

Research report

# College students' mental models for recognizing anorexia and bulimia nervosa

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## Abstract

Knowledge about eating disorders influences lay people's ability to recognize individuals with anorexia nervosa (AN) and bulimia nervosa (BN) and refer them to professional treatment. We assessed mental models (stored knowledge) of AN and BN in 106 college students. Results indicated that most students have general, but not specific, information about AN and BN's symptoms, consequences, causes, duration, and cures. They also believe that people with eating disorders tend to be young, White women. These findings suggest that lay recognition of eating disorders may be based primarily on observations of dysfunctional eating behaviors and therefore facilitated by additional knowledge.

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## Introduction

Consider the following scenario: Becky, a college sophomore, recently has noticed unusual behavior in her roommate, Molly, who has become more reserved and secretive. Although she sometimes goes to meals, she never seems to eat much. She also complains about being cold and tired. Becky is concerned that there is something wrong with Molly, but she is not sure exactly what the problem is or what to do about it.

Eating disorders such as anorexia nervosa (AN) and bulimia nervosa (BN) affect millions of individuals (Becker, Grinspoon, Klibanski, & Herzog, 1999). They can lead to serious physical and psychological outcomes, including bone damage, cardiac problems, infertility, malnutrition, depression, and death (Fairburn & Harrison, 2003; Sullivan, 1995; Treasure & Szukler, 1995).

It therefore is critical that individuals with AN and BN are appropriately diagnosed and treated.

Peers and family members may play an important role in recognizing disordered eating and suggesting that an individual needs professional care (Campbell & Roland, 1996; Price & Desmond, 1990; Pritts & Susman, 2003; Suls, Martin, & Leventhal, 1997; Tsogia, Copello, & Orford, 2001). However, the ability of lay people to recognize potential eating disorders depends on their knowledge of the behavioral, physical, and psychological characteristics associated with AN and BN. For example, how Becky responds to her roommate depends on whether she knows that minimal eating, coldness, and fatigue are potential indicators of AN. Thus, to understand, and ultimately improve, help-seeking for eating disorders, it is necessary to assess what lay people know about AN and BN.

In this paper, we provide detailed data about knowledge and beliefs about AN and BN in a group that is particularly likely to encounter it, college students. We first discuss the role of lay people in eating disorder referrals as well as previous research about lay people's knowledge of AN and BN. We then describe a study that

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comprehensively assesses college students' mental models of AN and BN. Finally, we discuss the implications of the research for understanding lay recognition of AN and BN and for increasing lay referrals.

### *The importance of lay referrals for AN and BN*

Over the lifespan, AN is diagnosed in approximately 0.5–1% of the population and BN is diagnosed in approximately 1–4% of the population (American Psychiatric Association [APA], 2000; Fairburn, Hay, & Welch, 1993; Hsu, 1996; Wakeling, 1996). According to the DSM-IV-TR (APA, 2000), there are four diagnostic criteria for AN: (1) failure to sustain a minimally normal weight, (2) extreme fear of weight gain, (3) distorted body image or excessive emphasis on weight in self-evaluation, and (4) amenorrhea (i.e., absence of menstruation). BN has five criteria: (1) repeated occurrences of binge eating, (2) repeated instances of compensatory behaviors (e.g., purging, laxative abuse) to prevent weight gain, (3) episodes of binge eating and compensatory behaviors at least twice per week for 3 months, (4) excessive emphasis on weight in self-evaluation, and (5) disordered eating behaviors that occur separately from periods of AN.

Epidemiological research indicates that a much larger portion of the population regularly engages in disordered eating behaviors, such as intentional starvation and purging (French, Perry, Leon, & Fulkerson, 1995; Heatherton, Nichols, Mahamedi, & Keel, 1995; Serdula et al., 1993; Story, French, Resnick, & Blum, 1995). For example, approximately 12% of teenagers report chronic dieting or purging to lose weight (Ackard, Neumark-Sztainer, Hannan, French, & Story, 2001; Story et al., 1995). Although many individuals who report dysfunctional eating may not have full-blown eating disorders, they still may require medical and/or psychological intervention to restore healthy eating and bodily functioning (Pritts & Susman, 2003).

Notably, eating disorders often go undetected (Hay, Marley, & Lemar, 1998; King, 1989; Whitehouse, Cooper, Vize, Hill, & Vogel, 1992) due to factors such as lack of familiarity among physicians, the ambiguity of related symptoms (e.g., fatigue), and the presence of comorbid conditions (Blumenthal, Gokhale, Campbell, & Weissman, 2001; Pritts & Susman, 2003). A key factor may involve the unwillingness of many individuals with AN and BN to seek treatment (Becker et al., 1999; Pritts & Susman, 2003), thus requiring another lay person, such as a friend or family member, to intervene (Campbell & Roland, 1996; Suls et al., 1997; Tsogia et al., 2001). School counselors have reported that students with eating disorders often come to their attention through referrals by other students, teachers, or parents (Price & Desmond, 1990). Likewise, interviews with family members may constitute an important source of information for physicians to diagnose eating disorders (Pritts & Susman, 2003). However, for such lay referral to occur, people need to be well-informed

about the physical, psychological, and behavioral indicators of eating disorders.

### *Lay knowledge about eating disorders*

Research from different disciplines indicates that people form cognitive representations of their knowledge about specific health problems. One framework asserts that *mental models of illness* contain information about several dimensions of a condition, including its (1) *identity* or nature (i.e., symptoms), (2) *causes*, (3) short- and long-term *consequences*, (4) *duration*, and (5) *cure* (Lau & Hartman, 1983; Leventhal, Nerenz, & Steele, 1984). Another framework, *mental health literacy* (Jorm, 2000), posits that cognitive representations of illnesses include this information as well as the ability to recognize a condition, attitudes about seeking treatment, and knowledge about how to obtain additional information. Despite minor differences, both frameworks assert that illness representations serve several functions, including organizing information about health problems, helping individuals plan and implement treatment strategies, and serving as schemas to guide the recognition and interpretation of new information (Jorm, 2000; Leventhal et al., 1984). As a result, they may influence whether people notice health-relevant information (e.g., low body weight), interpret it as indicative of a health problem (e.g., connect it with AN), and respond to it in an appropriate manner (e.g., encourage a friend to see a doctor).<sup>1</sup>

To date, eight studies have assessed some aspect of lay people's mental models of eating disorders (Butler, Slade, & Newton, 1990; Chiodo, Stanley, & Harvey, 1984; Furnham & Hume-Wright, 1992; Huon, Brown, & Morris, 1988; Lee, 1997; Mond, Hay, Rodgers, Owen, & Beumont, 2004a–c; Murray, Touyz, & Beumont, 1990; Smith, Pruitt, Mann, & Thelen, 1986). Typically, these studies have measured people's ability to recognize accurate information about AN or BN, for example, by labeling statements as true or false. Results indicate that the majority of lay people believe that excessive dieting is the primary characteristic of AN, and binge eating and purging is the primary characteristic of BN (Huon et al., 1988; Murray et al., 1990; Smith et al., 1986). They also believe that psychological factors (e.g., emotional problems), and social factors (e.g., pressure to be slim) can lead to eating disorders (Chiodo et al., 1984; Furnham & Hume-Wright, 1992; Huon et al., 1988; Lee, 1997; Mond et al., 2004b, Smith et al., 1986). They think BN can be treated by counselors, general practitioners, self-help groups, and better nutrition. Finally, lay people appear to be more knowledgeable about AN than BN, but few report detailed

<sup>1</sup>Although mental health literacy is a somewhat broader concept than mental models of illness, the current article focuses on features shared by both frameworks (e.g., knowledge about the nature of an illness and its consequences and treatments). Thus, for sake of simplicity, from this point forward, we will use the term, mental models, to refer to research from both traditions.

knowledge about either disorder (Chiodo et al., 1984; Huon et al., 1988; Murray et al., 1990; Smith et al., 1986). Together, these findings suggest that lay people have some basic information about eating disorders and may be able to recognize them if they see dysfunctional eating (e.g., bingeing and purging); however, they may lack the knowledge to recognize less obvious indicators of AN and BN (e.g., dental erosion).

In addition, mental models of eating disorders may contain beliefs about the groups of people who are likely to experience them. Specifically, lay people commonly believe AN occurs more frequently in women and adolescents than in men and people of other ages (Furnham & Hume-Wright, 1992; Lee, 1997; Mond et al., 2004b, Root, 1990). These beliefs may play an important role in lay referral. Because people may be more likely to attribute symptoms to a health problem when an individual belongs to an associated group (Martin, Gordon, & Lounsbury, 1998; Wrobel, 1993), they may be more likely to recognize eating disorders when the symptomatic individuals are young, upper-class, White women. In fact, two studies have shown that, holding symptoms constant, minimal eating is more likely to be seen as an indicator of an eating disorder when performed by a White woman than in an African-American or Latina woman (Gordon, Perez, & Joiner, 2002; Hunt & Rothman, 2004). Thus, a systematic assessment of lay people's knowledge about eating disorders needs to address beliefs about which groups of people are most likely to develop them.

### *Current research*

Although some research has investigated lay people's knowledge about AN and BN, those studies have several important limitations. First, previous research was not designed to provide a comprehensive assessment of all of the components of mental models. Second, prior studies typically have measured the ability to *recognize* rather than *generate* information about eating disorders. Because lay referral depends on the ability to identify possible symptoms in everyday contexts, it is necessary to assess knowledge that is salient and can be freely generated by lay people. Third, research has not systematically assessed beliefs about the occurrence of eating disorders in different gender and race groups, which may play an important role in lay referral.

The current study systematically examines knowledge about AN and BN in a group that may be especially likely to encounter them: college students. To address the limitations of previous research, the present study includes questions about all components of mental models, uses qualitative measures to determine what information about AN and BN is most salient to lay people, and systematically assesses associations between eating disorders, gender, and race. Because lay beliefs often differ from professional knowledge (Jorm et al., 1997), we also

compare participants' descriptions of AN and BN to clinical diagnostic criteria (APA, 2000). We hypothesized that most college students would possess basic knowledge about AN and BN's identity, causes, consequences, duration, and cures; however, substantially fewer students would have detailed knowledge (e.g., information about specific physiological consequences). Consistent with prior research, we predicted that students would know more about AN than BN (Chiodo et al., 1984, Huon et al., 1988; Lee, 1997; Murray et al., 1990; Smith et al., 1986), and women would know more about both eating disorders than would men (Lee, 1997; Smith et al., 1986). Finally, we hypothesized that students would believe that young White women are more likely than other groups to have eating disorders (Furnham & Hume-Wright, 1992; Lee, 1997; Mond et al., 2004b).

## **Method**

### *Participants*

Participants were 106 students (57 women, 49 men) from lower-level psychology classes at a large university in the midwestern United States. The majority of participants were not psychology majors, so the sample was highly representative of the university as a whole. Participants' ages ranged from 17 to 55 years ( $M = 22.9$ ). The majority self-identified as White (79.2%), with others identifying as African-American (5.7%) or Asian-American (7.5%). Six women and one man reported having a diagnosed eating disorder, and one woman indicated an undiagnosed eating disorder. Most participants (76.2%) knew someone with an eating disorder.<sup>2</sup>

### *Procedure*

Participants were recruited for a study on health beliefs. They were randomly assigned to complete a questionnaire assessing their knowledge and beliefs about either AN or BN in small group sessions. To encourage complete, honest answers, the experimenter emphasized that the

<sup>2</sup>The fact that the majority of participants knew someone with an eating disorder is consistent with other research showing that most lay people know at least one person with a mental health condition (e.g., Wolff, Pathare, Craig, & Leff, 1996). Further, personal experiences with individuals with different conditions are an important source of information for mental models (Wolff et al., 1996). In our sample, however, there was only one significant effect of eating disorder experience across all of the primary analyses. Specifically, there was a significant eating disorder condition  $\times$  participant gender  $\times$  experience interaction for including physical characteristics in overall descriptions of AN and BN,  $F(1, 96) = 6.87, p < .01$ . This interaction indicated that women who knew someone with an eating disorder provided more physical characteristics for both AN and BN, whereas men who knew someone with an eating disorder provided fewer physical characteristics for AN and a similar number of physical characteristics for BN. Because this was the only significant effect, personal experience with eating disorders will not be discussed further.

questionnaire was not a test and all responses would remain anonymous.

### Measures

We constructed a questionnaire consisting of qualitative and quantitative measures of eating disorder knowledge, using items that were similar in structure to items used in research on mental models of illness (Lau & Hartman, 1983; Meyer, Leventhal, & Gutmann, 1985). The subject of the questions was AN in one version and BN in the other. Participants focused on one eating disorder to facilitate complete reports of their knowledge rather than comparisons between the conditions.

Participants first answered seven open-ended and three yes–no questions about either AN or BN. These questions included (1) How would you describe AN (BN) to a fellow student who had never heard of the problem?, (2) What would you say are the primary characteristics of AN (BN)?, (3) What do you think is the average age at which a person develops AN (BN)?, (4) How long do you think people tend to have AN (BN)?, and (5) What treatments are available for someone who has AN (BN)? In addition, participants were asked to list the short- and long-term consequences of having AN (BN) and to describe the type(s) of people who are most likely to develop AN (BN). The three yes–no questions included (1) whether biological or genetic factors contribute to the development of AN (BN), (2) whether social factors contribute to the development of AN (BN), and (3) whether AN (BN) is curable. Participants who answered yes to the first two questions were asked to describe specific factors that may contribute to AN (BN).

Next, participants rated the likelihood that a person with AN or BN would engage in specific behaviors (i.e., exercise excessively, date actively, do well in school) or have specific characteristics (i.e., be dissatisfied with their body, have other psychiatric problems, have a family history of eating disorders, be popular with peers, feel in control of their life) on a 9-point scale from 1 (not at all likely) to 9 (extremely likely). Participants then completed two matrices in which they estimated the percentage of individuals in various social groups who would develop AN and BN at some point during their lives. Each matrix had two columns for gender (women, men) and five rows for racial background (African-American, Asian-American, Hispanic, Native American, White), resulting in estimates for 10 gender  $\times$  race groups. Finally, participants answered demographic questions, including items about personal experience with eating disorders.

### Coding

A coding taxonomy was developed for each open-ended question. Each response was divided into distinct pieces of information (e.g., each consequence). An initial coder sorted the information into categories that reflected

dominant themes; two additional coders then reviewed and further refined the category assignments. For example, short-term consequences were divided into categories of physical, psychological, and social consequences, and then into subcategories such as poor health, depression/unhappiness, and relationship problems.<sup>3</sup> Responses were considered *general information* if they referred to defining characteristics of AN or BN (e.g., “Eating very little,” “Throwing up after eating to not get the calories”) or alluded to a broad category of antecedents or consequences (e.g., “Damages your body”). Responses were considered *specific information* if they described a particular antecedent, consequence, or other aspect of AN or BN that belonged to a subcategory (e.g., “Yellow teeth caused by acid from stomach”).

Reliability was assessed by having another researcher code 10% of the responses. The overall concordance was .90. Coders were blind to participant gender and eating disorder condition (although responses sometimes indicated condition). Responses that fit into more than one category (e.g., “poor mental and physical health”) were included in all relevant categories, and disagreements were resolved through discussion.

## Results

### Overview and analytic strategy

Results are organized around four questions that encompass mental models of eating disorders: (1) What are people with eating disorders like? (*identity*), (2) Who develops eating disorders? (*group associations*), (3) What happens to people with eating disorders? (*consequences, duration, cure*), and (4) What causes eating disorders? (*cause*). In addition, we addressed the question, how do lay people’s beliefs compare to DSM-IV-TR diagnostic criteria?, to examine similarities and differences between the factors influencing lay referrals and clinical diagnoses.

Our analytic approach tested for differences in responses as a function of eating disorder (AN vs. BN) and participant gender. We used analysis of variance (ANOVA) to examine the use of different types of information (e.g., behavioral versus physical characteristics) and log-linear analysis to evaluate the use of specific categorical items. For sake of parsimony, log-linear analyses are reported only when they relate to primary hypotheses.

### What is a person with an eating disorder like?

To determine what characteristics of AN and BN are salient to college students, we asked participants two questions: (1) How they would describe AN (BN) to a fellow student who had never heard of the problem and (2)

<sup>3</sup>For sake of parsimony, we only report subcategories mentioned by at least 10% of participants in one condition. A complete list of categories can be obtained from the authors.

what they considered to be the primary characteristics of AN (BN). Response elements were classified as behavioral, psychological, physical, or social group characteristics and collapsed across the two questions for analysis.

Almost all participants (91.4%) mentioned at least one behavioral characteristic. As seen in Table 1, in the AN condition, 89.5% of participants mentioned restricted food intake, and in the BN condition, 89.6% of participants mentioned bingeing and purging. A smaller number mentioned excessive exercise. Psychological characteristics were mentioned by 65.7% of participants; common responses included distorted body image, excessive concern about weight and appearance, psychological problems such as depression, and low self-esteem. In addition, 59% of participants mentioned at least one physical characteristic, including changes in hair or skin, weakness or lack of energy, and general poor health. Two physical characteristics were mentioned disproportionately for one condition: thinness for AN and damage from vomiting for BN. Finally, 16.2% of participants mentioned group membership. These responses focused on gender, with the majority stating that they tend to occur in women (12.3% AN, 8.3% BN).

To analyze response patterns, we used a three-way mixed model ANOVA with eating disorder and participant gender as between-participant factors and response category as a within-participant factor. Overall, participants generated a mean of 3.58 ( $SD = 1.80$ ) characteristics. Behavioral elements were most commonly mentioned ( $M = 1.34$ ), followed by psychological ( $M = 1.08$ ), and physical ( $M = 1.02$ ) elements, then social group elements ( $M = 0.14$ ),  $F(3, 300) = 38.32$ ,  $p < .001$ . This pattern supports the prediction that participants would generate more

general knowledge (e.g., primary behavior patterns) than specific information (e.g., concrete psychological characteristics). Contrary to predictions, the amount of information participants provided did not vary by eating disorder or participant gender,  $F$ 's(1, 100)  $< 2.3$ ,  $p$ 's  $> .13$ .

#### *Likelihood of specific characteristics*

To supplement their open-ended descriptions, participants rated the likelihood that individuals with AN or BN would have specific characteristics that might serve as cues for lay referral. The items were rated on scales from 1 to 9, with 9 indicating very likely. Participants indicated that individuals with AN and BN were likely to be dissatisfied with their bodies and appearance ( $M = 7.85$ ), to have other psychiatric problems ( $M = 7.16$ ), and to exercise excessively ( $M = 7.03$ ). They expected that them to be somewhat likely to be popular with peers ( $M = 5.95$ ), to be actively dating ( $M = 4.81$ ), to be doing well at school ( $M = 4.75$ ), and to have a family history of eating disorders ( $M = 5.39$ ). Finally, they believed that individuals with AN and BN were not likely to feel in control of their lives ( $M = 3.84$ ). A multivariate analysis of variance (MANOVA) indicated that these expectations did not vary as a function of eating disorder or participant gender,  $F$ 's(8, 95)  $< 1.67$ ,  $p$ 's  $> .11$ .

#### *Who develops eating disorders?*

##### *Age*

Participants' estimates of the average age for developing an eating disorder showed a strong consensus that AN and BN typically arise during the teenage or young adult years. The mean for quantitative estimates was 14.81 years

Table 1  
Characteristics associated with eating disorders.

	Anorexia ( $N = 56$ ) Percent ( $N$ )	Bulimia ( $N = 48$ ) Percent ( $N$ )
<i>Behavioral</i>		
Restricted food intake	89.5 (51)	18.8 (9)
Bingeing and purging or other compensatory behavior	14.0 (8)	89.6 (43)
Excessive exercise	10.5 (6)	8.3 (4)
<i>Psychological</i>		
Distorted body image	54.4 (31)	25.0 (12)
Excessive concern about weight gain and appearance	26.3 (15)	12.5 (6)
Psychological problems	17.5 (10)	31.3 (15)
Low self-esteem	12.3 (7)	16.7 (8)
<i>Physical</i>		
Thinness	54.4 (31)	18.8 (9)
Changes in hair or skin	17.5 (10)	14.6 (7)
Poor health	17.5 (10)	14.6 (7)
Weakness or lack of energy	10.5 (6)	12.5 (6)
Damage from vomiting	3.5 (2)	16.7 (8)
<i>Group membership</i>		
Women	12.3 (7)	8.3 (4)

Note: Only response categories used by more than 10% participants are included.

Table 2

Descriptions of the type(s) of people most likely to develop anorexia and bulimia as a function of participant gender and eating disorder

	Anorexia			Bulimia		
	Overall ( <i>N</i> = 57) Percent ( <i>N</i> )	Women ( <i>N</i> = 35) Percent ( <i>N</i> )	Men ( <i>N</i> = 22) Percent ( <i>N</i> )	Overall ( <i>N</i> = 48) Percent ( <i>N</i> )	Women ( <i>N</i> = 22) Percent ( <i>N</i> )	Men ( <i>N</i> = 26) Percent ( <i>N</i> )
<i>Group membership</i>						
Women	54.4 (31)	45.7 (16)	68.2 (15)	50.0 (24)	31.8 (7)	65.4 (17)
Race, nationality, or socioeconomic status	12.3 (7)	20.0 (7)	0 (0)	8.3 (4)	4.5 (1)	11.5 (3)
Social roles (e.g., models, dancers)	19.3 (11)	22.9 (8)	13.6 (3)	16.7 (8)	9.1 (2)	23.1 (6)
<i>Psychological and social</i>						
Low self-esteem	33.3 (19)	31.4 (11)	36.4 (8)	35.4 (17)	45.5 (10)	23.1 (6)
Concerned with weight and appearance	10.5 (6)	8.6 (3)	13.6 (3)	16.7 (8)	18.2 (4)	15.4 (4)
Social problems or insecurities	21.1 (12)	14.3 (5)	31.8 (7)	14.6 (7)	18.2 (4)	11.5 (3)
Family problems	12.3 (7)	14.3 (5)	9.1 (2)	4.2 (2)	9.1 (2)	0 (0)
Psychological problems	10.5 (6)	17.1 (6)	0.0 (0)	31.3 (15)	45.5 (10)	19.2 (5)
<i>Other</i>						
Overweight	10.5 (6)	5.7 (2)	18.2 (4)	14.6 (7)	13.6 (3)	15.4 (4)

Note: Only response categories used by more than 10% participants are included.

(*SD* = 2.13; *N* = 68), which did not differ by eating disorder or participant gender,  $F(1, 64) < 1.4$ , ns. Thirty-five of the 37 (94.6%) qualitative responses indicated that eating disorders develop during adolescence or young adulthood.

#### *What types of people develop eating disorders?*

Participants described the types of people who are most likely to develop eating disorders. Overall, they generated a mean of 1.88 responses, which did not differ by eating disorder or participant gender,  $F(1, 101) < 1.2$ , ns.

Many responses focused on group membership. As seen in Table 2, approximately half of participants stated that women are most likely to develop eating disorders, with many specifying particular subgroups of women (e.g., young women, White women). More men (66.7%) than women (40.4%) listed women as an at-risk group,  $\Delta L^2(1) = 7.34$ ,  $p < .01$ ;  $L^2(4) = 4.46$ , ns. A smaller number of participants (10.5%) made reference to race, nationality, and/or socioeconomic status (e.g., Whites, Westerners, upper-middle class). Women were more likely to mention race in the AN than BN condition, whereas men listed race only in the BN condition,  $\Delta L^2(1) = 6.70$ ,  $p < .01$ . Finally, some participants mentioned social roles, such as models and dancers.

Certain psychological and social characteristics also were associated with eating disorders. Approximately one-third of participants stated that people with low self-esteem are more likely to have eating disorders. Other responses included people concerned with their weight and appearance and people with social problems or family problems. Participants also mentioned several psychological problems associated with eating disorders (e.g., depression); those responses occurred more frequently in the BN than AN condition and in female than male respondents,  $\Delta L^2(1) = 9.97$ , 8.21, respectively; both  $p$ 's < .005;  $L^2(1) = 1.94$ , ns. Finally, 12.4% of participants indicated

that people who are overweight are more likely to develop eating disorders.

#### *Lifetime incidence of eating disorders*

Participants estimated the percentage of women and men in different race and ethnic groups who will develop AN and BN during their lifetimes. We analyzed these lifetime incidence estimates using a four-way mixed model ANOVA with participant gender as a between-participant factor and eating disorder, target gender, and target race as within-participant factors. There was a significant participant gender  $\times$  target gender  $\times$  target race interaction,  $F(4, 88) = 2.77$ ,  $p < .04$ .<sup>4</sup> As seen in Table 3, participants considered women and Whites to be more likely to develop eating disorders than men and non-Whites, respectively, but disproportionately high estimates were generated for White women. This pattern was especially pronounced in female participants. There also was a significant two-way interaction between target gender and eating disorder,  $F(1, 91) = 8.88$ ,  $p < .005$ . Whereas estimates for males did not differ by eating disorder ( $M$ 's = 6%), females were considered more likely to develop AN ( $M = 19\%$ ) than BN ( $M = 17\%$ ),  $t(96) = 2.97$ ,  $p < .005$ .

#### *What happens to people with eating disorders?*

##### *Short-term consequences*

Participants listed short- and long-term consequences of AN or BN. Overall, they generated 2.42 short-term consequences, which were categorized as physical, psychological, or social. Nearly all participants (90.7%) listed at least one physical consequence. As seen in Table 4, responses included weakness, malnourishment, weight loss, damage from vomiting, and general poor health.

<sup>4</sup>The order of the matrices did not affect responses,  $F(1, 89) < 1$ , ns.

Table 3  
Lifetime incidence estimates for anorexia and bulimia as a function of participant gender, target gender, and target race

Target group	Anorexia		Bulimia	
	Women	Men	Women	Men
<i>Women</i>				
African-American	17.14 (13.35) <sup>c</sup>	13.42 (11.37) <sup>b</sup>	16.36 (14.08) <sup>d</sup>	14.68 (13.83) <sup>c</sup>
Asian-American	15.60 (13.89) <sup>b,c</sup>	12.29 (9.47) <sup>b</sup>	13.05 (13.23) <sup>c,d</sup>	11.98 (10.97) <sup>b,c</sup>
Hispanic	17.98 (14.72) <sup>c</sup>	11.61 (11.23) <sup>b</sup>	14.63 (12.01) <sup>c,d</sup>	10.68 (10.07) <sup>b,c</sup>
Native American	14.42 (13.35) <sup>b,c</sup>	11.22 (11.39) <sup>b</sup>	11.88 (12.27) <sup>b,c</sup>	9.47 (8.42) <sup>a,b</sup>
White	41.48 (23.21) <sup>d</sup>	28.13 (20.42) <sup>c</sup>	36.26 (22.13) <sup>c</sup>	26.09 (16.98) <sup>c</sup>
<i>Men</i>				
African-American	5.22 (9.06) <sup>a</sup>	5.13 (7.37) <sup>a</sup>	5.29 (11.31) <sup>a,b</sup>	6.07 (10.39) <sup>a,b</sup>
Asian-American	5.17 (8.76) <sup>a</sup>	4.35 (4.94) <sup>a</sup>	5.28 (11.93) <sup>a,b</sup>	6.04 (11.92) <sup>a,b</sup>
Hispanic	5.16 (9.53) <sup>a</sup>	3.89 (4.71) <sup>a</sup>	4.77 (10.12) <sup>a</sup>	3.30 (4.09) <sup>a</sup>
Native American	5.27 (10.36) <sup>a</sup>	3.73 (5.20) <sup>a</sup>	4.54 (10.76) <sup>a</sup>	3.17 (4.43) <sup>a</sup>
White	10.37 (13.18) <sup>a,b</sup>	8.52 (8.52) <sup>a,b</sup>	9.20 (12.21) <sup>a,b,c</sup>	8.85 (10.61) <sup>a,b,c</sup>

Note: Different superscripts denote significant differences ( $p < .05$ ) within participant gender and eating disorder conditions. Participants provided estimates for both eating disorders.

Some women, but no men, mentioned amenorrhea and changes in hair or skin. Fewer participants mentioned psychological (41.2%) or social (27.8%) consequences. Psychological consequences included negative emotions, depression, low self-esteem, and poor body image. Social consequences included relationship problems and poor social functioning. A mixed model ANOVA indicated that participants generated more physical ( $M = 1.61$ ) than psychological ( $M = .52$ ) or social consequences ( $M = .30$ ),  $F(2, 186) = 74.18$ ,  $p < .001$ . Contrary to predictions, there were no differences for participant gender or eating disorder,  $F$ 's(1, 93) = 3.02, 2.63,  $p$ 's < .09, .11, respectively.

#### Long-term consequences

Participants generated a mean of 2.65 long-term consequences. Nearly all participants (86.3%) listed at least one physical consequence, such as malnourishment, heart problems, bone or muscle problems, and stunted growth (see Table 4). Participants in the BN condition mentioned several problems related to repeated vomiting, such as digestive problems, throat damage, and dental damage. Again, only women mentioned reproductive problems, such as amenorrhea. A number of participants list death as a consequence; that response was more frequent in the AN than BN condition,  $\Delta L^2(1) = 4.55$ ,  $p < .04$ ;  $L^2(4) = 5.81$ , ns.

Approximately one-third (32.4%) of participants mentioned at least one long-term psychological consequence, such as low self-esteem and negative emotions. A small number (9.8%) mentioned long-term social problems, particularly relationship difficulties. Again, a mixed model ANOVA indicated that participants listed more physical consequences ( $M = 2.14$ ) than psychological ( $M = .41$ ) or interpersonal ( $M = .10$ ) consequences,  $F(2, 196) = 170.12$ ,  $p < .001$ , with no differences by eating disorder or participant gender,  $F$ 's(1, 98) < 1.5, ns.

#### Duration of eating disorders

When estimating how long AN and BN tend to last, men were significantly more likely than women to report that they last less than 5 years (63.0% vs. 32.1%, respectively),  $\Delta L^2(1) = 9.84$ ,  $p < .002$ ;  $L^2(4) = 3.81$ , ns, whereas women were significantly more likely than men to assert that they last at least five years or until treated (33.9% vs. 15.2%, respectively),  $\Delta L^2(1) = 4.83$ ,  $p < .03$ ;  $L^2(4) = 4.72$ , ns. Neither response differed by eating disorder. AN was more likely than BN to be considered a lifelong or recurring problem (25.5% vs. 6.4%, respectively),  $\Delta L^2(1) = 7.20$ ,  $p < .01$ ;  $L^2(4) = 7.43$ , ns.

#### Treatment of eating disorders

Nearly all participants (98.0%) thought BN was curable; however, only 82.1% of participants thought AN was curable,  $\Delta L^2(1) = 8.12$ ,  $p < .005$ ;  $L^2(4) = 6.05$ , ns. This pattern complements the previous finding that participants considered AN more likely than BN to be fatal or a lifelong problem. Participants were asked to list treatments available for eating disorders. The majority (83.0% AN, 90.0% BN) referred to counseling or therapy; other responses included hospitalization (30.2% AN, 22.5% BN), medication (17.0% AN, 20.0% BN), nutrition/diet counseling (11.3% AN, 15.0% BN), and social support (11.3% AN, 7.5% BN).

#### What are the causes of eating disorders?

Participants indicated whether biological and/or social factors influence the development of eating disorders. Overall, 29.2% of participants thought that biological or genetic factors contribute to eating disorders. More men than women believed that biological factors were influential (40.8% vs. 19.3%, respectively),  $\Delta L^2(1) = 5.93$ ,  $p < .02$ ;  $L^2(4) = 4.27$ , ns. Responses did not differ by eating disorder. In a follow-up question, participants identified

Table 4  
Beliefs about the short- and long-term consequences of having an eating disorder

	Anorexia			Bulimia		
	Overall ( <i>N</i> = 53) Percent ( <i>N</i> )	Women ( <i>N</i> = 33) Percent ( <i>N</i> )	Men ( <i>N</i> = 22) Percent ( <i>N</i> )	Overall ( <i>N</i> = 43) Percent ( <i>N</i> )	Women ( <i>N</i> = 19) Percent ( <i>N</i> )	Men ( <i>N</i> = 24) Percent ( <i>N</i> )
<i>Short-term consequences</i>						
Physical						
Weakness or lack of energy	51.9 (28)	42.4 (14)	66.7 (14)	32.6 (14)	10.5 (2)	50.0 (12)
Malnourishment	14.8 (8)	18.2 (6)	9.5 (2)	14.0 (6)	21.1 (4)	8.3 (2)
Weight loss	29.6 (16)	27.3 (9)	33.3 (7)	7.0 (3)	5.3 (1)	8.3 (2)
Damage from vomiting	13.0 (7)	21.2 (7)	0.0 (0)	25.6 (11)	36.8 (7)	16.7 (4)
Poor health	31.5 (17)	42.4 (14)	14.3 (3)	20.9 (9)	26.3 (5)	16.7 (4)
Amenorrhea	7.4 (4)	12.1 (4)	0.0 (0)	4.7 (2)	10.5 (2)	0.0 (0)
Changes in hair or skin	11.1 (6)	18.2 (6)	0.0 (0)	7.0 (3)	15.8 (3)	0.0 (0)
Psychological						
Negative emotions	18.5 (10)	21.2 (7)	14.3 (3)	20.9 (9)	36.8 (7)	8.3 (2)
Depression	14.8 (8)	18.2 (6)	9.5 (2)	7.0 (3)	10.5 (2)	4.2 (1)
Low self-esteem/poor body-image	7.4 (4)	6.1 (2)	9.5 (2)	14.0 (6)	10.5 (2)	16.7 (4)
Social						
Relationship problems	20.4 (11)	15.2 (5)	28.6 (6)	18.6 (8)	15.8 (3)	20.8 (5)
Poor social functioning	13.0 (7)	12.1 (4)	14.3 (3)	7.0 (3)	10.5 (2)	4.2 (1)
<i>Long-term consequences</i>						
Physical						
Malnourishment	23.2 (13)	20.6 (7)	27.3 (6)	17.4 (8)	19.0 (4)	16.0 (4)
Heart problems	12.5 (7)	14.7 (5)	9.1 (2)	10.9 (5)	14.3 (3)	8.0 (2)
Bone or muscle problems	14.3 (8)	11.8 (4)	18.2 (4)	6.5 (3)	0.0 (0)	12.0 (3)
Stunted growth	12.5 (7)	11.8 (4)	13.6 (3)	4.3 (2)	4.8 (1)	4.0 (1)
Digestive problems	10.7 (6)	8.8 (3)	13.6 (3)	23.9 (11)	33.3 (7)	16.0 (4)
Throat damage	3.6 (2)	2.9 (1)	4.5 (1)	21.7 (10)	28.6 (6)	16.0 (4)
Dental damage	7.1 (4)	8.8 (3)	4.5 (1)	21.7 (10)	33.3 (7)	12.0 (3)
Reproductive problems	7.1 (4)	11.8 (4)	0.0 (0)	4.3 (2)	9.5 (2)	0.0 (0)
Unspecified health problems	55.4 (31)	55.9 (19)	54.5 (12)	34.8 (16)	38.1 (8)	32.0 (8)
Psychological						
Low self-esteem	14.3 (8)	11.8 (4)	18.2 (4)	15.2 (7)	4.8 (1)	24.0 (6)
Negative emotions	17.9 (10)	14.7 (5)	22.7 (5)	21.7 (10)	33.3 (7)	12.0 (3)
Social						
Relationship problems	8.9 (5)	8.8 (3)	9.1 (2)	6.5 (3)	4.8 (1)	8.0 (2)
Other						
Death	53.6 (30)	47.1 (16)	63.6 (14)	32.6 (15)	23.8 (5)	40.0 (10)

Note: Only response categories used by more than 10% participants are included.

genetic predisposition (50.0% AN, 76.9% BN) the primary biological factor affecting eating disorders.

A higher percentage (97.1%) of participants believed that social factors affect the development of eating disorders. One hundred percent of women, compared with 93.8% of men, believed in social causation,  $\Delta L^2(1) = 4.80$ ,  $p < .03$ ;  $L^2(4) = 3.53$ , ns. Responses did not differ by eating disorder. A follow-up question revealed that participants believed societal standards of beauty (41.1% AN, 50.0% BN), the media (44.6% AN, 28.3% BN), peer and romantic pressure (37.5% AN, 39.1% BN), and family issues (19.6% AN, 17.4% BN) contribute to eating disorders.

#### Comparison of lay beliefs and diagnostic criteria

To investigate how students' beliefs about AN and BN compare to clinical diagnostic criteria, we assessed how

many DSM-IV-TR (APA, 2000) criteria were present in participants' initial descriptions of AN and BN. Participants in the AN condition mentioned an average of 1.63 of the 4 diagnostic criteria. Most mentioned refusal to maintain a healthy body weight (97.1% women, 95.5% men) and distorted body image/excessive concern about weight (68.6% women, 40.9% men), whereas very few mentioned fear of weight gain (8.6% women, 0% men) or amenorrhea (5.7% women, 0% men). Participants in the BN condition generated an average of 1.90 of the 4 diagnostic criteria.<sup>5</sup> The majority mentioned binge eating (81.8% women, 65.4% men) and compensatory behaviors (90.9% women, 84.6% men), but far fewer mentioned

<sup>5</sup>The DSM-IV-TR (APA, 2000) lists a fifth diagnostic criterion which states that bulimic behaviors should not occur exclusively during periods of AN. We did not code for this criterion, as participants were asked only to describe BN.



excessive influence of weight on self-evaluation (27.2% women, 30.8% men). No one indicated that cyclic eating needs to occur semiweekly for 3 months. Overall, participants in the BN condition generated a greater number of diagnostic criteria than did participants in the AN condition,  $F(1, 100) = 4.79, p < .04$ , perhaps due to the more concrete nature of the BN criteria. In addition, women mentioned more diagnostic criteria for both conditions than did men ( $M$ 's = 1.88, 1.60, respectively),  $F(1, 101) = 5.03, p < .03$ .

## Discussion

Knowledge about eating disorders may affect lay people's ability to recognize individuals with AN or BN and refer them to treatment. In this study, we used qualitative and quantitative questions to conduct a comprehensive assessment of mental models of AN and BN in a group that may be particularly likely to encounter them, college students. We found that the vast majority of students believed that the primary characteristic (*identity*) of AN is restrained eating and the primary characteristic of BN is cyclic eating. Regarding *cause*, they believed that AN and BN are more likely to stem from psychological or social factors than from biological factors. Most participants were able to list some physical *consequences* of AN or BN, with approximately one-third also generating psychological and/or social consequences. Women were more likely than men to believe AN and BN have a lifelong *duration*, and BN was perceived as a more transient condition than AN. The majority of participants believed that AN and BN can be *cured*, usually through counseling or therapy. Thus, overall, lay knowledge about AN and BN, particularly about symptoms and consequences, tends to be consistent with clinical data. However, the aspects of AN and BN that are most salient to lay people tend to be behavioral and physical and differ somewhat from the DSM-IV-TR's (APA, 2000) diagnostic criteria (Jorm et al., 1997).

This study replicates some previous findings regarding lay people's knowledge about eating disorders, but challenges other findings. We replicated the finding that lay people know more general (e.g., dominant behavior patterns) than specific (e.g., concrete physiological consequences) information about AN and BN. In contrast, there was only weak evidence that women know more than men about eating disorders (Lee, 1997; Smith et al., 1986). In some instances, women generated more and/or unique information (e.g., about reproductive effects) compared to men. However, these effects were small and inconsistent, perhaps reflecting differences across samples or perhaps suggesting that heightened awareness of eating disorders has diminished gender differences in knowledge. In addition, this study did not find consistent evidence that lay people know more about AN than BN (Chiodo et al., 1984; Huon et al., 1988; Lee, 1997; Murray et al., 1990; Smith et al., 1986). This difference may reflect a growing

awareness of BN as a unique condition from AN. Finally, although this study replicated the finding that counseling is considered the primary treatment for eating disorders (Mond et al., 2004a), it showed less support for social support and nutrition and more support for hospitalization than found in previous research.

In addition, the current study revealed several new aspects of lay mental models about AN and BN. First, college students consider AN to be a more serious health problem than BN, asserting that AN lasts longer, is less likely to be cured, and is more likely to be fatal. Second, students tend to believe that psychological and social factors (e.g., media, peer pressure) are more likely to cause AN and BN than are biological factors (cf. Mond et al., 2004b). Women, however, place relatively greater emphasis on psychological and social factors, whereas men place relatively greater emphasis on biological factors.

Third, college students appear to overestimate the rate of AN and BN relative to clinical data. Although clinical data suggest a prevalence of approximately 0.5–4% (APA, 1994; Fairburn et al., 1993; Hsu, 1996; Wakeling, 1996), participants' estimates of the lifetime incidence of eating disorders ranged from 3% to 41%, depending on demographic group. Similarly, in another study (Mond et al., 2004c), Australian women indicated that approximately 30% of women experience some form of bingeing and purging. Lay people's estimates may reflect inflated estimates of AN and BN in the popular press (e.g., Wolf, 1991). They also may reflect a tendency to rely on behavioral rather than clinical definitions of AN and BN. Notably, estimates of AN and BN among our sample of college students resembled epidemiological data for dysfunctional eating behaviors such as bingeing in younger populations (i.e., their peers; French et al., 1995; French et al., 1996; Heatherton et al., 1995; Serdula et al., 1993; Story et al., 1995). This pattern suggests that lay people rely on observations of dysfunctional eating when making judgments about possible eating disorders.

### *Associations between eating disorders and social groups*

We assessed an additional component of mental models: beliefs about the groups of people who develop particular health problems. Both qualitative and quantitative responses reveal that college students have a distinct image of a person with AN or BN as an adolescent or young adult White woman. This belief is fairly consistent with clinical data, which indicate that the vast majority of people diagnosed with AN and BN are White women (APA, 1994; Fairburn et al., 1993; Hsu, 1996; Wakeling, 1996), but does not seem to reflect awareness of the relatively high rate of dysfunctional eating in racial minorities and men found in epidemiological research (e.g., Gross & Rosen, 1988; McNulty, 1997; Serdula et al., 1993; Story et al., 1995).

Differences between clinical and epidemiological estimates may reflect several factors, including severity of condition, access to care, and diagnostic bias. However, as

discussed earlier, even individuals who do not meet the full diagnostic criteria for AN and BN may experience serious health outcomes and benefit from treatment (Pritts & Susman, 2003). Thus, it is important to consider how participants' belief that eating disorders occur primarily in young White women might affect lay referrals. Specifically, associations between eating disorders and White women may make people more sensitive to dysfunctional eating or other indicators of eating disorders when they occur in White women rather than minority women or men (Gilbert, 2003; Root, 1990; Silber, 1986). Consistent with this prediction, experimental research has shown that lay people are more likely to suspect an eating disorder when a woman who engages in minimal eating behavior is described as White rather than African-American or Latina (Gordon et al., 2002; Hunt & Rothman, 2004). Thus, given the role of lay referral as an avenue to treatment, it appears that lay people may benefit from increased awareness of disordered eating in men and racial minorities.

#### *Implications for eating disorder prevention*

For lay people to recognize eating disorders in others, they must have accurate, accessible knowledge about the behaviors, symptoms, and other characteristics of AN and BN. The current study suggests that overt eating behaviors are the most salient aspects of AN and BN for college students. Thus, students may be relatively well-equipped to make inferences about eating disorders when they are able to see that someone is engaging in restrained and/or cyclic eating. However, given that individuals with AN and BN often are secretive about their eating behaviors (APA, 2000; Pritts & Susman, 2003), knowledge of other indicators of eating disorders may be helpful for lay referrals. However, relatively few participants were able to generate information about specific physical, psychological, or social indicators of AN and BN, such as damage from repeated vomiting, dry skin, lanugo, and social difficulties (APA, 2000; Becker et al., 1999; Fairburn & Harrison, 2003; Treasure & Szmukler, 1995; Pritts & Susman, 2003). In addition, few participants indicated awareness of distortion in body image or fear of weight gain, both of which are important, although difficult to observe, indicators of eating disorders (APA, 2000; Pritts & Susman, 2003).

These results indicate a need for additional education on eating disorders, particularly among populations likely to encounter them, such as high school and college students. Evaluations of eating disorder education programs show that they lead to increased knowledge, although usually not major changes in body image or eating behavior (Littleton & Ollendick, 2003). Although these findings suggest that education may have limited efficacy in terms of *prevention*, they indicate that it may be a valuable tool for promoting eating disorder *recognition*. By increasing lay people's awareness and knowledge, health educators may be able to

increase recognition of potential eating disorders and thereby increase lay referrals. Given current knowledge, educational programs should emphasize more subtle indicators of eating disorders and promote awareness that disordered eating often occurs in racial and ethnic minorities and men (Gilbert, 2003; Gross & Rosen, 1988; McNulty, 1997; Serdula et al., 1993; Story et al., 1995).

#### *Limitations and future directions*

The present study has some limitations that point to the need for additional research on mental models of AN and BN. The current study involved a predominantly White American sample with relatively high levels of education and income. This sample may have had more knowledge about AN and BN and/or different associations with demographic groups than would more diverse, less affluent, or international samples. Future research should assess beliefs about AN and BN across diverse and international samples.

Another potential limitation is that participants' responses may have been somewhat constrained by assumptions about social communication. Research on survey responses indicates that people often try to avoid being redundant (e.g., by repeating responses) when completing questionnaires (Schwarz, Groves, & Schuman, 1998). This response bias may have led participants to omit certain answers. For example, they may not have listed a particular outcome as both a short- and long-term consequence because they wanted to provide novel information. Likewise, some participants may not have listed "White women" as the type of person most likely to develop AN or BN because they considered that response to be the "default" and thus uninformative. Consistent with this analysis, when specifically asked about demographics, over 91% of lay people indicate that the "typical person" with AN and BN is a White woman under the age of 30 (Hunt, Iyer, McGorty, & Rothman, 2003). As a result, this study may provide a slightly conservative estimate of college students' knowledge and beliefs about AN and BN.

Despite these limitations, we believe that our study has important implications for research and practice. People's beliefs about illnesses influence the way they interpret and respond to potential symptoms (Leventhal et al., 1984; Martin et al., 1998; Meyer et al., 1985). As a result, illness knowledge is likely to be an important predictor of lay referrals, in which lay people encourage others to seek professional care for potential health problems (Campbell & Roland, 1996; Suls et al., 1997; Tsogia et al., 2001). Because lay referrals may be a primary avenue through which individuals with AN and BN enter treatment (Price & Desmond, 1990; Pritts & Susman, 2003), it is critical for future research to test the effects of eating disorder knowledge and beliefs on lay people's ability to identify AN and BN. It also is important to continue developing effective methods of disseminating information about eating disorders to lay people. We believe that our analysis

of college students' mental models of AN and BN provides the groundwork for research examining how lay people recognize and respond to eating disorders, as well as for educational programs that can increase knowledge and recognition of eating disorders.

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