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Associations among Eating Disorder Behaviors and Eating Disorder Quality of Life in Adult Women with Anorexia Nervosa

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Anorexia nervosa (AN) is associated with elevated mortality and psychiatric morbidity (Arcelus, et al., 2011; Hudson et al., 2007) as well as reduced quality of life (QOL) compared to healthy controls and individuals with other psychiatric conditions (Ágh et al., 2016; Jenkins et al., 2011). Further, some studies have demonstrated that women with AN with a lower body weight have lower QOL (Bamford et al., 2015;Weigel et al., 2016), although, others have found no association (e.g., Abbate-Daga et al., 2014). In addition, individuals with AN-binge/purge (AN-BP) subtype show more detriments in quality of life compared to individuals with AN-restricting (AN-R) subtype (DeJong et al., 2013; Mond et al., 2005). However, DeJong et al. (2013) did not find associations between symptom severity, such as dietary restraint or binge eating/purging behaviors, and QOL. Studies examining QOL among adults with AN have consistently used retrospective self-report measures of eating disorder (ED) behaviors to study the relation between behaviors and QOL (Sy et al., 2013). Examining associations between ED behaviors collected in the natural environment through ecological momentary assessment may provide more accurate data to determine how ED behavior is related to QOL. Ecological momentary assessment overcomes a number of inherent biases in self-reported data from questionnaire and clinical interviews, notably retrospective recall bias, resulting in data with improved reliability and ecological validity.

Although individuals with AN often engage in a number of ED behaviors (e.g., binge eating, purging, dietary restriction), it is unclear how ED behaviors that occur in daily life are related to QOL. Binge eating and purging have numerous psychological (e.g., shame, guilt)

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and physical (e.g., extreme fullness, hypoglycemia, gastrointestinal problems) effects that may impact QOL (Anderson et al., 1997; Hinrichsen et al., 2007; Johnson et al., 1994). In addition, extreme caloric restriction is associated with a number of psychological and neurological complications, which may affect individuals' day-to-day functioning (Başoğlu et al., 2006; Kalm and Semba, 2005; Polivy, 1996). Alternatively, reduced quality of life may function to maintain and/or exacerbate ED symptomatology (Mitchison et al., 2015). Elucidating how ED behaviors in daily life are associated with QOL will allow us to better understand QOL in AN, and will inform identification of important treatment targets. Thus, this study was guided by two primary aims. The first aim was to examine associations between ED behaviors (i.e., binge eating, purging, restriction) assessed in the naturalistic environment via ecological momentary assessment in explaining individual differences in overall EDQOL in AN. We expected that increased frequency of ED behaviors would independently be associated with reduced QOL. The second aim was to investigate unique associations between facets of EDQOL (i.e., psychological, physical, financial, and work) in predicting ED behaviors in ecological momentary assessment (i.e., binge eating, purging, restriction).

Of note, the current paper is a post-hoc secondary analysis of a multi-method, observational study of women with anorexia nervosa; these data have been used to investigate ED behaviors including binge/purge and restriction in other papers (e.g., Engel et al., 2013; Haynos et al., 2016; See supplementary material for full list of papers). These papers primarily examined momentary predictors of ED behaviors (e.g., affect, stress), and have not investigated EDQOL, and its relation with ED behaviors. Therefore, this current paper examines new research questions using ecological momentary assessment data collected from women with AN. Specifically, we used ecological momentary assessment as a methodology for collecting real-time, naturalistic data on ED behaviors and examine the association between this data and EDQOL, which has never been previously done in research on QOL in AN.

Method

Participants and Procedure

Women with AN (N = 118) were recruited at three sites in the Midwestern United States via eating disorder treatment facilities, online postings, and clinical, community, and campus advertising. A subset of women completed the Eating Disorder Quality of Life Instrument (EDQOL; Engel et al., 2006) resulting in a sample of 82 for analysis. The majority of the sample was Caucasian (96.6%). The mean age was 25.3 ± 8.4 years and the mean body mass index (BMI) was 17.2 ± 1.0 kg/m^2. Eligibility criteria included: being female, at least 18 years of age, and meeting criteria for Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM-IV; American Psychiatric Association, 2000) AN or subthreshold AN. Subthreshold AN was defined as meeting all of the DSM-IV criteria for AN except: (1) body mass index between 17.5 and 18.5 kg/m^2; or (2) absence of amenorrhea or an absence of the cognitive features of AN.

At baseline, participants completed interviews and questionnaires. Subsequently, participants completed two-weeks of ecological momentary assessment recordings using

palmtop computers in which they were instructed to respond to six semi-random signals delivered each day as well as to complete surveys whenever an eating episode occurred (e.g., snack, meal, binge eating). Signal-contingent reporting required participants to complete an assessment at various times throughout the day in response to six semi-random signals distributed around six anchor points (i.e., 8:30 a.m., 11:10 a.m., 1:50 p.m., 4:30 p.m., 7:10 p.m., and 9:50 p.m.).

Measures

Diagnostic interview.—The Structured Clinical Interview for DSM-IV Axis I Disorders, Patient Edition (SCID-I/P; First et al., 1995) was used to determine DSM-IV diagnostic criteria for AN and subthreshold AN. SCID interviews were recorded by trained assessors and a second independent assessor rated current eating disorder diagnoses in a random sample of 25% ($n = 30$) of these interviews. Interrater reliability for current AN diagnosis based upon a kappa coefficient was .929.

EDQOL.—The EDQOL (Engel et al., 2006) is a measure of the impact of eating disorder symptoms on QOL in four domains: psychological (e.g., “feeling embarrassed or different” and “feeling worse about yourself”), physical (e.g., “weakness” and “frequent headaches”), financial (e.g., “spend money from savings or use credit card” and “significant financial debt”), and work (e.g., “reduced hours at work” and “losing a job or dropping out of school”). The scale includes four subscales (i.e., psychological, physical, financial, and work), which can also be combined into a global QOL score. Participants responded to items on a sale from 0 (*never*) to 4 (*always*). Higher scores indicate worse EDQOL. The EDQOL has shown excellent psychometric properties including adequate internal consistency and test-retest reliability as well as adequate validity, both strong correlations with convergent measures and weaker correlations with discriminant measures (Engel et al., 2006). In addition, the EDQOL has been shown to differentiate people with and without EDs and severity of EDs. Cronbach’s alphas in the current study were .91, .83, .92, .87 for psychological, physical, financial, and work subscales respectively.

Ecological Momentary Assessed ED behaviors.—Consistent with Haynos et al. (2016), restrictive eating episodes were defined as any eating episode during which an individual endorsed “I ate as little as possible”. Individuals were also instructed to indicate whether they engaged in binge eating and vomiting during random signals and eating episode recordings.

Statistical Analysis

For Aim 1, ecological momentary assessed ED behaviors (i.e., binge eating, purging, dietary restriction) were aggregated to obtain composites of ED behaviors that women reported engaging in over the 2-week ecological momentary assessment protocol. In order to reduce the number of predictor variables, total binge eating and vomiting episodes were summed to create a total bulimic behavior variable. A multiple linear regression was calculated with BMI (which was also included as a symptom severity variable), restriction, and bulimic behavior entered together as predictor variables of total EDQOL score. For Aim 2, three general estimating equations with logistic functions were used. The four EDQOL

dimensions were entered as predictor variables of each ED behavior (i.e., restriction, binge eating, purging).

Results

Descriptives

There were 57 women (70%) with AN-restricting subtype and 25 (30%) with AN-binge eating/purging. There were 37 women (45%) who met full criteria for DSM-IV AN and 45 (55%) women who met criteria for subthreshold DSM-IV AN. Women with full- and sub-threshold AN did not significantly differ on EDQOL, $t(80) = 0.07$, $p = .94$. Descriptive statistics of study variables are displayed in Table 1.

Aim 1

The regression predicting total EDQOL showed that ecological momentary assessed restriction ($B = .02$, $\beta = .31$, $SE = .01$, $p = .003$) and ecological momentary assessed bulimic behavior ($B = .02$, $\beta = .30$, $SE = .01$, $p = .005$) were significantly associated with EDQOL scores. Women with greater ecological momentary assessed restriction and bulimic behavior had lower EDQOL (i.e., higher EDQOL scores indicate lower QOL). BMI was unrelated to EDQOL ($B = -.03$, $\beta = -.06$, $SE = .06$, $p = .57$). The model accounted for 21% of the variance in EDQOL.

Aim 2

Table 2 shows results of GEE models predicting ecological momentary assessed ED behaviors from EDQOL scales. Psychological EDQOL was the only aspect of QOL independently associated with increased likelihood of dietary restriction such that decreased psychological EDQOL was related to more restriction. Work EDQOL was the only aspect of QOL independently associated with increased likelihood of binge eating such that decreased work EDQOL was related to more binge eating. No aspect of EDQOL was independently related to purging.

Discussion

Findings from this study show that increased severity of dietary restriction and bulimic behavior each independently contribute to reduced overall QOL in AN. This finding is consistent with research demonstrating that individuals with AN-BP typically report worse QOL than those with AN-R (DeJong et al., 2013; Mond et al., 2005). Binge eating and purging may increase psychological distress and cause negative physical reactions (e.g., fullness, bloating) as well as have substantial financial (e.g., purchasing binge foods) and medical burden, which all may decrease QOL in AN. In addition to bulimic behaviors, severity of dietary restriction was associated with reduced EDQOL controlling for BMI. More severe restriction may lead to numerous physical and cognitive effects (e.g., headaches, hunger, and fatigue) as well as a negative metabolic and nutritional state that all impact daily functioning and overall QOL.

The results also showed that lower psychological EDQOL was uniquely predictive of increased restrictive eating behavior as measured by ecological momentary assessment. Psychological factors may be the primary factors maintaining restriction. For example, fear of weight gain and body dissatisfaction are two facets of psychopathology that may cause restriction, and as these rise so does the severity of restriction (Stice and Shaw, 2002). Restrictive eating may function as a means of regulating negative psychological states, including mood as well as dissatisfaction with oneself and one's body (Haynos and Fruzzetti, 2011; Haynos et al., 2016). Further, lower work-related EDQOL was uniquely predictive of increased binge eating in ecological momentary assessment. Women with AN reporting lower work-related EDQOL may not be able to work or study, which may result in time at home or in isolation. In these circumstances, binge eating may occur in order to escape aversive food and non-food-related thoughts as well as to relieve feelings of boredom, social isolation, and other types of negative affect (Havermans et al., 2015; Heatherton and Baumeister, 1991; Mason et al., 2016). In addition, research has demonstrated that work-related QOL impairment is the strongest indicator of overall QOL impairment in EDs (Engel et al., 2006). Thus, given that bulimic behavior represents a unique factor associated with total QOL impairment (demonstrated by the Aim 1 analysis) and by research finding greater QOL impairment in AN-BP compared to AN-R (DeJong et al., 2013; Mond et al., 2005), this finding may reflect the association between binge eating and overall QOL impairment. It is possible that women with less QOL impairment are able to engage solely in restricting behavior, but once QOL reaches a greater level of impairment (such as affecting work), they start engaging in binge eating possibly to cope with stress and negative emotions. Further, these factors may be bi-directional such that work-related EDQOL leads to binge eating, and binge eating leads to poorer work-related EDQOL.

A limitation of this study is that not all women were severely low weight and thus results may not generalize to all women with AN. In addition, because the study findings are correlational in nature, causality and, as a result, directionality cannot be inferred. Further, more research is needed to determine if these results generalize to men and ethnic minorities. Thus, while the present research was the first to identify specific relationships between naturalistically assessed ED behaviors and EDQOL, additional research is warranted to assess the directionality of these relationships and other possible contributing factors. Establishing the directionality will help determine the extent to which treating ED symptoms improves EDQOL, targeting facets of EDQOL leads to decreases in ED symptoms, and/or how addressing other treatment targets (e.g., negative affect) influence ED symptoms and EDQOL together. These findings also highlight the associations between facets of QOL and ED behaviors. For example, understanding the impact of work-related impairment on the maintenance of binge eating may have utility in reducing binge eating in women with AN. Future research is needed to determine how current treatment strategies can be used to target QOL in the treatment of AN, as well as to identify novel interventions to target both QOL and ED behaviors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Descriptive Statistics of Study Variables

Variable	*M*	*SD*	Min	Max
Eating Disorder Behavior				
Binge eating frequency	2.22	4.18	0.00	22.00
Purging frequency	4.33	8.95	0.00	43.00
Bulimic behavior frequency	6.55	11.25	0.00	51.00
Restriction frequency	12.93	11.83	0.00	45.00
Eating Disorder Quality of Life				
Psychological	2.34	0.83	0.22	3.78
Physiological	1.93	0.85	0.00	3.50
Financial	0.75	1.05	0.00	4.00
Work	0.54	0.75	0.00	3.40
Total	1.58	0.68	0.16	3.20

Note. *M* = Mean; *SD* = standard deviation; Min = minimum; Max = maximum

Table 2.

General Estimating Equations of Eating Disorder Quality of Life Subscales Predicting Ecological Momentary Assessment Eating Disorder Behaviors

EDQOL Subscale	EMA Restriction			EMA Binge Eating			EMA Purging		
	Estimate	*SE*	*P*	*Estimate*	*SE*	*p*	*Estimate*	*SE*	*p*
Psychological	.83	.22	<.001	−.01	.31	.97	.30	.51	.55
Physical	−.01	.22	.98	.04	.26	.87	.45	.36	.21
Financial	.01	.11	.95	.13	.18	.48	−.05	.18	.79
Work	−.29	.22	.18	.45	.19	.01	.38	.25	.12

EDQOL = Eating Disorder Quality of Life; EMA = ecological momentary assessment