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Research report

Is there a perfectionist in each of us? An experimental study on perfectionism and eating disorder symptoms

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ABSTRACT

Previous studies have shown consistent associations between perfectionism and eating disorder (ED) symptoms. However, to date, only one study (Shafran et al., 2006) used an experimental design to examine in a non-clinical sample the causal relationship between perfectionism and ED symptoms. The current experimental study aimed to build on that study by examining the role of trait perfectionism in the effects of an experimental induction of perfectionism and by adopting a multidimensional approach to perfectionism. University students (N = 100; M age = 20.6 years; SD = 2.24) were randomly assigned to one of three experimental conditions, that is, a high Personal Standards condition, a condition combining Personal Standards perfectionism and Evaluative Concerns perfectionism, and a non-perfectionist condition. Compared to the non-perfectionist condition, participants in the two perfectionist conditions reported higher levels of state perfectionism during the next 24 h and this effect occurred irrespective of trait perfectionism levels. Further, participants in the perfectionist conditions, compared to those in the non-perfectionist condition, reported significantly higher levels of restraint and binging during the 24 h after manipulation. Together, the results suggest that perfectionism can be induced in people irrespective of their levels of trait perfectionism and that perfectionism represents a causal risk factor for ED pathology.

Introduction

Recent research suggests that perfectionism is involved in the development, course, and maintenance of eating disorders (Egan, Wade, & Shafran, 2011; Fairburn, Cooper, & Shafran, 2003; Stice, 2002). However, debate remains about whether perfectionism is a causal risk factor for eating disorder symptoms or whether it represents a concomitant or even consequence of eating disorder pathology (e.g., Bardone-Cone et al., 2007; Shafran & Mansell, 2001). The current study aimed to contribute to this debate by relying on an experimental design to examine whether the experimental activation of perfectionism produces an increase in eating disorder symptoms, thereby adopting a multidimensional approach to perfectionism. Additionally, by measuring participants' dispositional levels of perfectionism prior to exposing them to an experimental induction of perfectionism, we examined whether state perfectionism could be activated in all participants, independent of their initial disposition towards perfectionism.

Multidimensionality of perfectionism

In current research, perfectionism is typically considered as a multidimensional construct (Dunkley, Blankstein, Halsall, Williams, & Winkworth, 2000; Stoeber & Otto, 2006). This multidimensional conceptualization harkens back to the distinction of Hamachek (1978) between 'normal' and 'neurotic' perfectionism. He argued that perfectionism does not necessarily need to be maladaptive, but may also involve positive striving tendencies that might be relatively less harmful or even adaptive. Normal perfectionists were described as people who set high but attainable standards for themselves and who can derive a sense of pleasure from their attempts to pursue these standards, whereas neurotic perfectionists set unattainable standards and would never be satisfied with their performance (Hamachek, 1978). Consistent with Hamachek's reasoning, factor analytic studies using the most widely used multidimensional measures of perfectionism support a distinction between two components of perfectionism, that is: 'Personal Standards' (PS) perfectionism and 'Evaluative Concerns' (EC) perfectionism (Dunkley et al., 2000; Frost, Heimberg, Holt, Mattia, & Neubauer, 1993).

EC perfectionism has been found to be associated positively with maladaptive outcomes (e.g., depression and negative affect), whereas PS perfectionism has been found to be unrelated to these

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negative outcomes and sometimes even positively related to adaptive outcomes, such as positive affect (Frost et al., 1993; Stoeber & Otto, 2006). The question whether PS perfectionism is also harmless or even adaptive in the context of ED pathology has been a topic of controversy (Bardone-Cone et al., 2007). So far, findings are inconsistent: although EC perfectionism has been found to relate systematically to ED symptoms, associations between PS perfectionism and ED symptoms are less straightforward (Bardone-Cone, 2007; Bulik et al., 2003). For instance, several studies indicated that levels of both PS and EC perfectionism were higher in ED patients compared to healthy controls or other psychiatric groups (Bastiani, Rao, Weltzin, & Kaye, 1995). This type of findings raises questions concerning the adaptive nature of PS perfectionism. Other studies, however, found that only EC perfectionism was related to ED symptoms. Bulik et al. (2003), for instance, reported that EC (but not PS) perfectionism was associated with elevated odds ratios for the presence of eating disorders, compared to other psychiatric illnesses. In line with this, Soenens et al. (2008) found that, although eating disorder patients had higher scores on both perfectionism components compared to normal controls, these elevated scores of PS perfectionism disappeared when the variance shared with EC perfectionism was controlled for. Because research on the relevance of the distinction between PS and EC perfectionism in the context of ED symptoms has yielded inconclusive findings, it was deemed important to adopt this distinction in the current experimental study.

Research on the predictive and causal role of perfectionism in eating disorder symptoms

Evidently, cross-sectional studies on the relation between perfectionism and ED symptoms do not allow one to draw conclusions about perfectionism as a risk factor for EDs (e.g., Bardone-Cone, 2007). To overcome this limitation, longitudinal studies have been conducted to determine whether perfectionism is related to increases in ED symptoms across time (e.g., Bardone-Cone et al., 2007). However, the scarcely available longitudinal studies did not produce clear-cut findings. Whereas some studies found perfectionism to prospectively predict ED symptoms (e.g., Boone, Soenens, & Braet, 2011; Tyrka, Waldron, Graber, & Brooks-Gunn, 2002), others could not replicate such findings (e.g., Leon, Fulkerson, Perry, Keel, & Klump, 1999). Although methodologically superior to cross-sectional studies, longitudinal effects still fall short of demonstrating causality because observed longitudinal effects of perfectionism might be spurious, that is, driven by third variables. Hence, to examine the causal status of perfectionism in ED, there is a need to expand research methods, such as the use of experimental research.

Recently, experimental intervention studies have shown that the treatment of perfectionism through CBT resulted in a reduction of perfectionism and ED symptoms (e.g., Egan et al., 2011; Steele & Wade, 2008). Although these studies showed that an intervention focused on reducing perfectionism resulted in decreased levels of perfectionism and ED symptoms, they did not provide insight into dynamics involved in the causal association between perfectionism and ED symptoms in the general population. Therefore, in this study, it was deemed important to examine the effects of experimentally activated perfectionism on ED symptoms in non-clinical individuals.

To the best of our knowledge, to date, only one experimental study on perfectionism and eating disorder attitudes and behaviors has been conducted in a non-clinical sample (Shafran, Lee, Payne, & Fairburn, 2006). Shafran et al. (2006) randomly placed adolescents in either a high standards (i.e., perfectionist) or a low standards (i.e., non-perfectionist) group. High standards were manipulated by asking participants to set high Personal Standards and to pursue perfection during 24 h in a self-defined life domain (e.g., work or studies). In the low standards condition, participants were asked to function to the minimal possible standards. The activation of high personal, relative to minimal, standards caused participants (a) to eat less high-calorie foods, (b) to make more attempts to restrict food, and (c) to experience more regret after eating during the day.

Shafran et al.'s (2006) finding that perfectionism activated in the course of one day is related to ED symptoms experienced that day is consistent with a recent diary study in which it was shown that day-to-day fluctuations in perfectionism covary with day-to-day fluctuations in ED symptoms (Boone et al., 2012). One may wonder why (i.e., through which intervening mechanisms) perfectionism experienced one day would relate to ED symptoms within the day. A number of intervening mechanisms have been identified to explain why trait perfectionism is related to ED symptomatology, such as maladaptive cognitive schema's (Boone, Braet, Vandereycken, & Claes, 2012; Shafran, Cooper, & Fairburn, 2002), pressure to be thin and thin-ideal internalization (Boone et al., 2011). Because these mechanisms develop across a relatively long period of time, they are unlikely to be responsible for the association between daily perfectionism and ED symptoms. Herein, we argue that other mechanisms may be responsible for associations between daily perfectionism and ED symptoms, in particular processes related to coping and emotion regulation. It has been shown, for instance, that perfectionism is related to avoidant coping within the day (Stoeber & Janssen, 2011). Avoidant coping, in turn, has been shown to be systematically related to ED symptoms and binge eating in particular (e.g., Aldao, Nolen-Hoeksema, & Schweizer, 2010). Similarly, restricted eating could be considered a compensatory and derivative way of coping with frustration and feelings of failure on days when one is highly perfectionistic (Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012).

The present study

This study builds on the experimental study of Shafran et al. (2006) in three ways, that is, (a) by adding, consistent with the multidimensional perspective on perfectionism, an experimental condition characterized by the activation of both PS and EC perfectionism, (b) by examining whether the experimental manipulation of perfectionism interacts with dispositional levels of perfectionism assessed prior to the experiment, and (c) by examining the effect of perfectionism on a broad set of eating disorder outcomes, including restrictive symptoms, binge eating pathology, and body dissatisfaction, which were assessed 24 h after the experimental induction.

These three novel features allowed us to examine three understudied yet important issues. First, next to the conditions involving high PS perfectionism and low PS perfectionism (which were included in the Shafran study), we included a third condition involving the combined activation of PS and EC perfectionism in which participants were asked to set high standards for themselves and to make sure they would not fail to attain them. By doing so, we could explicitly examine whether the activation of PS perfectionism by itself would elicit an equal degree of EC state perfectionism compared to the activation of both PS and EC. If this were the case, it would suggest that PS perfectionism might not be so adaptive after all.

Second, the inclusion of an assessment of trait (or dispositional) levels of perfectionism prior to the experimental manipulation allows one to examine potential interactions between trait perfectionism and an experimental manipulation in the prediction of state perfectionism and ED symptoms. Such interaction analyses help to shed light on the question how stable or trait-like versus malleable and state-like perfectionism is. If the present study

would demonstrate that perfectionism could be activated regardless of participants' trait levels of perfectionism, it would suggest that there resides a potential for perfectionistic thinking and behaving dormant in each (or at least most) of us.

Third, with the inclusion of state measures of binge eating symptoms and body dissatisfaction next to restrictive symptoms, we aimed to investigate whether the effect of perfectionism on ED symptoms would be specific for certain ED symptoms or would apply to a broader range of ED symptoms.

To sum up, the main goal of this study was to examine whether an experimental manipulation of perfectionism would affect participants' state perfectionism and display of ED symptoms. If effects of the manipulation on ED symptoms would be established, we aimed to investigate whether state PS perfectionism or state EC perfectionism would account for the effect of the experimental manipulation on ED symptoms.

Method

Participants

A total of 100 university students from different faculties at Ghent University in Belgium (e.g., psychology and educational science, law, bioscience engineering, political and social science, physical education) volunteered to participate in the study. The announcement of the study was placed on a webpage of Ghent University. To prevent self-selection, the announcement was very neutral and did not disclose anything about the intent of the study. Only one participant dropped out during the course of the study. In exchange for their participation, students were paid 10 euro. Inclusion criteria were being female within an age range of 18–30 years. The mean age of the sample was 20.6 years (SD = 2.24), with a mean BMI of 22.04 (SD = 2.98). As regards parental educational level: 47% of the fathers and 58% of the mothers had obtained post-high school education (of which 15% and 12% obtained a university degree), and 8% and 10%, respectively, had not obtained a high school diploma. All participants were White and had the Belgian nationality. Study procedures were approved by the local ethics committee of Ghent University.

Procedure

The experiment consisted of three phases: a pre-manipulation assessment, an experimental phase, and a post-assessment phase. The pre-manipulation assessment and post-manipulation assessment were identical in all experimental conditions. The procedure of the experiment was based on the study of Shafran et al. (2006), but we added a third experimental condition, involving the simultaneous activation of PS and EC.

At the beginning of the pre-manipulation assessment, each participant obtained a unique code, which was further used to ensure confidential treatment and matching of data obtained throughout the study. The pre-manipulation assessment took place at least 24 h before the experimental manipulation and participants were invited to take part in an internet-based survey through e-mail. The pre-manipulation assessment involved the measurement of demographic variables (e.g., age, BMI, parental education) and trait perfectionism. Different from the study of Shafran et al. (2006), we chose not to measure ED symptoms prior to the manipulation to avoid that participants would suspect the goals of the study.

The second phase of the study took place at the university. Participants were assigned randomly to one of the three experimental conditions, that is, a high Personal Standards condition (PS alone; n = 33), a high Personal Standards and Evaluative Concerns condition (PS + EC; n = 34), and a low Personal Standards condition (non-perfectionism; n = 33). The experimenter provided all participants a standardized explanation of the aim of the session and discussed with them the content of the contract for the upcoming 24 h. Participants received instructions from one and the same experimenter. Dependent on condition allocation, the experimenter instructed the participant either (a) to set and strive for high standards (PS-alone), (b) to set high standards, thereby also highlighting negative self-evaluative themes such as avoiding to fail and avoiding to disappoint oneself and others (PS + EC), (c) to set low Personal Standards and to adopt a relaxed orientation towards one's standards (non-perfectionism). Parts of the instructions that were critical for the manipulation in each condition were (full instructions are available from the authors upon request):

> [PS alone condition] ... we would like to ask you that everything you do in the next 24 h will be done to the *highest possible standards*. We ask you to *set high standards* for yourself and to have high expectations for your performance and to strive to *adhere* to them as good as you can, in all circumstances. [...] Let me ask you now; in which domains of life do you *strive for high standards*? In other words: in which domains do you have *high expectations* for yourself?

> [PS + EC condition]... we would like to ask you that everything you do in the next 24 h, will be done to the *highest possible standards*. We ask you to *set high standards* for yourself and to have high expectations for your performance, *thereby avoiding to fail or to disappoint yourself and others*. [...] Let me ask you now; in which domains of life do you *strive for high standards* and would you *feel like an absolute failure* if you did not meet your standards? In other words, in which domains do you have *high expectations* for yourself and in which domains do you *not want to fall short*?

> [Non-perfectionism condition] ... we would like to ask you that everything you do in the next 24 h, will be done to the *lowest possible standards*. We ask you to deal with expectations or demands as *relaxed* as possible, and to adopt, as much as possible, an *easygoing* orientation, in all circumstances.

After going through the general instructions, participants were asked to reflect on the life domains in which they find it personally very important to perform well and in which they have high expectations for themselves. By doing so, we aimed to probe personally relevant life domains for each participant. Once these important life domains were identified, specific exemplary behaviors relevant to the pursuit of high or low standards in these domains were discussed. Subsequently, the contract was presented to the participants, they were encouraged to read the instructions again, and to write down the discussed behaviors in which they promised to engage during the upcoming 24 h.

Most often, participants nominated the life domains of studying, friends, family, and hobbies. If participants referred to the domain of eating (e.g., trying to stick to a diet, eating less caloric food), they were told this domain was not applicable for the experiment, and they were encouraged to focus on a different life domain. This was done to avoid that the experimental manipulation would already involve a reference to the main outcomes in this study, that is, ED-related symptoms.[2] Examples of behaviors in the domain of studying were: studying for two hours without losing concentration and trying to concentrate during class and making perfect notes. Examples in the social and family domains were: trying to pay a lot of attention to friends, really asking friends how they

[2] Less than 5% of the participants nominated the domain of eating as a personally important domain of life. Removing these participants from the analyses did not alter the findings.

are doing instead of telling about yourself, and pro-actively and conscientiously helping one's parents in the household. Examples of behaviors relevant to the pursuit of low Personal Standards were: relaxing in classes, or not going at all and doing something pleasant instead, and doing no special efforts for cooking and cleaning.

The post-experimental assessment took place at the university, exactly 24 h after the experimental session. During this session, participants filled out a battery of questionnaires tapping into their behaviors, feelings, and cognitions during the past 24 h. Specifically, we tapped into state perfectionism (i.e., perfectionistic attitudes and behaviors displayed during the last 24 h) and three types of experienced eating disorder symptoms, that is, body dissatisfaction, binge eating, and restraint. Additionally, participants were asked to what extent they followed the contract. We also tapped into positive and negative affect during the last 24 h so as to be able to examine the effects of the manipulation on mood. A personal debriefing, explaining the study goals, was provided after the post-experimental assessment.

Measures

Perfectionism (pre- and post-manipulation)

The Frost Multidimensional Perfectionism Questionnaire (F-MPS; Frost, Marten, Lahart, & Rosenblate, 1990) is a 35-item self-report questionnaire. Items are rated on a scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). For the purpose of this study, only the intrapersonal subscales were used. To measure trait EC perfectionism (pre-manipulation) we administered the scales for Concern over Mistakes (CM; e.g., "People probably think less of me if I make a mistake") and Doubts about Actions (DA; e.g., "I usually have doubts about the simple everyday things I do"). Trait PS perfectionism was measured using the Personal Standards subscale (PS; e.g., "I set higher goals for myself than most other people"). State perfectionism (post-manipulation) was also measured with the same 20 items of the Frost-MPS, but all questions were slightly adapted, asking for perfectionistic experiences during the past 24 h. For instance, the original item "I should be upset if I make a mistake" was changed into "During the last 24 h, I was upset when I made a mistake". Additionally, for state perfectionism, participants were asked to answer, instead of on a 1–5 likert scale, on a VAS scale ranging from 0% (*I don't agree at all*) to 100% (*I fully agree*). VAS scales were used for post-manipulation assessment to obtain a more precise and reliable measure of perfectionism during the last 24 h. The F-MPS has good internal consistency, with alphas ranging from .77 to .93 (Frost et al., 1990).

Eating disorder symptoms (post-manipulation)

ED symptoms were only measured after the experimental manipulation. We administered items tapping into restrictive eating behavior, binge eating, and body dissatisfaction. All questions were derived from well-established measures of ED symptoms and were slightly adapted to refer to the previous 24 h. As with the state perfectionism measure, all items were rated on a 0–100 VAS scale.

First, to examine restrictive eating behavior, we used four items from the Eating Disorder Examination (EDE; Cooper & Fairburn, 1987). These items are the same as the ones used inthe study of Shafran et al. (2006) and they tap into attempted and actual dietary restraint during the last 24 h and into attempted and actual exclusion of food during the last 24 h. In addition, we administered a number of items tapping into weight loss behaviors (French, Perry, Leon, & Fulkerson, 1995). Participants were asked to rate to what extent they reduced fat intake, reduced intake of high-calorie food, ate more low-calorie food, and reduced the total amount of food during the past 24 h, with the intention to influence weight or shape. Second, to measure binge eating symptoms, we administered four items from the Bulimia subscale of the Eating Disorder Inventory-II (e.g., "During the last 24 h, I ate when I was upset"). Third, to measure body dissatisfaction, we administered five items from the corresponding scale of the EDI-II (e.g., "During the last 24 h, I thought my hips were too big"). Items were selected on the basis of face validity by the first and fourth author of this study. Both are familiar with the ED literature and have clinical experience with EDs.

Prior to the main analyses, we aimed to reduce the number of dependent variables. A Principal Components Analysis (PCA) was performed with maximum likelihood extraction and oblique rotation (Promax) on the 17 items tapping into ED symptoms (see Table 1 for an overview of all items). The PCA resulted in three components with an eigenvalue larger than 1, together accounting for 71.59% of the total variance in all ED items. The first component was defined by high loadings of attempted restraint, actual restraint, actual exclusion, attempted exclusion, eating less fat and calorie food, eating a smaller amount of food, and less calories, and can be interpreted as representing restrictive eating. The second component was defined by high loadings of items tapping into body dissatisfaction. The third component was defined by high loadings of all the items tapping into binge eating. The three factors obtained are in line with those identified by Goldschmidt, Aspen, Sinton, Tanofsky-Kraff, and Wilfley (2008). They proposed a classification of disordered eating attitudes and behaviors in three categories: negative attitudes toward shape and weight (i.e., body dissatisfaction), unhealthy weight control behaviors (i.e., restriction), and binge eating. In all further analyses, the three components as retrieved from the PCA were used. The factor scores are standardized scores (i.e., scores with a mean of 0 and a standard deviation of 1) in which the contribution of each item is weighted by its factor loadings.

Plan of analysis

Data-analysis proceeded in four steps. First, through analysis of variance (ANOVA) we examined whether the randomization of the participants across conditions was successful. Second, through a multivariate analysis of variance, we examined whether and how participants in the three conditions differed in terms of state perfectionism. To examine whether between-condition differences in state perfectionism are moderated by trait perfectionism, we additionally performed hierarchical regression analyses with interaction components. Third, to examine the effects of experimental condition on the eating disorder symptoms, thereby examining the moderating role of trait perfectionism, we performed another series of hierarchical regression analyses. Fourth, we used regression analysis to examine the intervening role of state perfectionism in associations between experimental condition and eating disorder symptoms. Indirect effects were computed using the Sobel (1982) test.

Results

Preliminary analyses

Prior to examining the effect of the experimental manipulation on state perfectionism and ED symptoms, we first checked whether the randomization of participants was successful. To do so, we examined whether participants in the three conditions differed in terms of two relevant background variables (i.e., age and BMI), and in terms of dispositional perfectionism assessed before the manipulation. Two separate analyses of variance (ANOVA) revealed that participants in the three conditions did not differ significantly in terms of age [$F(2,97) = .14$, $p = .87$, $\eta^2 = .003$], and

Table 1
Results of PCA on items tapping into eating disorder symptoms.

	Restraint	Body dissatisfaction	Binge eating	Mean (SD)
Attempted restraint	.88			33.4 (36.32)
Actual restraint	.70			15.9 (23.32)
Actual exclusion	.94			24.5 (30.74)
Attempted exclusion	.92			25.4 (31.98)
Decrease fat intake or snacking	.84			1.7 (0.76)
Reduce calories	.81			1.5 (0.66)
Reduce amount of food	.80			1.5 (0.63)
Eating low-calorie foods	.68			1.4 (0.61)
Stomach too big		.58		45.7 (38.89)
Thighs not the right size		.98		66.3 (32.57)
Dissatisfied with shape of body		.88		50.8 (32.05)
Dissatisfied with shape of buttocks		.93		58.2 (33.39)
Hips too big		.62		30.9 (32.73)
Eating when upset			.80	9.3 (19.81)
Stuffed with food			.93	10.1 (19.0)
Binge eating, not stopping			.91	8.8 (20.11)
Thinking about overeating			.76	10.4 (21.98)
Eigenvalue	7.62	2.59	1.96	
Explained variance	44.84%	15.20%	11.55%	

Note: Absolute values less than .40 are suppressed.

BMI [$F(2,97) = .54$, $p = .59$, $\eta^2 = .011$]. A multivariate analysis of variance (MANOVA) revealed that participants in the three conditions did not differ significantly on the pre-assessment measures of trait PS perfectionism and trait EC perfectionism [Willks' $\lambda = .99$, $F(4, 192) = .22$, $p = .929$, $\eta^2 = .004$]. These findings confirm the random assignment of participants to the experimental conditions.

Additionally, a univariate ANOVA was performed to analyze whether participants in the three conditions would differ in the extent to which they followed the contract. No significant between-conditions difference was found [$F(2, 97) = .303$, $p = .70$]. The mean score on the 0–100 VAS scale across conditions for following the contract was high ($M = 83.5$; $SD = 13.14$) indicating that participants were generally compliant with the experimental instructions. Descriptive statistics and correlations between the main study variables are shown in Tables 2 and 3.

Primary analyses

Effects of experimental manipulation on state perfectionism

A MANOVA was performed to examine whether the experimental manipulation had an effect on the state perfectionism scores.Results revealed a significant multivariate effect [Willks' $\lambda = 22.09$, $F(4, 192) = 22.09$, $p < .01$, $\eta^2 = .32$]. Condition had an effect on both state PS perfectionism [$F(2,97) = 52.29$, $p < .001$] and state EC perfectionism [$F(2,97) = 6.09$, $p < .01$]. Post-hoc Tukey tests revealed that there were no significant differences in state PS and EC perfectionism between the PS-alone condition ($M = 60.89$, $M = 29.58$; respectively) and the PS + EC condition ($M = 59.45$, $M = 33.90$; respectively). Participants in both conditions scored higher than participants in the non-perfectionism condition on PS as well as EC perfectionism ($M = 22.18$, $M = 17.52$; respectively), but they did not differ from each other on both measures. This indicates that the condition in which only PS perfectionism was manipulated resulted in equal levels of PS and EC perfectionism as the condition in which both PS and EC perfectionism was manipulated. This finding suggests that manipulating only PS perfectionism tends to not only induce the setting of high Personal Standards during 24 h, but also brings along Evaluative Concerns and self-criticism to a similar extent as in the condition in which EC perfectionism is induced explicitly. On the basis of this finding, we decided to combine both conditions (PS-alone and PS + EC) into one experimental condition. As such, two conditions were retained in the remainder of the analyses, referred to as the 'perfectionism condition' ($n = 67$) and the 'non-perfectionism condition' ($n = 33$).

In addition to establishing the main effect of condition on state perfectionism, we also examined whether this effect would be dependent on levels of trait perfectionism. To this end, a hierarchical regression analysis was performed in which state perfectionism scores were regressed on condition (dummy coded as: 0 = non-perfectionism; 1 = perfectionism), trait PS perfectionism, trait EC perfectionism, and the interactions between the trait perfectionism components and condition. Results of this analysis can be found in the first two columns of Table 4. Condition and the scores for trait perfectionism were standardized and the interaction terms were computed as the product of the standardized scores for condition and trait perfectionism (Aiken & West, 1991). In the first

Table 2
Means, standard deviations, and correlations between study variables.

	α	1	2	3	4	5	6
1. Trait PS perfectionism	.82						
2. Trait EC perfectionism	.91	.54***					
3. State PS perfectionism	.87	.19	.06				
4. State EC perfectionism	.93	.38***	.42***	.53***			
5. Restraint	.80	.32***	.35***	.31**	.48***		
6. Binge eating	.88	.24*	.31**	.13	.44***	.40***	
7. Body dissatisfaction	.89	.29**	.42***	.06	.30**	.44***	.38***

Note: PS, Personal Standards; EC, Evaluative Concerns.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 3
Means and standard deviations of study variables per condition.

	PS-alone condition		PS + EC condition		Non-perfectionism condition		Total scores	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Trait PS perfectionism	3.08	0.74	3.14	0.83	3.14	0.83	3.12	0.80
2. Trait EC perfectionism	2.49	0.77	2.55	0.86	2.67	0.89	2.57	0.84
3. State PS perfectionism	60.89	13.84	59.45	22.74	22.18	14.17	47.63	24.93
4. State EC perfectionism	29.58	19.59	33.90	24.04	17.52	14.70	27.07	20.86
5. Restraint	0.15	1.06	0.12	1.08	-0.28	0.80	0.00	1.00
6. Binge eating	-0.03	0.82	0.28	1.40	-0.26	0.48	0.00	1.00
7. Body dissatisfaction	-0.04	1.08	0.07	1.01	-0.04	0.93	0.00	1.00

Note: PS, Personal Standards; EC, Evaluative Concerns. Trait perfectionism scores were rated on a 5-points likert scale.
State perfectionism scores were rated on a 0–100 VAS scale. ED components are standardized factor scores.

Table 4
Standardized beta-coefficients of hierarchical regression analyses predicting ED symptom scores by BMI, experimental condition, trait perfectionism, and their interaction.

	State PS perfectionism		State EC perfectionism		Restraint		Binge Eating		Body dissatisfaction	
Predictor	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step1		.00		.02		.19***		.06*		.33***
BMI	.02		.14		.44***		.25*		.57***	
Step2		.56***		.32***		.17***		.13**		.15***
Condition	.72***		.35**		.21*		.20*		.05	
Trait PS	.19*		.19		.15		.09		.07	
Trait EC	.02		.34**		.26**		.27*		.35***	
Step3		.01		.03		.01		.02		.02
Condition × trait PS	.08		.15		−.10		.01		−.14	
Condition × trait EC	−.05		.03		.07		.13		.13	

Note: BMI, body mass index; PS, Personal Standards; EC, Evaluative Concerns; condition (0 = non-perfectionism condition; 1 = perfectionism condition). The effects on state PS perfectionismand state EC perfectionism remained the same when BMI was not statistically controlled for.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

step, BMI was entered as a control variable. BMI was not related significantly to state PS and state EC perfectionism. In the second step, the three main effects were tested. Condition had a significant effect on state PS and state EC perfectionism. Next, trait PS perfectionism uniquely predicted state PS perfectionism but not state EC perfectionism. Conversely, trait EC perfectionism uniquely predicted state EC perfectionism but not state PS perfectionism. In the third block, interactions between condition and both trait perfectionism components were entered and each of these interaction terms was non-significant. The latter finding indicates that the effect of condition on both state perfectionism components is not dependent on previous trait perfectionism levels. This finding supports the hypothesis that state perfectionism could be induced in all participants, independent of trait perfectionism levels.[3]

Effects of experimental manipulation on ED symptoms

To examine the effect of the experimental manipulation on ED symptoms, we ran another set of hierarchical regression analyses (see the last three columns in Table 4). The three ED factor scores were regressed on BMI (Step 1), condition, trait PS perfectionism, and trait EC perfectionism (Step 2), and the interactions between condition and the trait perfectionism measures (Step 3). As shown in Table 4, there was a significant effect of BMI on all three ED symptom scores. Trait EC perfectionism significantly predicted restraint, binge eating, and body dissatisfaction. Trait PS perfectionism was unrelated to each of the ED symptom scores. Condition had a significant effect on restraint and binge eating, indicating that the assignment to a perfectionistic compared to a non-perfectionistic condition resulted in significantly higher levels of restraint and binge eating symptoms during the subsequent 24 h. No significant interaction effects were found between condition and trait PS or trait EC perfectionism. In an ancillary set of regression analyses, we also added state positive and negative affect as predictors. The effects of condition remained unchanged when we controlled for state positive and negative effect.

State perfectionism as an intervening variable in the effect of experimental condition on ED symptom scores

In a final set of analyses we examined whether state perfectionism represents an intervening variable in associations between the experimental condition and ED symptom scores. We followed Holmbeck's (1997) recommendations to test for intervening effects. According to Holmbeck (1997), two types of intervening effects can be distinguished, that is, mediated effects and indirect effects. Mediation is considered to be evident when (a) there is initially a significant association between the independent variable (condition) and the dependent variables (i.e., the ED symptoms), and (b) this association is substantially reduced after taking into account the intervening variable (state perfectionism). An indirect effect is considered to be evident when there is no initial relation between the independent (condition) and the dependent variable (e.g., body dissatisfaction), but the indirect effect of the independent variable on the dependent variable through the intervening variable is significant (Zhao, Lynch, & Chen, 2010). The Sobel (1982) test was used to assess the significance of an indirect effect.

Only state EC perfectionism was considered as an intervening variable because Table 2 shows that, whereas state EC perfectionism was related to each of the ED symptom scores, state PS perfectionism was only related to restraint. Moreover, the latter

[3] Additional analyses were performed in which interactions between trait PS and EC perfectionism and the three separate conditions (i.e. PS-alone, PS + EC, non-perfectionism condition) on state PS and EC perfectionism and state ED symptoms were tested. These analyses revealed again non-significant interaction effects.

correlation was reduced to non-significance after controlling for the variance shared with EC perfectionism (partial $r = .08$; $p > .05$).

Following the recommendations of Kenny, Kashy, and Bolger (1998) to test for mediation and the recommendations of Zhao et al. (2010) to test for intervening effects, we followed a four step procedure, each time controlling for BMI, trait PS and trait EC perfectionism. Step 1 involves determining the magnitude of the path from the independent variable (condition) to the dependent variables (restraint, binging, and body dissatisfaction). Step 2 requires a significant path from the independent to the intervening variable (state EC perfectionism). Step 3 requires a significant path from the intervening to the dependent variable, controlling for the independent variable. Finally, in Step 4, the decrease in the path from the independent to the dependent variables after controlling for the intervening variable is inspected. When an initially significant association in Step 1 is reduced to non-significance in Step 4, full mediation is established.

A first set of regression analyses showed that the effect of condition on restraint ($\beta = .21$, $p < .05$) and binging ($\beta = .20$, $p < .05$) was significant, but not significant for body dissatisfaction ($\beta = .05$, $p > .05$) (Step 1). A second regression analysis showed a significant effect of condition on state EC perfectionism ($\beta = .35$, $p < .001$) (Step 2). In a third set of regression analyses, restraint, binging, and body dissatisfaction were regressed on both condition and state EC perfectionism. Results showed that state EC perfectionism was related significantly to restraint ($\beta = .28$, $p < .01$) and binging ($\beta = .30$, $p < .01$), but not to body dissatisfaction ($\beta = .05$, $p = .62$) (Step 3). Finally, the effects of condition on restraint ($\beta = .11$, $p = .20$) and binging ($\beta = .10$, $p = .32$) were reduced to non-significance after taking state EC perfectionism into account (Step 4). The results of this analysis (see Fig. 1) suggest that state EC perfectionism is a full mediator of the effect of the manipulation of perfectionism on restraint and binging Additionally, the Sobel test was significant for restraint and binging ($z = 2.90$, $p < .001$ and $z = 2.55$, $p < .001$, respectively) but not for body dissatisfaction ($z = .74$, $p = .46$). The latter finding shows that state EC perfectionism was not an intervening variable in the association between condition and body dissatisfaction.

Discussion

Based on the procedure developed by Shafran et al. (2006), our aim was to investigate the causal effect of perfectionism on ED related symptoms, such as restraint, binging, and body dissatisfaction. First, we examined whether the experimental manipulation of perfectionism affected participants' state perfectionism experienced during the 24 h period following the manipulation. As expected, participants in both the PS-alone and the PS + EC condition reported higher levels of state PS perfectionism compared to participants in the non-perfectionism condition. Interestingly, however, the PS-alone and PS + EC conditions did not differ in terms of state EC perfectionism. If the experimental activation of PS would uniquely result in state PS (but not EC) perfectionism, one would expect that state EC perfectionism would only be elevated in the PS + EC perfectionism condition. Reasoning the other way around, these findings suggest that it is not necessary to explicitly activate EC perfectionism to heighten participants' state EC perfectionism. It suffices to have participants pursue high standards to increase this tendency to engage in negative self-evaluation and self-criticism. These findings call into question a strict demarcation between PS and EC perfectionism and suggest that dynamics of EC perfectionism are closely intertwined with the pursuit of high standards, at least when this pursuit of high standards is activated experimentally. More generally, these findings raise questions about the status of PS perfectionism as an adaptive personality feature (Stoeber & Otto, 2006). The current results suggest that experimentally induced PS perfectionism had an effect on EC perfectionism and may, as such, represent an indirect risk factor for psychopathology through its association with EC perfectionism. Future longitudinal studies might examine whether PS perfectionism actually predicts ED symptoms across time

An important goal of this study was to examine the effects of the experimental manipulation of perfectionism on a broad range of ED symptoms displayed during the 24 h following the manipulation. Participants in the perfectionistic conditions reported higher levels of restraint and binge eating symptomatology compared to those in the non-perfectionstic condition. No such effects were found for body dissatisfaction. These findings provide evidence for the causal role of perfectionism in the development of particular ED related symptoms. Although some research has shown perfectionism to be related also to body dissatisfaction (Hewitt, Flett, & Ediger, 1995), causality in this association could not be established in our study. Possibly, perfectionism is an indirect rather than a direct risk factor for body image concerns. Indeed, a number of correlational studies found that perfectionism was related indirectly to body dissatisfaction through thin ideal internalization, social comparison, or pressure to be thin (Boone et al., 2011). An alternative explanation for the lack of effect on body dissatisfaction is that body dissatisfaction is a relatively more stable feature of ED pathology that is less susceptible to environmental influence, especially within a time frame of 24 h. Test–retest reliability studies using the EDI-II indeed show body dissatisfaction to be most stable over time (e.g., Thiel & Paul, 2006).

Given that experimentally manipulated perfectionism had an effect on ED symptoms, we aimed to further analyze whether state perfectionism could explain this causal relation. The mediation analysis indicated that state EC perfectionism could indeed account for the differences between the two experimental conditions in terms of restraint and binging. These findings are in line with research showing that EC perfectionism is ultimately more strongly involved in ED pathology than PS perfectionism (e.g., Bulik et al., 2003). Yet, recall that an experimental induction of PS alone also elicited EC perfectionism and that PS perfectionism may, as such, be considered an indirect risk factor for ED pathology, through its association with EC perfectionism.

Finally, we examined interactions between trait perfectionism and the experimental manipulation in the prediction of state perfectionism and ED symptoms. Interestingly, we found no evidence for such interactions. This indicates that state levels of perfectionism and associated ED symptoms could be induced in participants independent of their trait levels of perfectionism. This finding provides evidence for perfectionism as a relatively malleable personality feature open to environmental influences (Asendorpf & van Aken, 2003; Soenens et al., 2008). Put more strongly, it might suggest that perfectionism is a personality feature dormant in each (or at least most) of us with the potential to get activated by situational circumstances. As such, our findings are consistent with a conceptualization of perfectionism, not as a fully dispositional trait characterized by stable inter-individual differences, but as a cognitive-affective structure (Luyten & Blatt, 2011; Shahar, Joiner, Zuroff, & Blatt, 2004; Zuroff, Mongrain, & Santor, 2004). Zuroff et al. (2004) indeed portrayed features of personality vulnerability to psychopathology, including self-critical perfectionism, as dynamic cognitive-affective structures available in many people. Dependent on (early) life-experiences, life events, stress, and interactions with others, this personality feature can be dormant or can become relatively more accessible and active in people's functioning.

Towards a better understanding of processes involved in the association between EC perfectionism and restraint and binging

An important aim for future research will be to examine why EC perfectionism experienced in the day would affect ED symptoms in

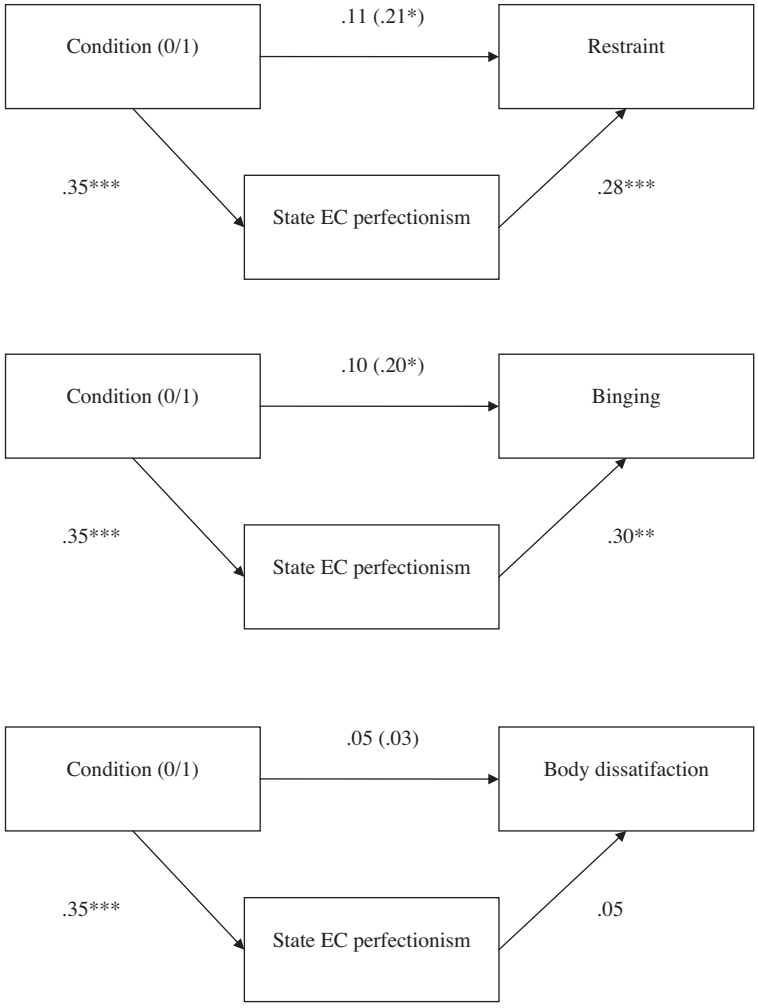

Fig. 1. The mediating role of state EC perfectionism between condition and restraint and binging. The intervening role of state EC perfectionism between condition and body dissatisfaction. *Note*: EC = Evaluative Concerns; condition (0 = non-perfectionism condition/1 = perfectionism condition). Coefficients are standardized regression coefficients. The coefficients between brackets represent the direct effects of condition on ED symptoms before taking into account the mediating role of EC perfectionism. $^{*}p < .05$; $^{**}p < .01$.

the course of the day. We argue that processes that have been identified as mediating mechanisms in associations between trait perfectionism and ED symptoms are not necessarily accounting for associations between daily perfectionism and daily ED symptoms. Rather than processes that accumulate across a longer period of time (such as maladaptive cognitive schemas and thin-ideal internalization), we propose that individuals' ways of coping and regulating emotions in the day are more likely to account for the dynamics of daily perfectionism. For instance, the effect of EC perfectionism on restriction could be understood as a compensatory and derivative attempt to restore feelings of control (Verstuyf et al., 2012). Evaluative Concerns or self-criticism stemming from the pursuit of high standards may lead to feelings of pressure and incompetence. Subsequent to these feelings, individuals may attempt to restore feelings of being in control by engaging in dietary restriction (Fairburn et al., 2003). Narrowing the focus of control over one's own life to control over eating at least temporarily increases (or may hold the promise of increasing) one's competence and self-worth and may distract the attention from the real challenges in life.

Similarly, the effect of daily EC perfectionism on binge eating might be accounted for by maladaptive coping in the day. Research has shown that EC perfectionism is related to avoidant coping during the course of one day (Dunkley, Zuroff, & Blankstein, 2003; Stoeber & Janssen, 2011). Avoidant coping, in turn, has been shown to be related to binge eating (Aldao et al., 2010). The notion that avoidant coping would mediate associations between EC perfectionism and binge eating is consistent with an escape-of-awareness effect (Blackburn, Johnston, Blampied, Popp, & Kallen, 2006; Heatherton & Baumeister, 1991). To escape from negative feelings experienced during the day, individuals experiencing EC perfectionism may turn to overeating and binge eating (Shafran et al., 2002). Additionally, it could be hypothesized that the setting of high standards for oneself and the internal pressure to succeed requires energy from an individual (Deary & Chalder, 2010). This energy-consuming effect of perfectionism leaves less energy available to control oneself and makes one more prone to engage in binge eating in response to stressors. The latter mechanism may even account for the finding that both restraint symptoms and binge eating are increasedat the same time in the perfectionistic condition, a finding that may seem somewhat surprising or counterintuitive at first sight. Possibly, on perfectionistic days people might initially cope with negative feelings and frustration by trying to keep control over their functioning by restricting their food. However, their cognitive resources might get depleted throughout the day, thereby increasing the risk for binge eating

in response to stressors. Indeed, this reasoning is consistent with several models such as restraint theory, the disinhibition hypothesis, and the transdiagnostic formulation of EDs (Fairburn et al., 2003; Herman & Mack, 1975; Polivy & Herman, 1989), in which it is postulated that restraint or dieting may lead to binge eating. Future studies may want to include daily measures of coping, emotion regulation, and energy depletion to shed more light on the dynamics relating daily perfectionism to ED symptoms and to explain comorbidity between ED symptoms in the day. In doing so, future research may complement the current experimental approach with experience sampling methodology. Such research also allows one to examine the effects of perfectionism on ED symptoms in the day and would complement the current research by charting naturally occurring (rather than experimentally induced) day-to-day variation in perfectionism and ED symptoms. For example, an ecological momentary assessment approach allows one to test processes of stress generation, where failing to meet standards may generate stress which, in turn, may precede binge eating.

Limitations and directions for future research

One limitation of our study is that we only measured state perfectionism after 24 h. It would also be interesting to test whether levels of state perfectionism would persist after 48 h or even after one week. This would shed more light on the duration of the induction of state perfectionism; how long can the effect of the manipulation last? It could be hypothesized that, in contrast with the short term effects, the long term effects of the experimental manipulation on ED related features would depend on trait levels of perfectionism. Possibly, only those high on trait perfectionism would persist in higher levels of state perfectionism and only for these people, causal effects on ED features would remain significant.

Although the randomization across conditions makes it unlikely that there were pre-experimental differences between conditions in terms of ED symptoms, one could argue that we cannot exclude with certainty the possibility that there were baseline level differences in ED symptoms between the conditions. Future research may want to include such pre-assessment measures of ED symptoms. To avoid disclosing the true intent of the study to the participants, these pre-assessment eating disorder items may best be embedded in a larger questionnaire with distractor items.

Another limitation is our reliance on a sample of university students. It would be interesting to examine whether state perfectionism would also be independent of trait perfectionism in a clinical population of ED patients. Possibly, ED patients already high on perfectionism could be more susceptible to inductions of state perfectionism. Alternatively, one could argue that, because ED patients have higher perfectionism levels than normal controls maybe a ceiling effect would make it relatively more difficult to increase perfectionism levels in ED patients. Also, given that perfectionism levels in ED patients remain high even after recovery and considering the difficulties to reduce perfectionism in treatment (e.g., Nilsson, Sundbom, & Hagglof, 2008), it might prove difficult to induce state non-perfectionism in ED patients high on trait perfectionism.

Next to the use of a different sample in a future experimental study on perfectionism, we believe it could be interesting to examine the effect of additional experimental conditions. First, to truly test whether the induction of PS alone brings along state EC perfectionism, a condition that primes PS perfectionism and actively works against EC perfectionism should be added to the design (e.g., "We ask you to set high standards for yourself. . .and to strive to adhere to them as good as you can, in all circumstances. While we want you to truly try your best, make sure that you don't criticize yourself if you don't meet some of the standards; focus on the process of striving rather than on the outcomes and evaluations of your performance"). Second, in order to disentangle the effects of PS perfectionism from EC perfectionism, an EC alone group could shed further light on the ongoing debate concerning the multidimensionality and adaptiveness of perfectionism. Examining the effects of an EC alone condition seems important because recent research indicates that at least some adolescents indeed have high EC perfectionism without setting high standards (Boone, Soenens, Braet, & Goossens, 2010). Moreover, future research may want to validate the way in which EC perfectionism was induced in this experiment. One may wonder whether the manipulation was sufficiently strong to induce EC perfectionism. We tend to interpret the lack of difference in EC perfectionism between the PS alone and the mixed (PS + EC) conditions as meaning that PS alone may increase EC perfectionism to the same extent as an explicit induction of EC perfectionism. An alternative explanation for this finding, however, is that the experimental induction of EC perfectionism was simply not strong enough. Future research might want to address this issue by using different experimental methods to induce EC perfectionism. One could also argue that some of our findings may have been driven by demand effects and social desirability. Some participants in the perfectionism conditions may report higher state perfectionism scores because they thought they were supposed to. Although demand effects are a source of concern, it is in our view unlikely that such effects would explain most or all of our findings. If demand effects would account for most of our findings, we probably would not have obtained the current, relatively differentiated, pattern of results where, for instance, the experimental induction only had an effect on binge eating and restraint, and not on body dissatisfaction.

Implications for prevention and treatment

Because perfectionism appears to be a causal risk factor for restrictive and binging behaviors and attitudes, prevention programs should focus on perfectionism in the prevention of ED pathology. Important efforts are being made in this area, with selective prevention programs being developed for adolescents with elevated levels of pressure to be thin, thin-ideal internalization, body dissatisfaction, dieting, negative effect, which are risk factors for the development of ED's (Stice, Shaw, & Marti, 2007). A recent study of Wilksch, Durbridge, and Wade (2008) showed that high-risk participants (i.e., those with high levels of shape and weight concern at baseline) benefited most from a program targeting perfectionism. Perfectionism should take an important place in prevention programs in which it is an important aim to try to challenge, but not necessarily to remove, unrealistic and rigidly held Personal Standards and the accompanying negative self-evaluations and self-criticism (Egan et al., 2011).

Our finding that people could be encouraged to have relatively low perfectionistic standards independent of their trait scores on perfectionism, is in a way promising for therapeutic interventions. Although future research still needs to examine how long the effects of an induced non-perfectionism state last, the current results and previous successful intervention studies on perfectionism (Egan et al., 2011)warrant some optimism about the possibility to reduce perfectionism. Such reductions of perfectionism in ED patients may be important in breaking the maintaining effect of perfectionism on ED and in the improvement of recovery (Fairburn et al., 2003).

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