Influence of College Peers on Disordered Eating in Women and Men at 10-Year Follow-up

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Abstract

Research supports both concurrent and prospective associations between peer behaviors and disordered eating levels in late adolescent and young adult men and women. However, no study has examined peer influence after a follow-up duration over which peer groups change dramatically. This study examined how college roommates' dieting predicted disordered eating levels in women (n=566) and men (n=233) at 10-year follow-up. For women, college roommate dieting significantly predicted Drive for Thinness, Bulimia scores, and purging at 10-year follow-up. Findings highlight the potential for school-based, peer-led interventions to have long-term benefits in women.

Keywords

peers; longitudinal; disordered eating

Eating disorders are most likely to onset during adolescence and young adulthood (American Psychiatric Association, 2000; Hudson, Hiripi, Pope, & Kessler, 2007). As part of the transition to adulthood, peers become important sources of influence, and studies support significant peer influence on disordered eating behaviors and attitudes (Eisenberg & Neumark-Sztainer, 2010; Vincent & McCabe, 2000). Friends' dieting frequency has been positively associated with weight control behaviors in adolescents (Eisenberg, Neumark-Sztainer, Story, & Perry, 2005) and drive for thinness in adults (Gravener, Haedt, Heatherton, & Keel, 2008) and predicts unhealthy and extreme weight control behaviors (e.g., fasting and self-induced vomiting) and binge eating/loss of control eating in girls at 5-year follow-up (Eisenberg & Neumark-Sztainer, 2010; Neumark-Sztainer et al., 2007). However, no study has evaluated the enduring influence of peer behaviors over a follow-up in which peer groups change dramatically.

If peer behaviors represent an important risk factor for the development of disordered eating, then gender differences in risk may be reinforced by affiliation with same-sex peers. Specifically, girls' risk for developing disordered eating may be heightened by their

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affiliation with girls who are more likely to diet. Conversely, boys are more likely to spend time with other boys whose reduced dieting may reinforce lower risk. Gravener et al. (2008) found that both women's and men's drive for thinness was positively associated with dieting frequency of same-sex friends. However, both women and men reported that their female friends dieted more frequently than their male friends, indicating women would be exposed to more dieting among their same-sex friends. In addition, boys may be less susceptible to peer influence on disordered eating. Eisenberg and Neumark-Sztainer (2010) found that friends' dieting frequency at baseline consistently predicted disordered eating at 5-year follow-up in girls but not boys. Thus, during the period of peak eating disorder risk, peer environment and susceptibility to social influences may differ between genders.

The current study examines the extent to which peer dieting predicts drive for thinness, bulimic symptoms, and purging in women and men 10 years after college. Important developmental changes occur between college and 10-year follow-up as individuals begin careers, get married, and have children (Masten et al., 2004), and life role changes predict reduced disordered eating in women (Keel, Baxter, Heatherton, & Joiner, 2007). Given these significant changes and their impact on disordered eating, it is unclear whether peer context in college has lasting influences on disordered eating levels as individuals move from their 20's to their 30's. We focused on the behaviors of college roommates as a particularly salient aspect of one's social environment during the transition from adolescence to adulthood. We predicted that we would find evidence of concurrent associations between peer dieting and disordered eating levels in both women and men. However, we predicted that peer dieting would predict disordered eating at 10-year follow-up only in women.

Methods

Data come from a longitudinal, epidemiological survey of bulimic syndromes in cohorts established and followed at 10-year intervals in 1982, 1992, and 2002 (Keel et al., 2007; Keel, Heatherton, Dorer, Joiner, & Zalta, 2006). Analyses include baseline and 10-year follow-up data from the 1992 cohort because 1992 surveys contained questions regarding participants' social environment. This study had IRB approval, and all participants provided written informed consent prior to all assessments.

Participants

Women (n=800) and men (n=400) were randomly sampled from the freshman and senior classes of a selective northeastern university. Women (71%) were more likely than men (59%) to complete surveys at baseline ($\chi^2(1)=17.3$, $p<.001$), but there were no differences in age or ethnic/racial composition between participants and nonparticipants (p-values > .10). Mean (SD) age was 20 (2) years at baseline and 30 (2) years at follow-up. Among participants, 66% were Caucasian, non-Hispanic, 7% African American, 17% Asian, 7% Hispanic, and 3% "Other." Over 99% of those sought for 10-year follow-up were found, and 79% of those located completed assessments, reflecting a high ascertainment and retention of the original sample despite the long duration of follow-up. Women (81%) were significantly more likely than men (70%) to participate at 10-year follow-up ($\chi^2(1)=12.8$, $p<.001$), suggesting that data were not missing completely at random (Schafer & Graham, 2002). As previously reported (Keel et al., 2006), 1.3% (n=7) of women and 0.4% (n=1) of men met DSM-III-R criteria for bulimia nervosa (BN) in 1992, consistent with prevalence estimates from the National Comorbidity Survey Replication (Hudson et al., 2007).

Measures

Body Mass Index (BMI)—Participants self-reported height and weight on surveys, and BMI was calculated as weight in kilograms divided by the square of height in meters (kg/

m^2). Studies have demonstrated high correspondence between self-reported and objectively measured weight in both men and women of different age groups in the United States (Stunkard & Albaum, 1981), with absolute errors ranging from 1.00–3.54% in college-age men and women (Imrhan, Imrhan, & Hart, 1996).

Social variables—Participants reported how often their roommates dieted using "Never," "Rarely," "Sometimes," "Often," and "Always." To replicate and extend prior longitudinal analyses of peer influences (Eisenberg & Neumark-Sztainer, 2010), we included parent dieting as covariates. Participants indicated whether or not their mothers and fathers frequently dieted. Endorsement of mothers' frequent dieting was significantly associated with a second question regarding mothers' dieting frequency (ranging from "Never" to "Always") ($\chi^2(4)=107.35$, $p<.001$), supporting the concurrent validity of these items. Previous research supports high test-retest reliability for single-item assessments of peer and parental weight loss behaviors (peers=0.84, mothers=0.87, and fathers=0.78; Vincent & McCabe, 2000), and correspondence between child and parent reports increases as children age (van den Berg, Keery, Eisenberg, & Neumark-Sztainer, 2010; Wertheim, Martin, Prior, Sanson, & Smart, 2002). Keel, Harnden, Hornig, and Heatherton (1997) obtained reports of parental dieting from daughters, parents, and the parents' spouse (e.g., mothers reported on fathers' dieting and vice versa). When examining associations between parental behaviors and daughter's disordered eating, Keel et al. (1997) found the highest correspondence between associations based on the daughter's report of a parent's behavior and the spouse's report of that same parent's behavior. This pattern was observed for both moms' and dads' reported behaviors, supporting the concurrent validity of single-item reports made by adolescents regarding both parents' behaviors and that some discrepancies may reflect the influence of social desirability on parent self-report. Finally, disordered eating has been successfully predicted by single-item assessments of peer and/or parental dieting, supporting their predictive validity (Eisenberg & Neumark-Sztainer 2010; Neumark-Sztainer et al., 2010).

Disordered eating was measured using the Eating Disorder Inventory (EDI) Drive for Thinness and Bulimia scales (Garner, Olmstead, & Polivy, 1983). The EDI has demonstrated factor invariance between men and women and from college through mid-life (Keel et al., 2007). The Drive for Thinness scale has good discriminate validity in women (Garner et al., 1983; Hurley, Palmer, & Stretch, 1990) and men (Olivardia, Pope, Mangweth, & Hudson, 1995). In the current sample, scores discriminated between individuals with and without bulimic syndrome diagnoses based on survey and interview assessments at baseline (t(108.59)=18.48, $p<.001$ and t(96.38)=7.85, $p<.001$, respectively) and follow-up (t(610)=5.52, $p<.001$ and t(85)=3.25, $p=.002$, respectively). Internal consistency was α=.91 at baseline and α=.89 at follow-up. The Bulimia scale has good discriminant validity in women (Garner et al., 1983; Hurley et al., 1990) and men (Olivardia et al., 1995). In the current sample, Bulimia scale scores discriminated between individuals with and without bulimic syndrome diagnoses based on surveys and interviews at baseline (t(784)=15.12, $p<.001$ and t(99)=9.95, $p<.001$, respectively) and follow-up (t(610)=6.30, $p<.001$ and t(85)=3.72, $p<.001$). Internal consistency was α=.85 at baseline and α=.81 at follow-up.

Purging (self-induced vomiting, laxative or diuretic misuse; American Psychiatric Association, 2000), was assessed from a checklist of current bulimic symptoms. We focused on purging behaviors rather than BN diagnosis to maximize power for analyses because more women endorsed current purging in college (n=18, 3.2%) and at 10-year follow-up (n=9; 1.6%) than met criteria for BN. In addition, self-report assessments of purging have demonstrated excellent agreement with interview assessments (Carter, Aime, & Mills, 2001), and purging reflects a pathological behavior due to its associations with medical

complications and suicidality (Favaro & Santonastaso, 1996; Greenfeld, Mickley, Quinlan, & Roloff, 1995).

Data Analyses

Comparisons of baseline values revealed no significant differences between individuals who participated in follow-up assessments and those who did not on any variable aside from sex (all *p*-values > .10). To avoid biased estimates of associations, missing data were imputed using expectation-maximization (EM) method in PASW 18, following Schafer and Graham's (2002) recommendations. Results were unchanged when using listwise deletion. Drive for Thinness and Bulimia scores were log transformed prior to analyses to control for positive skew.

Hierarchical multiple regression models examined prospective associations between roommate dieting and disordered eating, with baseline values of the dependent variable entered in the first block and remaining predictors added in the second block. Bulimia scores were entered as a covariate in models predicting Drive for Thinness scores and vice versa to establish the extent to which roommate dieting explained variance unique to each measure. Binary logistic regression was used to predict purging at 10-year follow-up, controlling for purging in college. Models were run separately for women and men given the smaller sample of men and interest in examining patterns of associations separately for each group.

Results

Table 1 presents comparisons of men and women. BMI was significantly higher in men than in women; however, mean BMI values fell within the healthy range. Men and women did not differ on reports of moms' or dads' frequent dieting; moms were described as more likely to diet frequently than dads by both men and women (Wilcoxon Signed Rank Test *p*-values < .001). Consistent with expected gender differences, women's roommates were described as dieting more frequently than men's roommates. Mean scores indicated that women's roommates were dieting "rarely" to "sometimes" whereas men's roommates were dieting "never" to "rarely." Women endorsed higher Drive for Thinness and Bulimia scores in college and at 10-year follow-up compared to men (see Table 1). Women's disordered eating attitudes and behaviors occurred "rarely" to "sometimes" whereas men "never" to "rarely" experienced disordered eating. More women than men purged in college and at 10-year follow-up; however, purging occurred too infrequently in men to allow for meaningful comparisons.

Table 2 presents correlations between variables. In both men and women, BMI was positively associated with disordered eating levels in college and at 10-year follow-up. Both men and women reported a positive association between moms' and dads' dieting. In men, moms' dieting also was positively associated with drive for thinness in college, and dads' dieting was significantly positively correlated with roommate dieting and drive for thinness in college. Roommate dieting was not significantly associated with disordered eating in men in college or 10-year follow-up. For women, moms' dieting was significantly positively correlated with Drive for Thinness and Bulimia scores at baseline and at 10-year follow-up whereas dads' dieting was not associated with any disordered eating variables. Women also demonstrated significant positive associations between roommate dieting frequency and higher Drive for Thinness and Bulimia scores in college and at 10-year follow-up. Finally, significant associations were observed between baseline and follow-up levels of disordered eating in both men and women.

Correlations with roommate dieting could reflect peer selection rather than socialization if women with more disordered eating in college selected peers who dieted more frequently.

To evaluate both the direction of associations and control for selection, we conducted longitudinal analyses examining whether roommate dieting predicted disordered eating at 10-year follow-up while controlling for baseline disordered eating. Over 10-year follow-up, men reported a significant increase in Drive for Thinness (t(232)=5.57, $p<.001$) and demonstrated no significant change in Bulimia scores (t(232)=0.29, $p=.77$). In contrast, women demonstrated a significant decline in both Drive for Thinness (t(565)=7.81, $p<.001$) and Bulimia scores (t(565)=10.40, $p<.001$). Table 3 presents results from multivariate regression analyses examining the prospective association between risk factors and disordered eating levels at 10-year follow-up.

For men, baseline Drive for Thinness was the only significant predictor of Drive for Thinness at 10-year follow-up. Similarly, the only significant predictors of Bulimia scores at 10-year follow-up were Bulimia and Drive for Thinness scores in college (see Table 3). For women, BMI, mom's dieting, and roommate's dieting in college predicted significantly higher Drive for Thinness at 10-year follow-up (see Table 3), suggesting these variables predicted greater maintenance of disordered eating as women transitioned from their 20's to their 30's. BMI, Drive for Thinness, and roommate dieting all significantly predicted Bulimia scores at 10-year follow-up, and mom's dieting demonstrated a trend-level association in predicting Bulimia scores (p=.08) (see Table 3).

A binary logistic regression predicting purging status at 10-year follow-up in women, with baseline purging status entered in the first block, and baseline BMI, race/ethnicity, mom dieting, dad dieting, and roommate dieting entered in the second block, revealed two significant predictors: purging status in college (Odds Ratio (OR) = 11.64; 95% CI = 1.87, 72.45; p=.009) and roommate dieting (OR=2.03; 95% CI = 1.08, 3.80; p=.03). No other variables significantly predicted purging. Because no men endorsed purging at 10-year follow-up, it was not possible to explore predictive associations for this variable in men.

Discussion

Men and women reported different exposure to peer dieting in college, with women's roommates dieting more frequently than men's roommates. In addition, roommate dieting was a significant predictor of Drive for Thinness and Bulimia scores and purging status at 10-year follow-up for women but not men. These findings extend results from a 5-year longitudinal study of adolescent girls and boys (Eisenberg & Neumark-Sztainer, 2010) by showing that exposure to peer dieting in college predicts disordered eating in women from late adolescence to adulthood, even though friendship groups, living environment, and life roles have changed substantially.

The natural course of disordered eating in women from college to 10-year follow-up is characterized by decreasing drive for thinness, bulimic symptoms, and purging behaviors (Keel et al., 2007). Changes in life roles, such as becoming a wife and mother, predict decreases in disordered eating in women (Keel et al., 2007), potentially because these roles provide a wider range of factors upon which to base self-worth and because these roles lead to social environments that are more diverse with regard to age and gender. In addition, as women mature, their same-age female peers diet less frequently (Gravener et al., 2008). Given all of these changes, one question is why the influence of roommate dieting endures. Dieting roommates may reinforce the cultural ideal of thinness and internalization of this ideal during a critical period of development. According to Thompson and Stice (2001), thin-ideal internalization is a potent causal risk factor for the development of eating disturbances. Internalization of this ideal occurs through social reinforcement, and roommate behaviors that conform to this ideal may increase the likelihood that women develop a core value regarding the goodness of being thin at a time when they are forming

their adult identity. Once internalized, this ideal could contribute to the enduring influence of peer behaviors long after women are no longer living with their college roommates. Future research should include intermediate assessment waves to evaluate whether thin ideal internalization mediates the enduring influences of peer dieting.

In addition to receiving a higher "dose" of exposure to roommate dieting, there was some evidence that women might be more influenced by behaviors of women in their environment both in terms of whose behaviors have the most influence and how much influence these behaviors have. Patterns of results for parent dieting provide the clearest support for this possibility. Both women and men reported that their dads were less likely to diet frequently than their moms. However, only moms' frequent dieting was a significant predictor of drive for thinness in women, suggesting that dads' dieting was irrelevant for women. In addition, men and women did not demonstrate differences in moms' dieting or in the association between moms' dieting and drive for thinness in college. However, moms' dieting predicted drive for thinness at 10-year follow-up only in women, suggesting that women may be more vulnerable than men to long-term effects of these social influences. To further explore this possible interpretation for a variable in which the "dose" did not differ between women and men, we tested the interaction between sex and mom dieting in the longitudinal model predicting Drive for Thinness. The addition of the interaction term significantly improved model fit (ΔR^2=.01, p=.009). The final model included baseline Drive for Thinness (β=.52; p<.001), BMI (β=.11; p<.001), roommate dieting (β=.08; p=.006), and sex X mom dieting (β=.12, p=.009) as significant predictors (see beta weights in Table 3 for the nature of the interaction effect). Future studies might examine patterns of convergence in disordered eating levels over time between same-sex versus opposite-sex roommates, partners, and spouses to determine the gender specificity of social influences.

As described above, mom's dieting was a significant predictor of women's Drive for Thinness at 10-year follow-up, which differs from the nonsignificant effect of moms' dieting on disordered eating at 5-year follow-up of adolescent girls (Eisenberg & Neumark-Sztainer, 2010). This may reflect differences in dependent variables as Eisenberg and Neumark-Sztainer did not examine drive for thinness in their study, and moms' dieting did not demonstrate significant associations with other measures of disordered eating in our study. Discrepancies also may reflect age differences between our samples. Their study captured developmental shifts from mid to late adolescence whereas our study focused on the transition from late adolescence to adulthood. Additionally, similarities between mothers and their daughters may reflect the influence of their shared genetic make-up. Weight concerns and disordered eating have demonstrated significant heritability (Keski-Rahkonen et al., 2005), supporting the expectation that moms who diet regularly would have daughters who are more concerned about their weight and at greater risk for disordered eating.

This study had several strengths. We had a large sample of women and men, followed over a long period of time, and achieved high participation at follow-up. The longitudinal design enabled us to establish that roommate dieting prospectively predicted changes in disordered eating levels in women. Finally, our measures of disordered eating demonstrated strong psychometric properties, including high internal consistency, high convergent validity, and reasonable stability over the 10-year period of observation, and findings for continuous measures were replicated using purging as a clinically significant eating disorder symptom.

Despite these strengths, our study had notable weaknesses. First, data come from a selective university, and results may not generalize to other groups. Second, both the reduced number of men and lower levels of disordered eating in men reduced power to detect some effects that may be present. In addition, surveys did not include questions that may tap more relevant social influences for men, such as driven exercise in fathers or roommates. Thus,

findings are more informative for longitudinal influences in women than in men. Third, measures of parental and roommate dieting came from single items, which are more vulnerable to measurement error. As a consequence, effects may be underestimated. Fortunately, these items demonstrated significant covariation with other measures in predicted directions, providing reassurance that these items tapped their intended constructs. We measured participants' perceptions of roommate and parent dieting which may have been biased by concurrent levels of disordered eating. Controlling for baseline levels of disordered eating should control for biases attributable to eating pathology. However, perceptions may be biased by other factors, such as social norms. Our approach focused on the behaviors of specific individuals within the participant's living environment for whom direct observation of dieting can be made. This approach differs markedly from asking participants how frequently their peers or women or men, in general, diet. Importantly, informant reports support the validity of perceived behaviors in the social environment (Keel, Heatherton, Harnden, & Hornig, 1997), and patterns of associations found for perceived social influences have been supported by studies directly observing social influences (van den Berg, et al., 2010; Wertheim, et al., 2002), minimizing concerns that our results are a mere artifact of perceptual bias or social norms.

Although dieting may seem like a relatively common and, thus, benign peer behavior in women's environment, its predictive significance for higher Drive for Thinness, Bulimia scores, and purging in women suggests that it may have harmful consequences. Results reinforce the importance of implementing college-based prevention programs because college may represent a period of exposure to risky peer behaviors with potentially long-lasting effects. Such programs can reinforce healthy weight management while combating internalization of the thin ideal using cognitive dissonance-based techniques (Becker, Bull, Schaumberg, Cauble, & Franco, 2008). Peer-led programs (Becker, Smith, & Ciao, 2006) may offer a powerful intervention given that women who described their roommates as dieting *less* frequently reported the greatest declines in their own Drive for Thinness and Bulimia scores, and were at significantly lower risk of purging at 10-year follow-up. Peer-led cognitive dissonance interventions would reduce both peer dieting and perceptions of peer dieting given the social context in which participants challenge both the thin ideal and efforts to attain the thin ideal. Thus, results from longitudinal designs such as this can be used to understand opportunities to mitigate risk and reduce disordered eating and associated eating disorders.

Acknowledgments

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Table 1

Comparisons between Men and Women on Risk Factors and Disordered Eating Levels.

Measures	Men	Women			
Baseline	n (%)	n (%)	χ^2	df	p
Mom Frequent Dieting	93 (40)	231 (41)	0.06	1	.81
Dad Frequent Dieting	47 (20)	107 (19)	0.17	1	.68
Current Purging	3 (1)	18 (3)	2.23	1	.14
	Mean (SD)	Mean (SD)	t	df	p
Body Mass Index (kg/m^2)	23.08 (3.05)	21.93 (2.89)	5.06	797	<.001
Roommate Dieting Frequency [*]	1.43 (.77)	2.59 (1.24)	−15.63	628.41	<.001
Drive for Thinness	2.05 (.44)	2.62 (.46)	−16.11	797	<.001
Bulimia [*]	2.20 (.29)	2.47 (.36)	−10.99	528.61	<.001
10-year Follow-up	n (%)	n (%)	χ^2	df	p
Current Purging	0 (0)	9 (2)	3.29	1	.07
	Mean (SD)	Mean (SD)	t	df	p
Drive for Thinness	2.17 (.37)	2.48 (.40)	−10.37	797	<.001
Bulimia [*]	2.21 (.25)	2.35 (.30)	−6.77	513.64	<.001

[*] Degrees of freedom are adjusted for violation of homogeneity of variance.

Table 2

Correlations between Risk Factors and Disordered Eating Levels in Men and Women

	1	2	3	4	5	6	7	8
1 Body Mass Index	-	.08	−.001	−.03	.28***	.32***	.27***	.32***
2 Mom Dieting	.11	-	.25***	.02	.10*	.10*	.19***	.13**
3 Dad Dieting	.02	.33***	-	.05	.03	.04	.08	.03
4 Roommate Dieting	.11	−.12	.14*	-	.14***	.17***	.18***	.20***
5 Baseline Drive for Thinness	.41***	.13*	.16*	.03	-	.63***	.53***	.36***
6 Baseline Bulimia	.24***	.08	.12	.13	.47***	-	.41***	.63***
7 Follow-up Drive for Thinness	.35***	.08	.08	.01	.68***	.38***	-	.62***
8 Follow-up Bulimia	.26***	−.01	.07	.09	.43***	.58***	.61***	-

Women above the diagonal; men below the diagonal. The association between mom dieting and dad dieting is represented by φ, and all other associations for mom dieting and dad dieting represent point-biserial correlations (r_{pb})

*
  $p<.05$,

**
  $p<.01$,

***
  $p<.001$

Table 3

Prospective Associations between Risk Factors and Disordered Eating at 10-Year Follow-up in Men and Women.

Drive for Thinness	Men			Women		
		β	t		β	t
Step 1	$R^2=.46^{***}$			$R^2=.28^{***}$		
Drive for Thinness		.61	10.07^{***}		.41	8.98^{***}
Step 2	$\Delta R^2=.02$			$\Delta R^2=.05^{***}$		
Body Mass Index		.11	1.91		.11	2.99^{**}
Race/ethnicity		.10	1.88		.02	0.59
Bulimia		.06	0.98		.10	2.01^{*}
Mom Dieting		.003	0.06		.13	3.48^{***}
Dad Dieting		−.02	−0.30		.03	.89
Roommate Dieting		−.03	−0.58		.11	2.93^{**}

Bulimia	Men			Women		
		β	t		β	t
Step 1	$R^2=.29^{***}$			$R^2=.39^{***}$		
Bulimia		.44	6.98^{***}		.60	13.78^{***}
Step 2	$\Delta R^2=.05^{*}$			$\Delta R^2=.04^{***}$		
Body Mass Index		.10	1.60		.15	4.25^{***}
Race/ethnicity		.003	0.04		−.02	−0.58
Drive for Thinness		.17	2.50^{*}		.09	1.98^{*}
Mom Dieting		−.08	−1.21		.06	1.74
Dad Dieting		.01	0.17		−.01	−0.31
Roommate Dieting		.01	0.13		.11	3.21^{***}

*
$p<.05$,

**
$p<.01$,

***
$p<.001$