



## Full length article

# A revised examination of the dual pathway model for bulimic symptoms: The importance of social comparisons made on Facebook and sociotropy

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## ABSTRACT

**Objective:** To replicate the Dual Pathway Model (DPM) of bulimia nervosa (BN) symptoms prospectively, and to assess whether a revised version of the DPM that included the variables social comparisons made on Facebook and sociotropy influenced the DPM.

**Method:** Participants were 245 females who completed baseline measures (T1) that assessed the DPM, as well as the constructs social comparisons made on Facebook, and sociotropy, and a follow-up questionnaire, which assessed symptoms of depression, bulimia, and dietary restraint, one month later (T2).

**Results:** Path analysis revealed that the original and the revised DPMs had excellent fit once modifications to the respective models were made. In both DPMs, T1 pressures to be thin and T1 thin ideal internalization were related to T1 body dissatisfaction. T1 body dissatisfaction prospectively predicted T2 depressive symptoms and T2 bulimic symptoms, but not T2 dietary restraint. Furthermore, T2 dietary restraint, but not T2 depressive symptoms, predicted T2 BN symptoms. Results also showed that T2 dietary restraint was associated with T2 depressive symptoms. In the revised DPM, T1 social comparisons made on Facebook were associated with T1 body dissatisfaction, T1 pressures to be thin, and T2 bulimic symptoms. T1 sociotropy was related to T1 social comparisons on Facebook, T1 pressures to be thin, T1 body dissatisfaction, and T2 bulimic symptoms.

**Conclusions:** Findings suggest the BN preventative efforts might benefit from addressing appropriate forms of social comparisons, especially those made on Facebook, and the personality trait sociotropy.

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## 1. Introduction

The dual pathway model (DPM) proposes to account for the etiology of bulimia nervosa (BN) symptomology (Stice, Nemeroff, & Shaw, 1996). To date, only one longitudinal study (Stice, Shaw, & Nemeroff, 1998), and two cross-sectional studies (Duemm, Adams, & Keating, 2003; Stice et al., 1996) have tested the model in its entirety, and hence, the predictive utility of the model remains unclear. In addition, research has identified other important social factors associated with BN symptoms that have yet to be tested in the context of the DPM. For example, despite the social media site Facebook being a ubiquitous feature of many women's everyday social interactions (Duggan, Ellison, Lampe, Lenhart, &

Madden, 2015; Lenhart, Purcell, Smith, & Zickuhr, 2010), no study has assessed the influence of social comparisons made on Facebook on the DPM. Further, it remains unclear why some individuals who are exposed to sociocultural risk factors of BN (e.g., pressures to be thin) may be more susceptible to developing BN symptoms. To this end, research has examined whether the personality trait *sociotropy* [defined as the need for dependence on and/or approval from others (Clark & Beck, 1991)] is associated with BN symptoms. To date, only one cross-sectional study (Duemm et al., 2003) has examined the influence of sociotropy on the DPM. Thus, the present study is the first to use a large female sample to *i*) replicate the original DPM as proposed by Stice et al. (1996) prospectively, and *ii*) assess a revised conceptualization of the DPM that includes social comparisons made on Facebook and sociotropy.

### 1.1. The dual pathway model

According to the DPM, pressures to be thin from one's social

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environment (e.g., the media, family, and peers) leads to thin ideal internalization (the belief that the thin ideal is a desirable end state; Stice, 2002). Both of these constructs are thought to lead directly to body dissatisfaction as individuals are largely unable to achieve and/or maintain unrealistic thin-ideal standards, and thus, comparison between one's perceived body shape/size with this unrealistic ideal causes body dissatisfaction (Duemm et al., 2003). Body dissatisfaction is theorized to lead to BN symptoms through dual-pathways. The first pathway is via dietary restraint: binge-eating is thought to be a compensatory mechanism for caloric deprivation associated with dietary restraint (Polivy, Coleman, & Herman, 2005). The second pathway is via negative affect: increased body dissatisfaction leads to negative internal states, and binge-eating/purging behaviors are thought to be mechanisms that distract attention away from these negative mood states (Heatherton & Baumeister, 1991). Dietary restraint is also proposed to lead to negative affect.

In addition to the original Stice et al. (1996) publication, eight further cross-sectional studies (Duemm et al., 2003; Evans, Tovée, Boothroyd, and Drewett, 2013; Hutchinson, Rapee, & Taylor, 2010; Mason & Lewis, 2015; Ouwens, Van Strien, Van Leeuwe, & Van der Staak, 2009; Ruisoto et al., 2015; van Strien, Van Engels, van Leeuwe, & Snoek, 2005; Womble et al. 2001) have tested modifications of the model in female and male samples, and shown support for various pathways of the DPM. For example, in the earliest assessment of the DPM, Stice et al. (1996) found all hypothesized pathways to be significant and that the model accounted for 71% of the variance in BN symptoms. Support for the DPM was also found by Duemm et al. (2003), Mason and Lewis (2015), and Womble et al. (2001). These three studies found the DPM accounted for 59–70% of the variance in BN symptoms. The study by Evans et al. (2013) excluded the variable pressures to be thin, and found that the DPM accounted for 50% of the variance in disordered eating symptoms. Ouwens et al. (2009) and van Strien et al. (2005) did not examine the constructs pressures to be thin and thin ideal internalization, and failed to find support for the dietary restraint to disordered eating pathway. These two studies found that the DPM accounted for 7–12% of the variance in respective eating pathology symptoms.

Longitudinal studies (Allen, Byrne, & McLean, 2012; Dakanalis et al., 2014; Salafia & Gondoli, 2011; Stice et al., 1998) have also shown support for the DPM. In a nine-month (Stice et al., 1998) and a four-year longitudinal study (Salafia & Gondoli, 2011), the predictive utility of the DPM was supported, as these two studies explained 33.3% and 49% of the variance in BN symptoms, respectively. While Stice et al. (1998) operationalized pressures to be thin as a composite of pressures stemming from the media, peers, and family members, Salafia and Gondoli (2011) assessed the separate influence of pressures from peers, fathers, and mothers on body dissatisfaction. When assessed in this way, Salafia and Gondoli (2011) found that relative to pressures from fathers and mothers, pressures from peers was the strongest predictor of body dissatisfaction, suggesting that different types of pressures might confer different risk to the development of BN symptoms. However, as Salafia and Gondoli (2011) did not assess thin ideal internalization, the unique effect of different types of pressures on thin ideal internalization remains unknown.

Similarly, two subsequent longitudinal studies (Allen et al., 2012; Dakanalis et al., 2014) that also excluded thin ideal internalization found that the respective models accounted for 54–59% of the variance in binge-eating symptoms. Finally, the DPM has also been validated at a state-based level in a female community sample (Holmes, Fuller-Tyszkiewicz, Skouteris, & Broadbent, 2014).

While the above-mentioned evidence demonstrates support for the links between different types of pressures (e.g., family) on body

dissatisfaction and BN symptoms, it should be noted that meta-analyses by Ferguson (2013) and Holmstrom (2004) have found little evidence to support the influence of thin-ideal media effects on these same constructs. Further, other researchers (e.g., Roberts & Good, 2010) have suggested that the potentially negative influence of thin-ideal media effects on body dissatisfaction (and therefore on disordered eating symptoms) might be moderated by personality traits, such as neuroticism. Hence, it is important for future research to consider the influence of different types of social pressures, and other personality factors in the etiology of body dissatisfaction and BN symptoms.

### 1.2. The addition of social comparisons made on Facebook to the DPM

Past research into the DPM is limited by not assessing contemporary pressures that women are exposed to, such as the influence of the social media site Facebook. Current research suggests that many Western women use Facebook on a regular basis (Duggan et al., 2015). Given the apparent popularity of Facebook, as well as the influence of Facebook use on negative mood (Kross et al., 2013; Sagioglou & Greitemeyer, 2014), it is important to examine whether this factor is etiological to BN symptomology by examining it in the context of the DPM.

Studies that have examined how individuals present themselves on Facebook indicate that females often digitally enhance images in accordance with stereotyped representations of the thin ideal (Haferkamp & Krämer, 2011; Rodgers, Melioli, Laconi, Bui, & Chabrol, 2013). Researchers have argued that exposure to such images on Facebook might lead to body dissatisfaction as individuals likely compare their bodies to the “enhanced” bodies of others (Perloff, 2014; Williams & Ricciardelli, 2014). This process of evaluating one's self via comparison to an “other” is known as a *social comparison* (Festinger, 1954). It is thought that if an individual makes a comparison to an individual that, relatively speaking, is perceived to be closer to the thin ideal (i.e., an ‘upward comparison’) the resulting discrepancy might generate increased body dissatisfaction (Dittmar & Howard, 2004).

Indeed, extant research has provided initial evidence linking those who make social comparisons to others on Facebook with body dissatisfaction (see Holland & Tiggemann, 2016 for a review). Other studies have shown that women who display a greater tendency to make social comparisons were more likely to report higher levels of thin ideal internalization (Papp, Urbán, Czeglédi, Babusa, & Túry, 2013; Rodgers, Chabrol, & Paxton, 2011). While some studies have found social media usage is associated with thin ideal internalization in females (Tiggemann & Slater, 2013), other research (Ferguson, Munoz, Garza, & Galindo, 2014) has shown a null relationship of social media use on body dissatisfaction and disordered eating symptoms. No study to our knowledge has examined whether social comparisons made on Facebook are linked to pressures to be thin.

### 1.3. The addition of sociotropy to the DPM

It has been suggested that the personality trait sociotropy is etiological to the development of BN symptoms (Friedman & Whisman, 1998). Researchers have proposed that individuals with higher levels of sociotropy may be more likely to experience BN symptoms, pressures to be thin, thin ideal internalization, and body dissatisfaction, potentially due to increased levels of sensitivity to rejection, need for approval, and/or social dependency (Duemm et al., 2003; Hayaki, Friedman, Whisman, Delinsky, & Brownell, 2003; Jackson, Weiss, Lunquist, & Soderlind, 2005; Narduzzi & Jackson, 2002; Oates-Johnson & Clark, 2004; Pedlow & Niemeier,

2013). The only study to date to assess the influence of sociotropy on the DPM (Duemm et al., 2003) found that sociotropy was associated with thin ideal internalization and negative-affect suggesting that the variable conferred an indirect effect on bulimic behaviors.

Researchers have also argued that individuals with higher levels of sociotropy may be more susceptible to seeking validation from others, and hence more likely to make social comparisons (Giordano, Wood, & Michela, 2000; Krause, Robins, & Lynch, 2015). To date, no research has examined the relationship between sociotropy and social comparisons on Facebook. While preliminary in nature, the above evidence suggests that the inclusion of sociotropy in the DPM is indicated, and hence, further research is needed to examine the degree to which sociotropy influences the DPM.

#### 1.4. Limitation of past research

While there is evidence confirming specific pathways of the DPM, only two cross sectional studies (Duemm et al., 2003; Stice et al., 1996) and one longitudinal study (Stice et al., 1998) have examined the DPM in its entirety. Indeed, the majority of studies in this area have omitted one or more variables from the model. Thus, these omissions, as well as a lack of longitudinal research in this area, have made it difficult to draw firm conclusions regarding the predictive utility of the DPM as a whole. Further, while the DPM was originally proposed to be a model that accounts for the development and maintenance of bulimic symptoms, a large number of studies have only assessed binge-eating (e.g., Dakanalis et al., 2014; Mason & Lewis, 2015) or overeating symptoms (e.g., van Strein et al., 2005). While these studies have contributed important findings regarding the factors that influence the etiology of eating pathology as assessed via the DPM, further research is required to test the original proposition that the DPM is a model that accounts for the etiology of bulimic symptoms. Hence, further studies that utilize bulimic symptoms as the outcome measure for the DPM are required. Finally, only one study (Duemm et al., 2003) has examined the influence of sociotropy on the DPM, and no study has assessed the contribution of social comparisons made on Facebook. Understanding how these two factors influence the DPM longitudinally has the potential to provide further insight into how BN risk factors and subsequent BN symptoms develop.

#### 1.5. The current study

The present study had two aims: *i*) to assess the DPM prospectively by assessing all variables in the model at T1, and symptoms of dietary restraint, depression, and BN one month later at T2, and *ii*) to test a revised DPM to determine whether social comparisons made on Facebook and sociotropy assessed at T1 influenced the model.

For the original prospective DPM, it was hypothesized that T1 pressures to be thin would be related to T1 thin ideal internalization and T1 body dissatisfaction, and that T1 thin ideal internalization would be related to T1 body dissatisfaction. It was also hypothesized that T2 dietary restraint and T2 depressive symptoms would mediate the relationship between T1 body dissatisfaction and T2 BN symptoms, and T2 dietary restraint would be associated with T2 depressive symptoms.

For the revised prospective DPM, in addition to the existing DPM hypotheses, it was hypothesized that a) T1 social comparisons made on Facebook would be associated with T1 body dissatisfaction, T1 pressures to be thin, T1 thin ideal internalization, and T2 bulimic symptoms and b) T1 sociotropy would be related to T1 pressures to be thin, T1 thin ideal internalization, T1 body dissatisfaction, and T2 bulimic symptoms. Given there is no literature on

the relationship between sociotropy and social comparisons made on Facebook, no hypothesis was made for this relationship.

## 2. Method

### 2.1. Participants

Of the 498 participants who enrolled at T1, a total of 245 females ( $M = 23.77$ ,  $SD = 7.10$ ) participated in the baseline (T1) and one-month follow up (T2) assessments. Of these participants, 127 ( $M = 19.37$ ,  $SD = 2.49$ ) were undergraduate students from a Melbourne university, 58 ( $M = 27.78$ ,  $SD = 0.80$ ) were recruited from the community in Australia, and 60 ( $M = 29.13$ ,  $SD = 5.75$ ) were from the United States of America (USA) enlisted via the online labour system Clickworker. The university students received credit points towards their research experience participation program, and the women from the Australian community sample were offered the opportunity to enter a lottery to win an iPad mini for their participation. The Clickworker participants were reimbursed €8 (equivalent to \$12.05 AUD) for their participation in the baseline and the follow up study. Eligibility for participation in the current study required being a female over the age of 18 years. The University of Melbourne's Human Ethics Committee approved this study in accordance with the standards for ethical research of the National Health and Medical Research Council.

### 2.2. Materials

The following measures were administered online, via the software program Qualtrics (version 57853, Qualtrics Labs, USA).

#### 2.2.1. Participant demographics

Participant demographics included participants' age, ethnicity, country of birth, first language, education, employment status, marital status, and reported height and weight. Weight and height ( $\text{kg}/\text{m}^2$ ) were used to calculate body mass index (BMI).

#### 2.2.2. Thin ideal internalization

Thin ideal internalization was assessed at T1 using the Ideal Body Stereotype Scale-Revised (Stice, Shaw, Burton, & Wade, 2006). The scale consisted of six items that assessed the acceptance of socially sanctioned standards of thinness. Items were rated using a six-point Likert scale ranging from one (strongly disagree) to five (strongly agree) from which an average total score was calculated. The reliability coefficient for thin ideal internalization indicated good internal reliability at T1 (Cronbach's  $\alpha = 0.78$ ).

#### 2.2.3. Pressures to be thin

Pressures to be thin from the media, family, and friends to have a thin body was assessed at T1 using the Perceived Sociocultural Pressure Scale (Stice et al., 1996). Participants rated ten items using a five-point Likert scale ranging from one (none) to five (a lot) from which an average total score was calculated. Internal consistency for the Perceived Sociocultural Pressure Scale was high at T1 (Cronbach's  $\alpha = 0.86$ ).

#### 2.2.4. Body dissatisfaction

Body dissatisfaction was assessed at T1 using the Body Parts Satisfaction Scale-Revised (Petrie, Tripp, & Harvey, 2002). The measure consisted of 15 items addressing an individual's satisfaction with various body parts, muscle tone, and overall body satisfaction. Participants rated each item using a six-point Likert scale ranging from one (extremely dissatisfied) to six (extremely satisfied) from which an average total score was calculated. The internal consistency of this scale at T1 was high (Cronbach's  $\alpha = 0.88$ ).

### 2.2.5. Depressive symptoms

Depressive symptoms were assessed at T1 and T2 using the ten-item short form of the Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Participants rated each item in terms of the frequency that each mood or event occurred during the past week on a four-point Likert scale ranging from zero (rarely or none of the time, less than one day) to three, (all of the time, five–seven days) from which an average total score was calculated. The internal consistency of the CES-D was good at T1 (Cronbach's  $\alpha = 0.75$ ) and high at T2 (Cronbach's  $\alpha = 0.88$ ).

### 2.2.6. Dietary restraint

Dietary restraint was assessed at T1 and T2 using the dieting subscale from the Eating Attitudes Test-26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982). The subscale consisted of 13 items from which an average total score was calculated. Using a six-point Likert scale ranging from one (never) to six (always), participants rated the extent to which 13 dieting statements (e.g., I am aware of the calorie content of the food that I eat) described their behavior. Higher scores indicated greater levels of dietary restraint. The internal consistency of this subscale was high at T1 (Cronbach's  $\alpha = 0.82$ ) and T2 (Cronbach's  $\alpha = 0.85$ ).

### 2.2.7. Bulimic symptoms

Bulimic symptoms were assessed at T1 and T2 using the bulimia and food preoccupation subscale from the EAT-26 (Garner et al., 1982). The bulimia and food preoccupation scale subscale consisted of 6 items in total that measured participants' bulimic behaviors such as bingeing and purging (e.g., I have gone on binge eating episodes where I feel I may not be able to stop). Items were rated on a six-point Likert scale from one (never) to six (always) from which an average total score was calculated. Higher scores indicated greater levels of bulimic symptoms. Internal consistencies for BN symptoms was low at T1 (Cronbach's  $\alpha = 0.58$ ) and good at T2 (Cronbach's  $\alpha = 0.79$ ).

### 2.2.8. Facebook appearance comparisons

Seven questions from Fardouly and Vartanian's (2015) study were taken to measure participants' tendency to compare their appearance to others on Facebook. For two of the questions, participants were asked to indicate their level of agreement to statements such as: "When using Facebook, I compare my physical appearance to the physical appearance of others". The remaining items assessed the frequency of comparisons that were made to specific female groups (i.e., close friends, friends of friends, celebrities, and family members) on Facebook. Participants rated each of the items on a five-point Likert scale, ranging from one (never) to five (very often). These items provided excellent internal consistency at T1 (Cronbach's  $\alpha = 0.90$ ).

### 2.2.9. Sociotropy

Sociotropy was assessed using the Personal Style Inventory-II (PSI-II; Robins et al., 1994). The PSI-II is a 24-item scale that measures the extent to which individuals have concerns regarding acceptance and rejection. Items were rated using a five-point Likert scale ranging from one (strongly disagree) to six (strongly agree). The internal consistency of the PSI-II at T1 was excellent (Cronbach's  $\alpha = 0.93$ ).

## 2.3. Procedure

Participants were provided with a plain language statement prior to giving informed consent for both the baseline and follow up assessments. At baseline all participants completed the same questionnaire on Qualtrics, which included all the aforementioned

measures. Participants accessed the questionnaire using a hyperlink. Four weeks after individuals had completed the study they were contacted via email to request whether they would like to participate in the follow up study, which assessed depressive symptoms, dietary restraint, and bulimic symptoms. Individuals were provided with a debriefing statement at the end of the baseline and follow up questionnaires.

## 2.4. Statistical analyses

All analyses were performed using SPSS version 23 and Mplus version 7.2. Path analysis with continuous manifest variables was utilized to test the specified models. The absolute skew value for T2 bulimic symptoms exceeded the value of 2, suggesting that the assumption for univariate normality was not satisfied (Kline, 2015). To address the issue of skew, we used the MLR estimator in Mplus which is a maximum likelihood estimator with robust standard errors to account for non-normal data (Muthén & Muthén, 1998). Participants answered all questions, and as such, there was no missing data. Partial correlations (controlling for BMI, age, and sample characteristic differences) were used to examine the associations between all variables assessed. Two prospective models were assessed for their adequacy of fit: 1) the original DPM, and 2) the revised DPM. Path analysis, controlling for age, BMI, sample characteristic differences, and T1 symptoms of depression, bulimia, and dietary restraint, was used to test all specified models. Model modifications were completed if improvements to the fit of the data could be obtained and if theoretically justifiable (Kline, 2005). Models were deemed equivalent if  $\Delta\chi^2$  between the modified and non-modified models was not significantly different from 0 ( $p > 0.05$ ).

Given the chi-square statistic is sensitive to large sample sizes and minor deviations in multivariate non-normality (Tabachnick & Fidell, 2007), adequacy of model fit was assessed using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). The following cut-offs for standard fit indices were used in the present study: CFI  $> 0.95$  for excellent fit, and  $> 0.90$  for adequate fit; RMSEA  $< 0.06$  for good fit, and  $> 0.10$  for poor fit (Marsh, Hau, & Wen, 2004). Significant standardized beta weights indicated whether the hypothesized paths in the models were supported.

## 2.5. Descriptive analyses

Independent-samples T-tests were utilized to assess whether attrition influenced mean level scores on all variables from T1 to T2. Results showed that the mean levels of the following variables were significantly higher at T1 relative to T2; age [ $t(488) = 2.722$ ,  $p = 0.007$ ], T1 depression [ $t(488) = 4.811$ ,  $p = < 0.001$ ], and, T1 body dissatisfaction [ $t(485) = 2.859$ ,  $p = 0.004$ ]. Results also indicated that the mean level of T1 pressures to be thin was significantly higher at T2 relative to T1 [ $t(490) = 2.42$ ,  $p = .016$ ].

Approximately half of the participants were Caucasian, had completed some tertiary education, and were single. A majority of participants were Australian, were University students, and had English as their first language. Mean and standard deviation values for study variables are presented in Table 1.

A series of one-way ANOVAS and post-hoc Scheffe tests for continuous data (see Table 1) indicated significant mean differences between the three samples (i.e., the Melbourne University student sample, the Australian community sample, and the American community sample) on a range of variables. Given the number of significant differences found between groups, two dummy variables were created to control for these differences. The dummy variables were created by assigning the reference category (i.e., the

**Table 1**  
Results from one-way ANOVAS and post-hoc Scheffe tests on participant age, BMI, and study variables as a function of sample type.

Study variables	UNI	USA	AU	F	df	p	Comparison group	Post hoc p-value
Age (years)	19.71 (3.81)	29.15 (5.64)	27.59 (8.59)	70.193	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	<0.001
							USA Vs AU	<0.001
T1 body mass index	21.89 (5.05)	27.11 (5.43)	21.34 (4.33)	24.48	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	0.715
							USA Vs AU	<0.001
T1 sociotropy	4.09 (0.68)	3.90 (0.97)	4.05 (0.71)	2.809	2	0.061	–	–
T1 Facebook	3.24 (0.89)	2.80 (0.99)	2.89 (1.04)	11.263	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	<0.001
							USA Vs AU	0.725
T1 pressures to be thin	3.16 (1.16)	2.24 (0.51)	2.98 (1.20)	17.96	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	0.486
							USA Vs AU	0.001
T1 thin ideal internalization	3.67 (0.65)	2.68 (0.71)	3.51 (0.68)	47.13	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	0.232
							USA Vs AU	<0.001
T1 body dissatisfaction	2.98 (0.57)	2.93 (0.75)	2.74 (0.62)	3.011	2	0.051	–	–
T1 depressive symptoms	0.98 (0.56)	1.46 (0.65)	0.73 (0.49)	25.697	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	0.023
							USA Vs AU	<0.001
T2 depressive symptoms	1.09 (0.63)	1.13 (0.66)	0.76 (0.51)	7.17	2	0.001	UNI Vs USA	0.923
							UNI Vs AU	0.003
							USA Vs AU	0.005
T1 dietary restraint	0.58 (0.59)	0.68 (0.59)	0.44 (0.52)	2.367	2	0.096	–	–
T2 dietary restraint	0.52 (0.54)	0.42 (0.44)	0.38 (0.45)	1.658	2	0.193	–	–
T1 bulimic symptoms	0.39 (0.57)	0.92 (0.64)	0.29 (0.41)	23.613	2	<0.001	UNI Vs USA	<0.001
							UNI Vs AU	0.578
							USA Vs AU	<0.001
T2 bulimic symptoms	0.34 (0.51)	0.21 (0.43)	0.19 (0.37)	2.616	2	0.075	–	–

Note. UNI = Melbourne University student sample; USA = American community sample; AU = Australian community sample; T1 = time one; T2 = time two; Facebook = social comparisons made on Facebook; df = degrees of freedom; F = F value from one-way ANOVA; p = probability value; post hoc p value = p value derived from Scheffe test; – = not relevant.

**Table 2**  
Partial correlations controlling for BMI, age and dummy variables between all variables assessed in the DPM at time 1 and time 2.

	Pres T1	Int T1	BD T1	Dep T1	Dep T2	Bul T1	Bul T2	DR T1	DR T2	Soc T1
Pres T1	–									
Int T1	0.20**	–								
BD T1	0.46**	0.37**	–							
Dep T1	0.32**	0.27**	0.35**	–						
Dep T2	0.42**	0.15*	0.49**	0.52**	–					
Bul T1	0.39**	0.29**	0.45**	0.40**	0.33**	–				
Bul T2	0.40**	0.18**	0.44**	0.32**	0.36**	0.61**	–			
DR T1	0.46**	0.28**	0.51**	0.39**	0.33**	0.72**	0.60**	–		
DR T2	0.46**	0.24**	0.44**	0.40**	0.41**	0.54**	0.61**	0.75**	–	
Soc T1	0.31**	0.17**	0.39**	0.37**	0.38**	0.30**	0.31**	0.36**	0.31**	–
FB T1	0.41**	0.22**	0.45**	0.35**	0.35**	0.43**	0.35**	0.58**	0.53**	0.43**

Note. Pres = pressure to be thin; Int = thin-ideal internalization; BD = body dissatisfaction; Dep = depressive symptoms; Bul = bulimic symptoms; DR = dietary restraint; Soc = sociotropy; FB = social comparisons made on Facebook; T1 = time 1; T2 = time 2; \* =  $p < 0.05$  (2-tailed); \*\* =  $p < 0.001$  (2-tailed).

Melbourne University student sample) a value of 0. If the group was the target group for a dummy variable (e.g., dummy variable 1; the American community sample), it was assigned a value of 1. If the group was the target variable for another dummy variable (e.g., dummy variable 2; the Melbourne community sample), then its value for dummy variable 1 was assigned as 0. Each dummy variable was utilized as a covariate in the models tested, and was included in the model as a predictor for all other variables in the model.

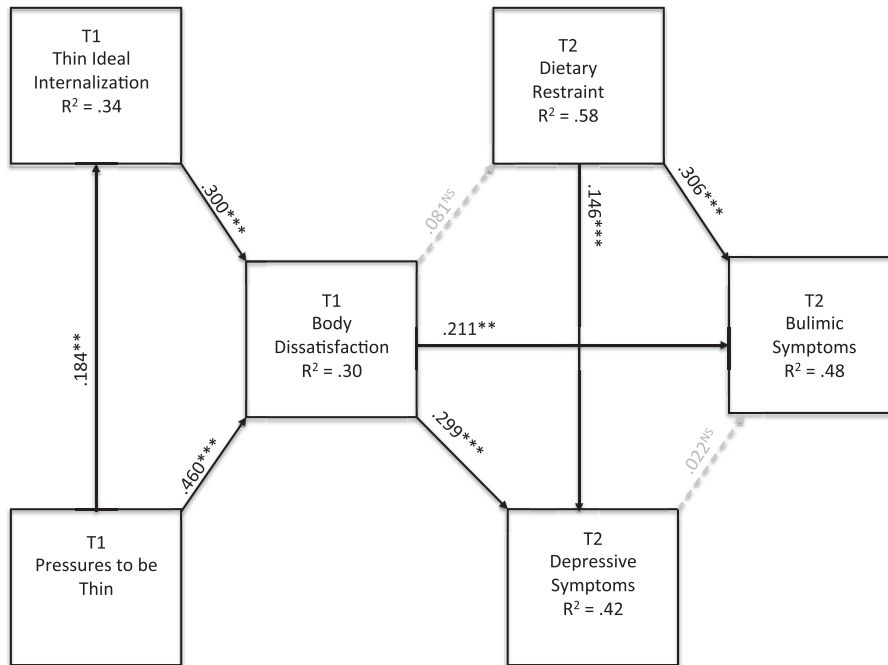
### 3. Results

Partial correlations controlling for BMI, age and sample characteristic differences between all variables are presented in Table 2. All variables showed significant positive correlations in the expected direction, with the magnitude of effects ranging from weak

to strong.

#### 3.1. Examining the original DPM prospectively

The adequacy of model fit for the original DPM demonstrated a reasonable fit of the data,  $\chi^2(16) = 35.611$ ,  $p < 0.001$ , CFI = 0.976, RMSEA = 0.071. This fit improved significantly [ $\Delta\chi^2(1) = 11.84$ ,  $p < 0.001$ ] when a path from T1 body dissatisfaction to T2 bulimic symptom was added,  $\chi^2(15) = 23.771$ ,  $p < 0.001$ , CFI = 0.989, RMSEA = 0.049. This latter conceptualization of the DPM (presented in Fig. 1) was therefore utilized due to superior model fit. Results indicated that all hypothesized paths between T1 pressures to be thin, T1 thin ideal internalization, and T1 body dissatisfaction were significant and in the expected direction. Results showed a non-significant effect of T1 body dissatisfaction on T2 dietary restraint, and T2 depressive symptoms on T2 BN symptoms. It was

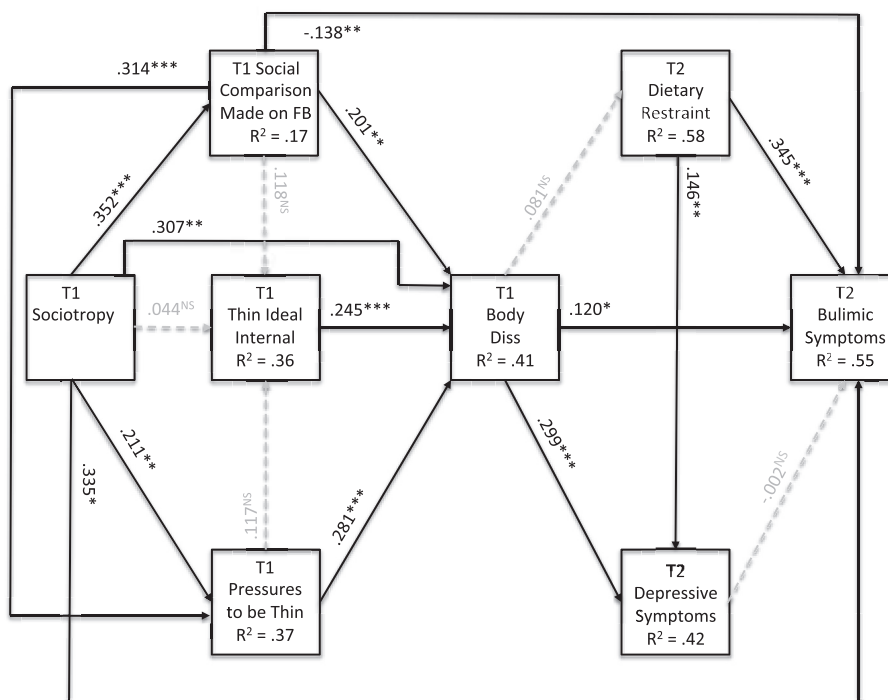


**Fig. 1.** The DPM assessed prospectively. Grey dashed lines indicate non-significant paths. Note. T1 = time one; T2 = time two; NS = non-significant; \* =  $p < 0.05$ ; \*\* =  $p < 0.01$ ; \*\*\* =  $p < 0.001$ .

also found that T1 body dissatisfaction predicted T2 bulimic symptoms, and that T2 dietary restraint was associated with T2 depressive symptoms. In addition, tests of indirect effects showed that neither T2 dietary restraint ( $\beta = 0.025, p = 0.151$ ) nor T2 depressive symptoms ( $\beta = 0.006, p = 0.664$ ) mediated the effect of T1 body dissatisfaction on T2 bulimic symptoms. This model explained 48% of the variance in BN symptoms.

### 3.2. Examining the DPM prospectively to include social comparisons made on Facebook and sociotropy

Results indicated that the revised DPM (presented in Fig. 2) showed an excellent fit of the data,  $\chi^2(19) = 26.023, p = 0.129$ , CFI = 0.993, RMSEA = 0.039. For this revised model, a null relationship was found between T1 pressures to be thin and T1 thin



**Fig. 2.** The revised DPM assessed prospectively. Grey dashed lines indicate non-significant paths. Note. T1 = time one; T2 = time two; NS = non-significant; Body Diss = body dissatisfaction; FB = Facebook \* =  $p < 0.05$ ; \*\* =  $p < 0.01$ ; \*\*\* =  $p < 0.001$ .

ideal internalization. Consistent with predictions, results showed that T1 social comparisons made on Facebook was associated with T1 pressures to be thin, T1 body dissatisfaction, and T2 bulimic symptoms (negatively), but not T1 thin ideal internalization. Finally, T1 sociotropy was associated with T1 social comparisons made on Facebook, T1 pressures to be thin, T1 body dissatisfaction, and T2 bulimic symptoms, but not T1 thin ideal internalization. In addition, tests of indirect effects showed that neither T2 dietary restraint ( $\beta = 0.028$ ,  $p = 0.145$ ) nor T2 depressive symptoms ( $\beta = -0.001$ ,  $p = 0.968$ ) mediated the effect of T1 body dissatisfaction on T2 bulimic symptoms. The revised model explained 55% of the variance in BN symptoms.

#### 4. Discussion

The current study addressed an important gap in the literature by exploring the potential role of social comparisons made on Facebook and sociotropy on the development of BN symptoms. Regarding the original DPM, the hypothesis that T1 pressures to be thin would be associated with T1 thin ideal internalization was supported. Similarly, results showed that T1 pressures to be thin and T1 thin ideal internalization were associated with T1 body dissatisfaction. Consistent with predictions, T1 body dissatisfaction was linked to T2 depressive symptoms, and T2 dietary restraint was associated with T2 BN symptoms. Contrary to predictions, T1 body dissatisfaction did not predict T2 dietary restraint, and T2 depressive symptoms was not associated with T2 BN symptoms. It was also found T2 dietary restraint and T2 depressive symptoms were associated.

In terms of the revised DPM, the hypotheses that T1 comparisons made on Facebook would be related to T1 pressures to be thin, T1 body dissatisfaction and T2 bulimic symptoms were supported, however, contrary to expectations, it was not associated with T1 thin ideal internalization. In addition, T1 sociotropy was associated with T1 comparisons made on Facebook, T1 pressures to be thin, T1 body dissatisfaction, and T2 BN symptoms. T1 sociotropy did not, however, show a direct effect on T1 thin ideal internalization. Overall, these findings provide limited support for the DPM and suggest that Facebook social comparisons and sociotropy are important additions to the existing DPM.

##### 4.1. The original DPM

Results indicated that our conceptualization of the original DPM model accounted for 48% of the variance in BN symptoms. The significant relationships observed between T1 pressures to be thin, T1 thin ideal internalization, and T1 body dissatisfaction highlight that constant messages about being thin may play an important role in promoting body dissatisfaction (Salafia & Gondoli, 2011). Our findings align with Stice et al.'s (1996) initial results, and suggest the previously neglected constructs of pressures to be thin and thin ideal internalization are still relevant in explaining variance in BN symptoms.

##### 4.2. The dual pathway mechanism

Results showed that while T1 body dissatisfaction predicted T2 depressive symptoms, it did not predict T2 dietary restraint. Further, T2 dietary restraint, but not T2 depressive symptoms, was associated with T2 BN symptoms. Our study also found that T1 body dissatisfaction directly predicted T2 BN symptoms. A test of indirect effects showed no significant effect of mediation for either T2 dietary restraint or T2 depressive symptoms on the path between T1 body dissatisfaction on T2 BN symptoms. Thus, these findings do not provide support for the dual pathway mechanism

which proposes that dietary restraint and depressive symptoms mediate the effects of body dissatisfaction on BN symptoms. Our results are inconsistent with all four past longitudinal studies in this area (Allen et al., 2012; Dakanalis et al., 2014; Salafia & Gondoli, 2011; Stice et al., 1998), however, it should be highlighted that this is only the second longitudinal study to assess the entire DPM, and as such, further research is required to verify the validity of this model.

By contrast, consistent with past research, our findings support the view that body dissatisfaction is a risk factor for symptoms of BN (Stice, 2002) and depression (Salafia & Gondoli, 2011), and that depression was associated with restrained eating, arguably due to the effects of starvation on mood (e.g., Stice, 2001). Our data suggests that restrained eating is therefore associated with BN symptomatology and depressive symptoms. This pattern of effects is consistent with the abstinence-violation effect, which proposes a cycle of restrictive eating followed by binge-eating/purging that results from body dissatisfaction (Pearson et al., 2015).

##### 4.3. The revised DPM: the inclusion of social comparisons made on Facebook

In line with our expectations, T1 comparisons made on Facebook were directly related to T1 body dissatisfaction in the revised DPM. As the authors of previous studies have speculated (Cohen & Blaszczynski, 2015; Fardouly & Vartanian, 2015), it is possible that individuals might engage in an upward social comparison whilst using Facebook (e.g., by comparing their bodies to the bodies of thin females), resulting in negative appraisals regarding one's shape and size, hence accounting for the link between T1 comparisons made on Facebook and T1 body dissatisfaction.

Contrary to expectations, T1 social comparisons made on Facebook were shown to have a non-significant effect on T1 thin ideal internalization. These results are at odds with previous findings (Tiggemann & Slater, 2013). It was hypothesized that the process of comparing one's self to others on Facebook might lead females to internalize the sociocultural norm of the thin ideal (Meier & Gray, 2014). The results of this study suggest a negligible relationship between these constructs. A striking finding of our results was that neither T1 social comparisons made on Facebook nor T1 pressures to be thin were associated with T1 thin ideal internalization. This finding suggests that social comparison processes made on Facebook, and external sociocultural pressures to be thin, exert a direct effect on body dissatisfaction in the absence of internalizing the thin ideal.

By contrast, consistent with our hypothesis, T1 social comparisons made on Facebook was associated with T1 pressures to be thin, suggesting that social comparisons is linked with perceived increases in pressure to obtain the thin ideal. Finally, results showed a significant albeit negative effect of T1 social comparisons made on Facebook on T2 BN symptoms. The negative direction of effect for this finding was unexpected and likely reflects suppression effects since re-modelling (not presented in the paper) with just T1 social comparisons made on Facebook on T2 BN symptoms showed the effect in the anticipated direction.

##### 4.4. The inclusion of sociotropy to the DPM

Results of this study suggest that the personality trait sociotropy may be instrumental in generating BN symptoms. Specifically, T1 sociotropy was found to be associated with T1 pressures to be thin, T1 social comparisons made on Facebook, and T1 body dissatisfaction. T1 sociotropy was also found to be a risk factor for T2 BN symptoms. These results suggest that the trait-based tendency to be sensitive to rejection, and/or to be invested in seeking other's

approval, might be pivotal in contributing to the development of BN symptoms.

In opposition to our hypothesis and the findings of Duemm et al. (2003), T1 sociotropy was not significantly related to T1 thin ideal internalization. This finding was unexpected given the hypothesis that individuals who are motivated to seek acceptance from others might be more likely to internalize sociocultural normal of thinness, especially as the attainment of the thin ideal might be viewed as a mechanism that enables one to gain perceived social acceptance. Our results suggest that individuals who experience pressures from their environment (e.g., via Facebook, family or friends etc) are more likely to be high on sociotropy, but that the internalization of these pressures is not related to sociotropy. It is currently unclear why sociotropy was found to be linked to social pressures, but not the internalization of the thin ideal, and hence, future research is required to assess these relationships.

Finally, our results indicated that sociotropy was a risk factor for BN symptoms. This finding highlights the importance of understanding the influence of the desire to seek approval/avoid rejection, and its longitudinal link to BN symptoms. A notable finding from this study was that of all the variables assessed, sociotropy demonstrated the greatest number of associations with other variables, suggesting that it affords important predictive utility in explaining the development of BN symptoms.

#### 4.5. Limitations

It is important to consider the current findings in the context of limitations. First, despite the use of well-validated self-report measures, the possibility for social desirability bias might influence the reliability of the results. Secondly, although some predictive pathways were found in the revised DPM, many of the conclusions drawn regarding the new constructs were based on cross-sectional data, which precluded causal inference. In addition, there was a limitation concerning the measurement of social comparisons made on Facebook; that is, it was assumed that individuals were making upward comparisons on Facebook and subsequently experiencing body dissatisfaction, however, this proposition was not empirically examined. The distinction between upward and downward (i.e., the person being compared to has a less-than-ideal shape relative to the person making the comparison) comparisons should be further explored in order to elucidate their influence on BN risk factors. Finally, it should be noted that the reliability of the BN scale at T2 was low. This low reliability might therefore have influenced the current results.

#### 4.6. Strengths and implications

Despite the aforementioned limitations, this study has numerous strengths including the utilization of a large, multinational female sample, a longitudinal design, and that it was the first study to assess the inclusion of both social comparisons made on Facebook and sociotropy concurrently in the DPM. These findings suggest important implications for future BN symptomology preventive efforts. Specifically, prevention efforts could focus on educating women on the deleterious effects Facebook comparisons may have on body dissatisfaction, as well as encouraging individuals to regulate the amount of time spent making such comparisons. In addition, the current findings also highlight the need for future research to understand the mechanism(s) by which sociotropy confers risk to BN symptoms.

### 5. Conclusion

In conclusion, the present findings provide limited longitudinal

support for the original conceptualization of the DPM as proposed by Stice et al. (1996). In terms of the revised DPM, these preliminary results suggest that future research would benefit from examining the influence of social comparisons made on Facebook and sociotropy on the development of BN symptoms, as both variables appear instrumental in conferring risk to BN symptoms.

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