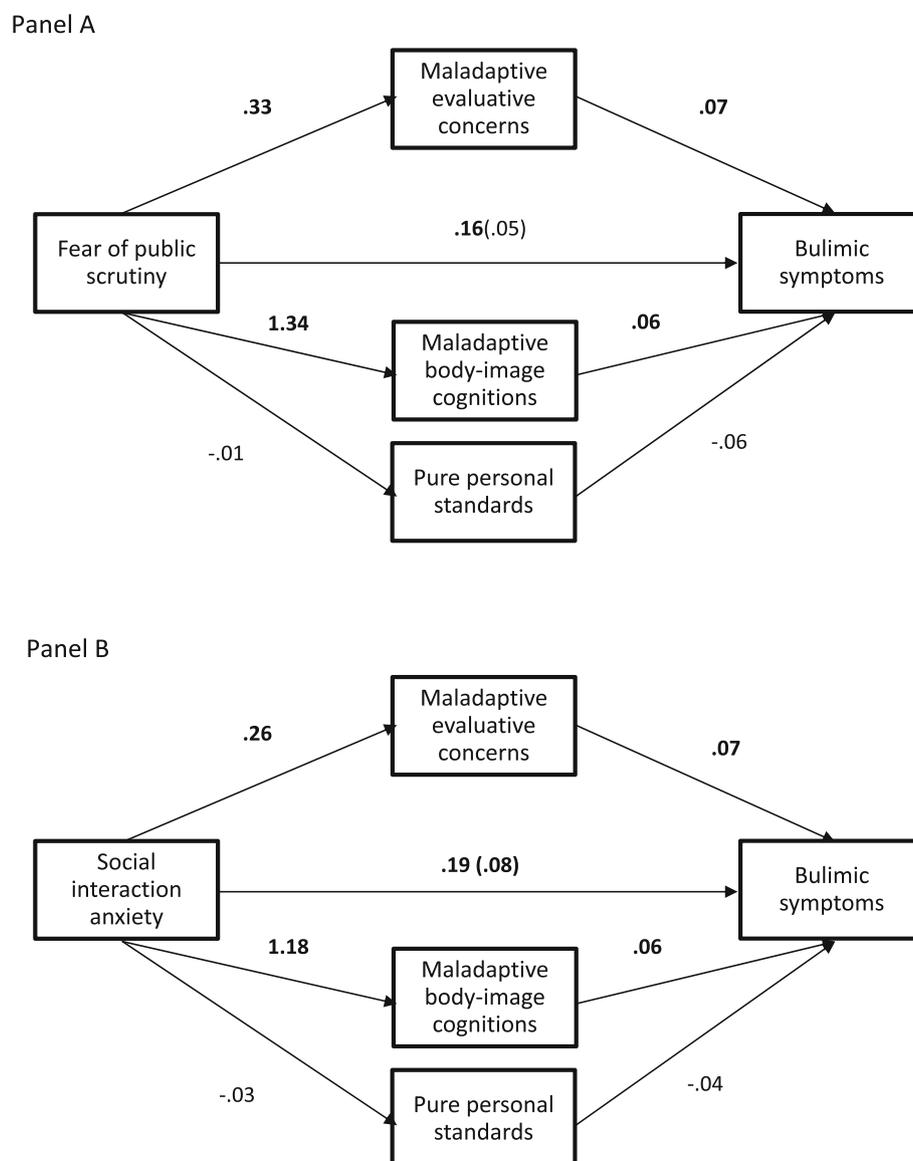
Utilizing the non-parametric bootstrap method described by Preacher and Hayes (2008), variables were entered into both hypothesized models according to the method described in the “Procedure” section. All CIs reported herein are bias-corrected and accelerated as recommended by Efron and Tibshirani (1993) (see “Procedure” for details). Results from two mediational models incorporating related facets of social anxiety (i.e., social interaction anxiety and fear of public scrutiny) supported hypothesis 2, and revealed unique indirect effects of MEPC between social anxiety facets and bulimic symptoms.

Specifically the 95 % CI of the indirect effect of maladaptive perfectionism did not cross zero for the model including either social interaction anxiety or fear of public

scrutiny as independent variables: (.0038, .0430) and (.0058, .0532), respectively (see Fig. 1) even after controlling for the indirect effects of (a) MBIC and (b) perfectionism specific to PPS. Due to the limitations of utilizing mediational analyses in cross-sectional data, we reversed the order of the hypothesized mediator and independent variables in an attempt to rule out an alternative explanation that social anxiety could serve as the mediator of the relationship between maladaptive perfectionism and bulimia symptoms. Results of these analyses indicated that social anxiety (i.e., social interaction anxiety and fear of public scrutiny, respectively) failed to mediate the relationship between maladaptive perfectionism and bulimia symptoms, 95 % CI of the indirect effects: (−.0382, .1005) and (−.0063, .0396), respectively.

In the mediational model including fear of public scrutiny as the independent variable, MEPC fully mediated the

**Fig. 1** Unique indirect effect of maladaptive evaluative perfectionism concerns; parentheses indicate direct effect; fear of public scrutiny = Social Phobia Scale (SPS), social interaction anxiety = Social Interaction Anxiety Scale (SIAS), maladaptive evaluative concerns = Frost Multidimensional Perfectionism Scale–maladaptive evaluative concerns (FMPS–MEC), pure personal standards = Frost Multidimensional Perfectionism Scale–pure personal standards (FMPS–PPS), maladaptive body-image cognitions = assessment of body-image cognitive distortions (ABCD), bulimia symptoms = eating disorders inventory-II, bulimia scale (EDI-II–B); ABCD and FMPS–PPS are treated as covariates in the model; bias-corrected 95 % CI of the indirect effect of FMPS–MEC between SIAS and EDI-II–B = (.0038, .0430); bias-corrected 95 % CI of the indirect effect of FMPS–MEC between SPS and EDI-II–B = (.0058, .0532); values in figure represent unstandardized *b* coefficients; **bold values** represent significance at  $p < .05$



relationship between fear of public scrutiny and bulimia symptoms (see Fig. 1a). Interestingly however, in the mediational model including social interaction anxiety as the independent variable, MEPC only partially mediated the relationship between social interaction anxiety and bulimia symptoms (see Fig. 1b), suggesting that fear of public scrutiny may relate differently to bulimia symptoms than does social interaction anxiety, despite having similar correlations with bulimia (see Table 2).

## Discussion

The present study provides partial support for a number of findings pertaining to the bivariate relationships between social anxiety, perfectionism, and bulimic symptoms. First, the current study did not replicate data reported by Shumaker and Rodebaugh (2009) which demonstrated a negative relationship between social anxiety and PPS; nonetheless, this effect was in the hypothesized direction, following the results reported by Shumaker and Rodebaugh (2009). The reason that this effect did not emerge as significant in our sample is unclear, but may pertain to differences in sample characteristics between our sample and that of Shumaker and Rodebaugh. Specifically, Shumaker and Rodebaugh recruited a mixed-gender sample comprised of undergraduates who self-identified as high in speech anxiety. It may be the case that a non-linear relationship exists between social anxiety and PPS, such that as social anxiety increases in the low to moderate range of severity (such as in the current study), no difference in PPS is detected. However, when social anxiety increases in the somewhat higher ranges (such as in Shumaker and Rodebaugh 2009), a significant decrease in PPS may be detected. Future research should attempt to identify moderator variables which may account for this potential non-linear relationship. On the other hand, other findings have indicated that perfectionism related to PPS is not related to social anxiety, and may instead be highly related to healthy psychological functioning (Bieling et al. 2003). In contrast, the current study did replicate the finding that social anxiety is positively related to bulimic symptoms (Swinbourne and Touyz 2007), and that bulimic symptoms are positively related to MEPC (Silgado et al. 2010).

The present study is one of only two (i.e., see Silgado et al. 2010) studies designed to parse apart the relationship between social anxiety, perfectionism, and bulimia. We found that MEPC fully mediated the relationship between fear of public scrutiny and bulimia symptoms, and partially mediated the relationship between social interaction anxiety and bulimia symptoms, above and beyond the indirect effects of MBIC and perfectionism specific to PPS. Furthermore, we found that when the mediator (MEPC) and the independent

variables (fear of public scrutiny and social interaction anxiety) were *reversed* in the model, a significant indirect effect was not detected, ruling out an alternative hypothesis that either fear of public scrutiny or social interaction anxiety could mediate the relationship between MEPC and bulimic symptoms. These findings are partially consistent with previous research which indicates that variability in perfectionism may depend on variability in SAD or, at the least, that perfectionism may be a maintaining factor for SAD (Egan et al. 2011; Lundh and Öst 2001).<sup>3</sup>

Recall that Lundh and Öst (2001) reported that perfectionism levels decreased following CBT for SAD. Moreover, other studies have reported that perfectionism may serve as a treatment barrier for SAD (Ashbaugh et al. 2007). Furthermore, Riley et al. (2007) and Steele and Wade (2008) have reported that anxiety and depression decrease following treatment for perfectionism. Data focusing on SAD reduction following treatment for perfectionism would provide further support for the role of perfectionism as a maintaining factor in SAD, provided that SAD is observed to emerge *before* perfectionism. Additional research examining the chronological relationship between SAD and perfectionism is needed to fully test the notion that SAD precedes perfectionism, but the present study obtained findings consistent with this pattern.

The direct effect of fear of public scrutiny on bulimia symptoms was non-significant, indicating that, even upon controlling for MBIC and PPS, MEPC fully mediated the relationship between fear of public scrutiny and bulimic symptoms. Interestingly, however, the direct effect of social interaction anxiety on bulimia symptoms remained significant even after partialing out the effects of the mediators, indicating that a significant portion of variance in bulimia symptoms was still explained by social interaction anxiety above and beyond the mediators. This difference across our two hypothesized mediational models is intriguing, yet it is worth noting that this difference appears to be consistent with cognitive behavioral models of SAD (Heimberg et al. 2010). Specifically, MEPC may relate more strongly to fear of public scrutiny (i.e., being observed and physically evaluated by others in performance contexts) than to social interaction anxiety (i.e., being physically evaluated in the context of a social interaction). Furthermore, if an individual

<sup>3</sup> One reviewer commented that an interactive relationship (similar to that which was reported by Silgado et al. 2010) may provide a viable alternative framework by which to consider the relationship between SAD, perfectionism, and bulimia symptoms. Specifically, Silgado et al. reported that perfectionism *moderated* the relationship between SAD and bulimia such that individuals high in both SAD and perfectionism reported the highest levels of bulimia symptoms. In response to this comment, the authors of the present study conducted moderation analyses in an attempt to replicate the results of Silgado et al. but did not find a significant SA by perfectionism interaction term predicting bulimia symptoms.

with high body-image concerns is distressed about being physically evaluated, it is reasonable to assume that this concern would be more prevalent in settings where the individual may be observed by many others, as opposed to dyadic or small-group social interactions (although body-image concerns may certainly be relevant in the latter situation as well). Although the cross-sectional nature of our design does not permit causal conclusions (see Maxwell and Cole 2007), it nevertheless provides future research with a firm empirical rationale for employing longitudinal and prospective study designs which are able to test causal hypotheses.

Although the current study provides some indirect support for a sequential link between social anxiety, perfectionism, and bulimia, specific elements within these constructs accounting for the link have not been identified. It may be the case that evaluative concerns such as those seen among individuals with elevated social anxiety are exacerbated by behavioral avoidance to the point that they begin to hold unrealistically high standards for how social interactions should unfold (Hope et al. 2000). This may lead individuals' MEC to generalize to physical appearance, potentially resulting in behaviors designed to regulate anxiety surrounding social presentation concerns (e.g., *physical scrutiny concerns*), including bingeing and purging (Heatherton and Baumeister 1991). Heatherton and Baumeister (1991) have argued that anxiety may cause binge-eaters to attempt to narrow their focus of attention towards stimuli in the immediate environment in order to escape broad and distressing anxious thoughts. In other words, purging may serve as a coping tool which temporarily serves to ameliorate anxiety experienced as a result of failing to meet perfectionistic social goals. While all bingeing and purging behavior may not be the result of anxiety in the face of high MEC, it may explain its occurrence among individuals who develop bulimic symptoms after the development of social anxiety. Additional research should explore Heatherton and Baumeister's (1991) theory further in order to determine if bulimia-like bingeing and purging behaviors may serve as indirect coping mechanisms for other anxiety disorders such as obsessive-compulsive disorder or post-traumatic stress disorder.

Pending replication in future studies including clinical samples, the present findings may hold treatment implications for SAD patients. In line with other recommendations by Egan et al. (2011), our findings highlight the need to routinely assess for bulimia symptoms among patients with SAD. Furthermore, performing interventions targeting perfectionism among SAD patients may have the added benefit of preventing future onset of BN, especially among young socially anxious females, though studies employing longitudinal designs would be needed in order to formally test this hypothesis.

The results of the current study should be interpreted in light of some noteworthy limitations. First, the present sample consisted of an unselected sample of undergraduates who were relatively homogenous in terms of age and race, thus limiting the generalizability of the findings to patient populations. Second, although our mediational models involving fear of public scrutiny/social interaction anxiety, perfectionism, and bulimic symptoms were informed by data reflecting the typical developmental sequence of these constructs (Swinbourne and Touyz 2007), causal hypotheses cannot be directly tested using this approach with cross-sectional data. Future research employing prospective and longitudinal designs are needed to test causal hypotheses (Maxwell and Cole 2007). In conclusion, the current study provided support for the mediational role of MEPC between social interaction anxiety and bulimic symptoms. Future studies should examine these variables in clinical populations using longitudinal study designs in order to replicate whether MEPC mediate the relationship between social anxiety and bulimia symptoms. The current study provides firm empirical rationale for pursuing such research.

**Conflict of interest** The authors have no conflict of interest to report.

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