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# Temporal sequence of comorbid alcohol use disorder and anorexia nervosa

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## HIGHLIGHTS

- We explored the temporal sequence of comorbid anorexia and alcohol disorders.
- Alcohol use disorder was more common in binge eating/purging type anorexia nervosa.
- No differences emerged between anorexia first and alcohol disorder first groups.
- Differences emerged between the anorexia nervosa only and the comorbid group.

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## ABSTRACT

Women with eating disorders have a significantly higher prevalence of substance use disorders than the general population. The goal of the current study was to assess the temporal pattern of comorbid anorexia nervosa (AN) and alcohol use disorder (AUD) and the impact this ordering has on symptomatology and associated features. Women were placed into one of three groups based on the presence or absence of comorbid AUD and the order of AN and AUD onset in those with both disorders: (1) AN Only, (2) AN First, and (3) AUD First. The groups were compared on psychological symptoms and personality characteristics often associated with AN, AUD, or both using general linear models. Twenty-one percent of women ($n = 161$) with AN reported a history of AUD with 115 reporting AN onset first and 35 reporting AUD onset first. Women with binge-eating and/or purging type AN were significantly more likely to have AUD. In general, differences were found only between women with AN Only and women with AN and AUD regardless of order of emergence. Women with AN and AUD had higher impulsivity scores and higher prevalence of depression and borderline personality disorder than women with AN Only. Women with AN First scored higher on traits commonly associated with AN, whereas women with comorbid AN and AUD displayed elevations in traits

*Abbreviations:* AN, Anorexia Nervosa; BN, Bulimia Nervosa; AUD, Alcohol Use Disorder; GAN, Genetics of Anorexia Nervosa; SIAB, Structured Interview for Anorexia Nervosa and Bulimic Syndromes; RAN, AN restricting type; PAN, AN purging type; AN-B, AN with binge eating with or without purging or lifetime history of both AN and BN; YBC-EDS, The Yale–Brown–Cornell Eating Disorder Scale (YBC-EDS); Y-BOCS, Yale–Brown Obsessive Compulsive Scale; TCI, Temperament and Character Inventory; BIS, Barratt Impulsiveness Scale-11; STAI-Y, State-Trait Anxiety Inventory Form Y (STAI-Y); GEE, generalized estimating equation modeling.

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more commonly associated with AUD. Results do not indicate a distinct pattern of symptomatology in comorbid AN and AUD based on the temporal sequence of the disorders.

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## 1. Introduction

The National Center on Addiction and Substance Abuse reports that up to 50% of individuals with an eating disorder abuse substances compared with 9% of the general population, and up to 35% of individuals with substance abuse have an eating disorder compared with 3% of the general population (CASA, 2003). The association between substance abuse and eating disorders is thought to be strongest with bulimia nervosa (BN) (Gadalla & Piran, 2007; Harrop & Marlatt, 2010; Holderness, Brooks-Gunn, & Warren, 1994). However, substance use disorders, including alcohol use disorders (AUD), also occur in women with anorexia nervosa (AN) (Baker, Mitchell, Neale, & Kendler, 2010; Bulik et al., 2004; Root, Pinheiro, et al., 2010; Root, Pisetsky, et al., 2010). For example, a recent population-based study indicated that approximately 22% of women with AN have a lifetime history of AUD (Baker et al., 2010). Although the association between AUD and AN is strongest with AN binge-purge type, the prevalence of AUD in women with AN restricting-type is greater than that found in the general population (Root, Pinheiro, et al., 2010). However, to date, the temporal sequence of comorbid AN and AUD has not been thoroughly examined.

Longitudinal studies indicate that women who initially present with an eating disorder are at risk for AUD over a prolonged period of time. Over the course of nine years, Franko and colleagues (Franko et al., 2005) found that 10% of women with an eating disorder reported onset of AUD after their initial presentation for eating disorder treatment. Similarly, in a 10-year follow-up of male and female adolescents (90% female) hospitalized for AN, 8% developed a new onset AUD (Strober, Freeman, Bower, & Rigali, 1996). The association and risk for comorbid AN and AUD is particularly important as there is substantial mortality in women with this comorbid presentation (Keel et al., 2003; Suzuki, Takeda, & Yoshino, 2011).

Of those women with comorbid AN and AUD, approximately 50% report AN onset prior to AUD onset whereas approximately 30% report AUD onset prior to AN onset (Baker et al., 2010; Bulik et al., 2004). Yet, few large-scale studies have addressed how chronology of onset influences the nature of symptoms, associated features, and additional comorbidities. One study revealed that AUD onset prior to AN onset is associated with increased reports of parental criticism (Bulik et al., 2004). Women with comorbid AN and AUD also report increased motor impulsivity, perfectionism, and parental criticism and expectations as well as greater frequency of major depressive disorder, obsessive compulsive disorder, post-traumatic stress disorder, social phobia, specific phobias, and borderline personality disorder (Bulik et al., 2004; Wiseman et al., 1999).

Further clarifying whether AN or AUD develops first in their temporal sequence may provide information on differential mechanisms of comorbid association, unique mechanisms of causation, insight into symptom heterogeneity, and inform differential treatment approaches. For example, heterogeneity of causal mechanisms is likely as women with AN first may subsequently turn to alcohol to dampen the physical effects of starvation and restriction (Bulik et al., 2004; Godart, Flament, Lecrubier, & Jeammet, 2000; Harrop & Marlatt, 2010), whereas women who develop AUD first may find the initial weight loss that can occur secondary to decreased food caloric intake and increased alcohol caloric intake rewarding (Liangpunsakul, 2010; Lieber, 1991; Reinus, Heymsfield, Wiskind, Casper, & Galambos, 1989). Finally, the symptom profile of each disorder could differ depending on chronology of onset, which could also inform treatment approaches.

The objectives of the present study are four-fold: (1) to assess the prevalence of comorbid AN and AUD in women by AN subtype; (2) to examine whether the ages of onset of AN and AUD differ in women with AN Only, AN First, and AUD First; (3) to determine whether AN-related symptom endorsement differs in women with AN Only, AN First, and AUD First; and (4) to investigate differences in personality characteristics and prevalence of other psychiatric disorders based on the presence or absence of AUD as well as order of onset in women with both AN and AUD.

## 2. Method

### 2.1. Participants

Participants were women from NIH funded Genetics of Anorexia Nervosa Collaborative Study (GAN), which has been previously described (Kaye et al., 2008). Institutional Review Boards and Ethics Boards at each participating site approved this study. All participants provided informed consent prior to participation.

Probands met criteria for a lifetime diagnosis of DSM-IV AN, with or without amenorrhea, at least three years prior to study entry, and were either ill or recovered. AN diagnosis was required to occur prior to age 45, and probands had to be at least 16 years-old to be included. Women were required to have a lowest illness-related body mass index (BMI) at or below 18 kg/m$^2$. For men, the lowest illness related BMI had to be at or below 19.6 kg/m$^2$. These values correspond to the 5th percentile BMI values of the NHANES epidemiological sample of women and men (Hebebrand, Himmelmann, Heseker, Schafer, & Remschmidt, 1996), respectively, for the average age range (27–29 years) of the probands in our previous studies (Kaye et al., 1999; Reba et al., 2005). Probands were required to have at least one first, second, or third degree relative with AN (excluding parents and monozygotic twins) who was willing to participate in the study. Potential probands were excluded from the study if they had a history of binge eating episodes at least twice a week for at least three months; a maximum lifetime BMI exceeding 30 kg/m$^2$; a history of severe central nervous system trauma; a psychotic disorder or developmental disability; or any disorder that could confound the diagnosis of AN or interfere with the ability to respond to assessments.

The inclusion criteria for affected family members were the same except that relatives were permitted to engage in regular binge eating and they did not have to meet AN criteria three years prior to study enrollment but were required to have had a minimum duration of at least three months at low weight. An additional lifetime diagnosis of BN was allowed. Families with an affected proband and family member who met inclusion criteria were permitted to include additional relatives with a diagnosis of AN, BN, or eating disorder not otherwise specified (ENDOS). All probands and affected family members completed the same assessment measures.

### 2.2. Measures

#### 2.2.1. Eating disorder pathology

Eating disorder diagnoses (i.e., AN, BN, and EDNOS) were assessed using a modified version of Module H of the Structured Clinical Interview for Axis I Disorders (SCID-I) (First, Spitzer, Gibbon, & Williams, 1997) and the Structured Interview for Anorexia Nervosa and Bulimic Syndromes (SIAB) (Fichter, Herpertz, Quadflieg, & Herpertz-Dahlmann, 1998) which are semi-structured clinical interviews. Specifically, the SCID-I was used to assess inclusion and exclusion criteria, AN diagnosis, age of AN onset, and eating disorder duration. If the participant reported a BMI below the cutoff (18 kg/m$^2$ for