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Secretive Food Concocting in Binge Eating: Test of a Famine Hypothesis

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Abstract

Objective—Food concocting, or making strange food mixtures, is well documented in the famine and experimental semistarvation literature and appears anecdotally in rare descriptions of eating disorder (ED) patients but has never been scientifically investigated. Here we do so in the context of binge-eating using a “famine hypothesis of concocting.”

Method—A sample of 552 adults varying in binge eating and dieting traits completed a Concocting Survey created for this study. Exploratory ED groups were created to obtain predictions as to the nature of concocting in clinical populations.

Results—Binge eating predicted the 24.6% of participants who reported having ever concocted but dietary restraint, independently, even after controlling for binge eating, predicted its frequency and salience. Craving was the main motive. Emotions while concocting mirrored classic high-arousal symptoms associated with drug use; while eating the concoctions were associated with intensely negative/self-deprecating emotions. Concocting prevalence and salience was greater in the anorexia > bulimia > BED > no ED groups, consistent with their respectively incrementing dieting scores.

Discussion—Concocting distinguishes binge eating from other overeating and, consistent with the famine hypothesis, is accounted for by dietary restraint. Unlike its adaptive function in famine, concocting could worsen binge-eating disorders by increasing negative effect, shame, and secrecy. Its assessment in these disorders may prove therapeutically valuable.

Keywords

craving; loss of control; motivation; BED; eating behaviors; dieting; compulsivity; dietary restraint; eating disorders; emotions

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Introduction

The aim of this study was to quantify, for the first time, the prevalence, physical composition, motivations, behavioral correlates, and predictors, as well as the emotions surrounding secretive food concocting. We studied this behavior as a feature of binge eating based on a “famine hypothesis”: that in binge-eating, concocting behavior would be directly linked to level of dietary restraint. This hypothesis was borne of the numerous descriptions of bizarre food mixtures or “concoctions” documented in the famine and semistarvation literature. In testing the famine hypothesis, we also considered the possibility that concocting might occur in the absence of any history of or current dietary restraint, a condition that characterizes many with binge-eating disorder (BED).^{1,2} Further, we wished to document the type of ingredients used in concoctions, the motives behind concocting, and, more importantly, the emotions associated with this eating behavior. Last, we created ad hoc eating disorder (ED) groups from a largely student-based population based on ED-related characteristics included in our measures.

This was done for purely exploratory reasons to obtain preliminary predictions as to how concocting might manifest itself in anorexia nervosa (AN), bulimia nervosa (BN), and BED. The importance of studying concocting is that it may be a unique feature of binge eating vs. non-binge overeating, and, if tied to increased secrecy, shame, and negative effect, could exacerbate EDs where binge-eating is characteristic and possibly slow their treatment. The more aware we are of the various behaviors that constitute aberrant eating patterns, the better equipped we are to treat them.^{3,4} This was a self-report study, and we defined the term “secretive food concocting” as making strange or bizarre mixtures of foods or food ingredients that one would be too embarrassed or ashamed to make in the presence of others. It is surprising that while other secretive behaviors that characterize EDs (e.g., hiding, hoarding, bingeing, and purging) have been empirically investigated, codified, and included in diagnostic instruments,^{5–10} food concocting has not. Awareness of symptoms described in victims of famine and semistarvation have elucidated some of the pathophysiology and psychopathology of EDs, mainly of AN and BN.^{11–14} Perhaps, food concocting can add to the understanding of these disorders, and to that of BED as well given its exploratory context in binge eating.

Historical accounts of concocting are rife in victims, refugees, and prisoners of war in natural or wartime famine. They have been described as making nauseating and poisonous concoctions of weeds, bark, clay, and manure; grinding acorns and weeds to mix with grain and chaff^{15,16}; eating hard woody roots soaked and swallowed in a green mush substance of pounded leaves, banana skins and mango pits¹⁷; mixing glycerin or Arctic willow with hot water^{16,18}; making watery stews from dirty potatoes and vegetables or with grits and stones^{19,20}; pounding cattle hide into a glue-like substance²¹; mixing old shoes in with shreds of burnt deer skin and bones^{16,22}; thickening soup by mixing sawdust into it^{16,23}; or even when food was more available, thickening food with flour or oatmeal.²⁴ Clearly, extreme hunger and the uncontrolled unavailability of food motivated the creative mixing of food and non-food substances in these individuals. Concocting was a means of survival. However, concocting has also been observed in experimental or “controlled” semistarvation studies, where survival was not a factor.

In the landmark Minnesota semistarvation study,¹⁶ Keys and colleagues observed that during the food-restriction phase, some of the participants made “weird and distasteful concoctions.”²⁵ They would over spice and “soup up food.” More compelling, the “creation of mixtures and concoctions” persisted into the 12-week-long rehabilitation period.²⁵ This was a time when food was abundant, precluding inanition as a motive. Even after this rehabilitation phase, volunteers continued in “their habits of making concoctions and combinations which could only be described as fantastic.”²⁵ This occurred amidst overeating or “gorging on prodigious quantities of food which approximated 6,000–7,000 cal/d.”²⁵ Hence, concocting occurred during what today would be regarded as binge-eating. Unfortunately, the composition of the concoctions by the study volunteers were described only in vague terms, e.g., “the free choice of ingredients stimulated creative and experimental messing with food,”²⁵ and a volunteer was described as “making fancy sandwiches or mixing food at the Student Union Cafeteria.”¹⁶

Specific to EDs, it is surprising that concocting has not been investigated systematically despite its mention in descriptions of ED patients. Although few of these reports exist, they were provided by individuals regarded as pioneers in the ED field. For example, Hilde Bruch wrote, “as observed during severe food shortages ... (when people) ... make weird and distasteful concoctions ... the same is observed in anorexic girls who may drink vinegar, or put enormous amounts of mustard on their one lettuce leaf.”²⁶ In patients with BN, Gerald Russell noted the “rapid and grotesque nature of binges,”²⁷ and Abraham and Beumont published graphic descriptions of intakes that resembled that of starvation victims, including the eating of inappropriate, frozen, spoiled, or trash-extracted food during binges.²⁸ However, concocting was not specifically mentioned among these descriptions of binges.

Albeit unscientific, it should be noted that the most abundant and graphic evidence of food concocting in EDs can be found on the internet. These are mainly reported in chat sites managed by ED-awareness organizations or as secondary sources of print media. For example, a reporter covering the story of a patient who died from BN described that “she would prepare strange concoctions to eat, such as pretzels covered with butter spray, mayonnaise and salsa then microwaved” (story of Kristi Hoffman by L. Schuetz; <http://www.highbeam.com/doc/1G1-114268140.html>). Personal posts on ED-related websites attest to the making of “strange food combinations” (<http://www.eda.org.au/disorders.html>); or “weird food concoctions”; “in secret ... frantically throwing stuff together.” Another contributor wrote, “I can be full and still eat while standing up and concoct. I know it is bad putting cinnamon and sugar on taco shells ...” Another routinely made “philly cheese spread, vegemite, and banana sandwiches” (<http://fish-yvb.something-fishy.org/show-thread.php?t=172309>).

Some of the authors of this article were prompted by such descriptions of chaotic or odd eating behaviors, particularly those elicited during semistarvation, to investigate their presence in modern-day populations. A small-sample study in students revealed that frequency of dieting, more than binge-eating (based on a sum of DSM criteria for BED), predicted the frequency of secretive food concocting.²⁹ However, dieting was measured with only one Likert-response question. In a second study using clients with BED, the Dutch Eating Behavior Questionnaire-Restraint scale (DEBQ-R³⁰) was used to measure dietary

restraint. Concocting and several other chaotic eating habits were more prevalent in BED than in healthy controls, were associated with greater dietary restraint, and with binges that were specifically triggered by negative emotions.³¹ In this particular group of individuals with BED, DEBQ-R scores did not differ from controls' so primary effects of dieting on concocting could not be ruled out. In these studies, concocting was not the primary focus of the studies, it was not studied to the depth that the present study did, and questions remained as to the role of dietary restraint in this particular behavior. Hence, this is the first study to fully and systematically investigate food concocting.

Taken together, the experimental semistarvation accounts of concocting despite food reavailability, and the few observations of concocting in patients with EDs, support the hypothesis that secretive food concocting is a behavior that may occur with enough frequency to distinguish binge-eating from normative eating. Of course, we expect that the types of foods used to concoct in binge eating and controlled semistarvation studies differ from the more bizarre, including non-food items, that comprised concoctions in famine victims. Nonetheless, the act of frantically mixing together atypical ingredients (i.e., concocting) is posited to be shared by these groups because of their common factor, caloric restriction. Hence, we further hypothesized that the degree to which concocting was practiced among those with binge eating would be directly linked to dietary restraint. These hypotheses were tested and in so doing also assessed the more important question concerning the effect of concocting on well being. The study was conducted on a large and ethnically diverse college student population which was expected to range widely in personal eating and dieting habits. We also intentionally included a population of clients seeking treatment for binge eating to assure that this eating pattern would be represented in the sample. From the collective sample we were able to create ad hoc "ED groups" to inform future clinical studies and provide predictions concerning the potential distribution and importance of concocting to clinical populations.

Method

Participants

A total of $N = 552$ participants were surveyed. They included college students from Introduction to Psychology classes at the University of Alabama at Birmingham and at the University of Texas at El Paso. The inclusion of UT El Paso participants provided an almost equal number of Hispanic and non-Hispanic participants in the total sample. To assure the inclusion of individuals with binge-eating patterns, $N = 45$ of the participants were clients seeking outpatient treatment for compulsive overeating and/or binge-eating issues from the Acoria Eating Disorder Treatment Center in Cincinnati, OH. Of the entire sample, 74% were female and 26% male. Ages ranged from 17 to 68 years ($M = 25.4$, $SD = 9.9$) and self-identified ethnic descent was 45.5% non-Hispanic White, 40% Hispanic, 10% African American, 2% Asian, 2% Native American, and 0.5% identifying as "other."

Self-Report Measures

Concocting Frequency and Concocting Salience Scores—Food concocting was assessed with a 22-item Food Concocting Survey developed for this study (see Appendix A).

Sixteen of the items required a 5-point Likert-type response from “never (0)” to “always (4).” Concocting was defined for the participant as “making strange food mixtures that you would be too ashamed or embarrassed to make in front of others.” The negative connotation was designed to preclude confusion with the act of making strange food mixtures out of a dare, for fun, or simple experimentation while cooking. The instructions also specified participants to think of times they had concocted during a binge and, “if unfamiliar with the term binge, to think of times they concocted while overeating” (see Appendix A). This terminology was used in order to assess the occurrence of concocting in individuals with non-binge eating patterns as well as in individuals with binge-eating patterns. These instructions also allowed for a subjective interpretation of binge eating. During completion of the Food Concocting Survey, if participants marked a response other than “never” to the first question they were instructed to continue answering the subsequent questions. These included Likert-type items asking how frequently the concoctions included various ingredients or food types, e.g., sugar, condiments, milk, butter, cereals, chocolate, cheese, peanut butter, salty snacks, among others. They were then asked to select among various reasons given why they concocted and were asked to write-in any motivations not listed. Additional write-in items asked for other ingredients used that were not on the survey, for examples of personal concoctions, and for emotions experienced while making and after eating the concoctions (see Appendix A).

The following variables were created for the analyses: (1) a concocting (C) vs. no-concocting (no-C) group. These groups were created based on a “never” or anything except “never” response to the first question on the survey regarding how often they had ever concocted. Anyone responding “never” was placed into the no-C group; and a “rarely” to “often” response placed participants in the C group; (2) a concocting frequency score. This was a score also based on this first question of the survey and could range from 0 (for a “never” response) to 4 (an “always” response); and (3) a concocting salience score. This score was calculated from the sum values of the fifteen 5-point Likert-type items (valued 0–4) regarding the frequency with which various ingredients or food types were used in the concoctions. Therefore this score could range from 0 to 60. This score was meant to capture the prominence or “salience” of concocting during binges (or overeating if so interpreted). The internal consistency of the Food Concocting Survey (Appendix A) was adequate (Cronbach’s $\alpha = 0.86$) using the 15 food type items and responses only from the C group to avoid alpha inflation due to the “never” responses across all of these items by the no-C group.

Binge Criteria Score—The Food Concocting Survey instructed participants to think of concocting while binge eating or overeating. However, to also obtain a brief assessment of binge-eating status, we included a yes/no-response survey to questions representing 10 DSM-IV criteria for BED⁵ (see Appendix B). After coding for reversed items, a sum of the endorsed criteria comprised a “binge criteria score,” which could range from 0 to 10. Here too, participants were instructed to think of times they “binged” or, if not familiar with the term “binged,” of times they had “overeaten.” An additional yes/no question was added to this criteria list asking participants if they had ever vomited, fasted, used laxatives, diuretics or excessive exercise after binge-eating (item #11 in Appendix B). This allowed us to cross-

check participants that reported suspicion or prior diagnosis of BN for the ad hoc ED groups analyses (described below). The internal consistency of the 10 items used for the binge criteria score (Appendix B) was adequate (Cronbach's $\alpha = 0.75$).

Dieting Measures—Two indicators of experience with dieting behavior were obtained including: (1) a DEBQ-R score. Higher scores on this 10-item, 5-point Likert questionnaire (values ranging from 1 to 5) are indicative of cognitive restraint over one's eating and with successful dieting (that resulting in weight loss).^{30,32,33} Hence scores could range from 5 to 50; (2) a Past Dieting score. As the DEBQ items are phrased in the present tense, we added to the end of the DEBQ items, the question, "how often have you dieted in the past?" which, like the DEBQ, required a 5-point Likert-type frequency response coded 1 for "never" to 5 for "very often." Hence this score could range from 1 to 5. The internal consistency of the DEBQ-R in this sample of participants was high (Cronbach's $\alpha = 0.94$).

Demographic Information and Creation of ad hoc Eating Disorder (ED) Groups

—A separate set of questions gathered information on sex, age, and ethnicity. There were also three yes/no questions pertaining to ED status: (1) "Has a physician, therapist, or psychologist ever diagnosed you with an eating disorder?"; (2) "Are you currently being treated for an eating disorder?"; and (3) "If never diagnosed with an eating disorder, do you suspect that you have an eating disorder?" For any question affirmed, they were asked to write in the specific ED. On the same sheet was a brief description of AN, BN, and BED from the DSM-IV.⁵ These responses were used in aggregate with participants' scores on the DEBQ-R, the binge criteria score, and the purging/compensatory criterion to assign them into the exploratory ED groups. Given the high incidence of EDs in college populations,³⁴ it was not unreasonable to expect that some students had experience with an ED or met subclinical criteria for an ED. The client participants from Acoria were expected to report BED and did, with some reporting BN. For classification into the AN group, anyone marking suspicion/ diagnosis of AN had to also have a higher DEBQ-R score than the mean DEBQ score of the noED group (defined below). For BN group classification, a report of suspicion/diagnosis of BN had to coincide with a higher than noED mean score on the DEBQ-R, binge criteria score, and purging criterion. For BED group classification, report of suspicion/diagnosis of BED had to coincide with a higher than noED mean binge criteria score. The entire sample was used for ED group classification, despite concocting status, due to the possibility that there could be participants with ED traits that never concocted. The noED group was comprised of participants that marked "no" to suspecting or ever having been diagnosed with an ED. There was no consideration of these individuals' DEBQ-R or binge criteria scores or purging status in assigning them to the noED group. Their group means on these measures served as the control values against which the other ED group classification criteria were compared. As detailed below, their mean values on these measures were consistent with values expected of noneating disordered individuals and were significantly lower than the created ad hoc ED groups' means.

Procedures

After giving signed consent, participants completed the described surveys either alone in an office suite (for clients) or in a quiet classroom setting (for students). They were then

debriefed more fully on the purpose of the study. All materials used were approved by the Institutional Review Boards of the University of Alabama at Birmingham and the University of Texas at El Paso. All the authors declare no conflicts of interest.

Statistical Analyses

Separate MANOVAs were used to determine differences between the C vs. no-C group, and among the exploratory ED groups on the various concocting, dieting, and binge-eating measures, and between sex and ethnic groups on the frequency of various ingredients used in concocting. Tukey HSD post-hoc tests were used to determine differences on multi-group main effects. Chi-square tests (χ^2) assessed for differential distribution of the purging endorsement, demographic variables, and ED groups across the two concocting groups (C vs. no-C group). Detailed analyses conducted in the C-group included two-tailed bivariate correlations using Pearson's r to determine associations between binge-eating, dieting, and concocting measures. Multiple linear regressions tested for variables that predicted concocting frequency scores and concocting salience scores. For all tests, α was set at 0.05 for significance. Results are reported as means (M) and standard deviations (number in parenthesis) or standard error of the mean as $\pm$ SEM where noted.

Results

Prevalence and Demographic Distribution of Concocting

As listed in Table 1, 24.6% of the total number of participants reported concocting while binge eating (or overeating for those that could not relate to binge eating). In those that concocted (the C group), the mean concocting frequency score (based on responses to the first question) was 2.66 (0.81), hence between “sometimes” and “often.” The mean concocting salience score was 33.32 (9.9) with a range of 1–58. These scores did not differ statistically between men and women, or among ethnic groups. Also as shown in Table 1, the C group was somewhat older than the no-C group, but the prevalence of concocting did not discriminate for sex ($\chi^2 = 4.0$, ns) or ethnicity ($\chi^2 = 22.7$, ns).

Differences Between the Concocting and No-Concocting Groups on Binge-Eating and Dieting Measures

As also noted in Table 1, the C group had significantly elevated scores on all of the dieting and binge-eating measures ($p < .001$). The C group had higher DEBQ-R scores, had dieted more in the past, had increased binge criteria scores, contained more participants who reported suspecting or having been diagnosed with an ED (all $p < .001$ vs. no-C group) and more participants who endorsed the purging/compensatory behaviors criterion ($\chi^2 = 37.9$, $p < .001$).

Relationship between Frequency of Concocting with Binge-Eating and Dieting Scores

Although the no-C group reported a frequency of “never” concocting, it was used as part of a continuous score (0–4) in bivariate correlation tests with binge-eating and dieting scores. Frequency of concocting was found to be significantly related to binge criteria scores ($r = .33$), DEBQ-R scores ($r = .20$), and frequency of past dieting ($r = .24$); all $p < .01$.

Characteristics of Concocting

To gain a better quantitative and qualitative understanding of secretive food concocting, only those participants who reported concocting (the C-group) were included in the following analyses and subsequent results.

Correlates and Predictors of Concocting—As expected and shown in Table 2, higher dietary restraint (DEBQ-R scores) was associated with higher frequency of past dieting. These dieting measures were also each strongly associated with binge criteria scores (i.e., a higher number of BED criteria endorsed). Additionally, the two measures of concocting (frequency and saliency), were also associated with each other as expected. More importantly, the frequency of concocting (based on responses to the first question of the Concocting Survey) was associated only with elevated DEBQ-R scores. Saliency of concocting (based on the frequency of using among 15 types of ingredients of foods to concoct) was not only associated with DEBQ-scores but also with greater frequency of past dieting and with higher binge criteria scores. As shown in Table 3, regression analyses used to assess the influence of the binge and dieting variables on concocting measures revealed that only higher DEBQ-R scores accounted for unique variance in concocting frequency and saliency.

Physical Composition of Concoctions—Among those that concocted (the C group), the items, “chocolate” and “sugar/sweeteners” were most often used in concoctions, $M = 2.63$ (1.2) and 2.57 (1.2), respectively. A MANOVA also revealed that non-Hispanic Whites compared to Hispanics used more sugar/sweeteners, $M = 3.03$ (1.3) vs. 1.82 (0.9); $p < .001$; butter/oil/margarine, $M = 2.24$ (1.1) vs. 1.8 (0.9); $p < .05$; and refined flour items, $M = 2.69$ (1.1) vs. 2.12 (1.1); $p < .05$, while concocting. These pertain to items #1, 5, and 7, of the Concocting Survey, respectively (see Appendix A). Unfortunately, the much lower number of C-group participants representing the other ethnicities ($N = 3-6$ per group) precluded a valid comparison against the two larger non-Hispanic White ($N = 70$) and Hispanic ($N = 51$) groups. However, despite the difference in items used to concoct between the two largest ethnic groups, an ANOVA revealed that their concocting frequency and concocting saliency scores did not differ.

Participants that reported concocting were also able to write-in any other ingredient or food they used in concocting that was not listed. These are not listed here but most are included in the examples of personal concoctions that were volunteered (see Table 4). A glance at these descriptions attests to the very common use of certain ingredients such as peanut butter and chocolate. These were not rated as frequently used as sugar when presented as single items on the survey, perhaps because sugar, as an ingredient, could be contained in many more foods than in just chocolate or peanut butter. Concerning conditions under which the C group concocted, (item #19 of Appendix A) most chose that they concocted only when there were no other appealing foods available (65%) vs. preferring to concoct even when there were other appealing foods available (24%). The remaining 11% did not mark any of these choices.

As to what factors most motivated concocting behavior in the C group (item #20 in Appendix A), the majority reported that it was having a craving (41.2%), followed by there being nothing else to eat (19.9%), then boredom (12.5%). Hunger was the least endorsed motive (9%). A total of 11.8% did not mark any of the motives offered and 5.9% marked “other.” These other motives included stress, anger, loneliness, a desire to eat faster, or curiosity. Participants were also asked to write-in any emotions experienced while making these concoctions and after eating them (items #21–22 in Appendix A). It should be kept in mind that they were instructed to think of concocting as making strange mixtures “that they would be too ashamed or embarrassed to make in front of others.” Of the 136 participants comprising the C group, as many as $N = 108$ offered write-in responses. The vast majority reported emotions associated with arousal or learning/incentive processes that have been associated with drug use,⁵ e.g., ‘excited,’ and ‘anxious,’ which are also the most commonly reported emotions while making concoctions (see Table 5). Only a minority ($N = 12$) reported positive emotions that included “curious” or “good” while making concoctions, and “satisfied,” “fine,” and “good” after eating the concoctions. Interestingly, later analyses revealed that of the positive responders, most ($N = 8$) had been classified in the noED group (described below). Emotions after eating the concoctions were overwhelmingly self-deprecating or depressive (e.g., disgust, guilt, depressed, angry).

Concocting in Exploratory Ad Hoc Eating Disorder (ED) Groups

As shown in Table 6, the percent of participants representing each group is inflated compared to the actual clinical prevalence of these EDs.⁵ However, they were formed purely for exploratory reasons, and the ED groups were characterized with significantly more ED-traits than participants comprising the noED group. For example, the significantly higher dieting, binge-eating, and purging values of the ED groups compared to the control noED group are consistent with those that characterize clinical EDs⁵ (refer to Table 6). Our BED group would be considered a high dietary restraint group of BED given their greater than noED group DEBQ-R scores. Our AN group would be more representative of the “binge-eating/purging type” of AN given their higher than noED group binge criteria scores.⁵ It was not feasible to take height and weight measures to increase verification of AN status nor did we obtain them via self-report due to a tendency for self-report inaccuracy.³⁵ Surprisingly, there were as many participants in the noED group that endorsed the purging or compensatory behaviors criterion as the BN group. Admittedly, purging was measured with only one yes/no item but this may also be explained by the inclusion of “excessive exercising” in the purging criterion which may have been regarded as normative by participants in the noED group.³⁶ The ED groups, in contrast, would be expected to interpret this criterion with its intended definition of aberrant behavior. It appears they did since the purging criterion differentiated the BN from the AN and BED group, as expected.⁵ Lastly, ethnic representation varied among the ED groups ($\chi^2 = 113.4$, $p < .001$) with more non-Hispanic Whites comprising all ED groups.

Regarding concocting, a higher proportion of participants in all of the ED groups concocted compared to the noED group ($\chi^2 = 50.4$, $p < .01$, see Fig. 1A). In addition, all of the ED groups had higher mean concocting salience scores than the noED group (AN: 18.6 ± 4.0 ; BN: 17.1 ± 3.0 ; BED: 13.4 ± 1.6 vs. noED group: 4.9 ± 0.6 ; $p < .001$; shown in Fig. 1B).

Important to our “famine hypothesis of concocting,” the pattern of increasing concocting scores per ED group: AN >BN >BED >noED ($p < .001$ all EDs vs. noED group), paralleled that of dietary restraint scores for these groups: AN >BN >BED >noED ($p < .001$ AN and BN vs. noED and $p < .001$ BED vs. noED).

The ingredient or food item most strongly correlated with concocting scores in the noED group was salty snacks ($r = .76, p < .001$); in the AN group it was cheese ($r = .85, p < .001$); in the BN group it was refined flours (which included cereal, bread, rolls, and tortillas; $r = .92, p < .001$); and in the BED group it was sugar or other sweeteners ($r = .70, p < .001$). For all groups, having a craving was the most common motivation and hunger the least common motivation cited for concocting. The write-in nature of our emotional measures precluded detailed quantitative results per ED group. However, of $N = 136$ participants that concocted, $N = 108$ reported high-arousal emotions while making and after eating the concoctions. Of these, $N = 96$ were classified into an ED group vs. only four into the noED group. Hence, significantly more participants in an ED group reported negative emotions surrounding concocting behavior than did participants in the noED group ($\chi^2 = 52.4, p < .001$). Finally, no significant differences in any of the results reported above were found between client participants and student participants that comprised the BED group. Hence, results in this sample are not likely to be explained by uncontrolled treatment or treatment-seeking factors.

Discussion

This study is the first to investigate in a quantitative and systematically qualitative manner, the prevalence, distribution, correlates, motives, and consequences of secretive food concocting. We tested a “famine hypothesis of concocting” which posited that secretive and shame-ridden food concocting would be a distinguishing feature of binge-eating and that, in binge eating, would occur as a direct function of dietary restraint. This hypothesis was supported.

First, although secretive food concocting was reported by as many as 25% of the sample, it was strongly associated with binge-eating criteria. Hence, even though participants were free to consider engaging in secretive concocting in the context of overeating if they could not relate to binge eating, those higher in binge-eating traits experienced concocting more frequently and saliently. In this way, concocting appears to be a feature characteristic of binge eating vs. other forms of overeating. Recently, of all the indicators for impaired control proposed for BED, “eating alone out of embarrassment by how much one is eating”⁵ was found to be the best inclusion criteria and was one of the two best overall indicators for correctly identifying binge-eating.³⁷ Hence, the fact that this criterion most closely embodies the definition of secretive food concocting, supports concocting as a unique feature of binge-eating vs. other types of overeating.

Second, although both dieting and binge-eating were related to whether one would ever concoct, it was dietary restraint, as indicated by high DEBQ-R scores, that uniquely (above and beyond any shared variance with binge-eating) accounted for the pervasiveness (i.e., frequency and saliency) of concocting. This is consistent with the common occurrence of concocting in victims of famine and experimental semistarvation that spurred our “famine

hypothesis of concocting.” The more grotesque and bizarre types of food and non-food items used by victims of famine was surely a function of widespread food scarcity, extreme hunger, and general inanition. However, the observation that this survival-rooted behavior was reported here, in participants living amidst plenty of food availability, and who did not report hunger as a motivation to concoct, speaks to the severe dieting practices among those who binge eat and this, among a non-patient sample. To be clear, concocting in famine vs. modern-day binge eating involved different foods and motivations but it is the experience with caloric restriction, common in both situations albeit to very different degrees, that significantly accounts for this behavior.

A major difference between victims of famine and the present participants with binge-eating traits is that unlike the life preserving function of concocting in victims, in binge-eating concocting seems to negatively impact life. Emotions reported while making the strange mixtures are those associated with the “loss of control” that characterizes binge eating and drug use.⁵ The high intensity and negative valence of these emotions (e.g., excitement, anxiety, panic, fear, desperation, depression, guilt) mirror classic symptoms associated with drug use and withdrawal.⁵ This is not a far reaching parallel as patients with BN have reported physical symptoms of drug-like withdrawal that are only alleviated by binge eating.²⁸ The emotions reported after eating the strange mixtures were more intensely negative, self-deprecating, and disparaging (e.g., depression, disgust, and guilt). Given the known power of such negative cognitions and emotions to maintain and exacerbate binge eating,^{38–40} concocting, despite being conducted in secrecy, may worsen the binge-dieting cycle, possibly because of its secrecy.^{10,41}

In seeming contradiction to our “famine hypothesis,” it was craving, not hunger, that most commonly motivated concocting. Even when analyzed per ED group, the higher food-restricting AN and BN participants reported craving over any other motivation. However, it is interesting that specific food cravings were also a very common and stubborn complaint of victims recovering from semistarvation.^{16,42} Specifically, the desire for sweets, including chocolate, was observed universally among repatriated POWs and among men in controlled semistarvation studies.^{16,25,42} In this study too, chocolate and the sugar/ other sweeteners items were the most commonly reported ingredients used in concoctions. Also, the vast majority of the write-in descriptions (Table 4) included sweet foods. A previous study found that cravings of AN and BN patients were associated more with a sense of lack of control over eating than with dietary restraint.⁴³ Hence, the craving that drives concocting may be a specific behavioral manifestation of the lack of control criteria of binge-eating.^{5,37} This is supported by the feelings reported while making concoctions and the finding that its frequency was most strongly associated with the DSM-IV “loss of control” criterion. It would be interesting to study the incidence and nature of secretive food concocting among children who eat in the absence of hunger, in secrecy, or in response to emotions.⁴⁴ Concocting in children could serve as an objective indicator of the “sense of lack of control” criterion which can be challenging to measure in this population.

A strength of this study is its ethnically heterogeneous sample, namely the almost matched number of Hispanic to non-Hispanic Whites. It is alone significant that no major differences in the concocting parameters were found between these groups. However, the one difference

is worth discussion. Of all the 15 ingredients listed in the Food Concocting Survey, non-Hispanic Whites used sugar, fats, and refined flour significantly more often in concocting than did the Hispanic group. Many of the Hispanic students attending UT El Paso, which is located less than 3 miles from the US-Mexican border, are first-generation degree seekers and have a relatively lower degree of acculturation to the United States than non-Hispanic Whites. Their lower use of sugar, fats, and refined flour items in concocting may coincide with a slower adaptation to the super-hedonic American diet. It is super-hedonic due to the high content of exactly these three ingredients which have also been targeted as contributors of obesity and proposed “food addiction.”^{45–48} While fats and refined flour and sugars clearly contribute to secretive food concocting, they cannot be blamed for it because the concocting frequency and concocting salience scores between Hispanic and non-Hispanic Whites did not differ.

Together, craving as the main motivator, the more common use of highly hedonic ingredients (vs. fruit, meat, or vegetables), and the fact that most participants chose to concoct when there were no other appealing foods available, suggests that concocting may be a mechanism of either enhancing the reward of binges or of satisfying a craving when unable to obtain the craved food. In the characteristic frenzied nature of binge eating,^{5,28} one is not likely to stop midstream to board a vehicle and go shopping for the craved item. A parallel to the unavailability of food in victims of famine or in Keys’ food-restricted volunteers is not far-fetched when considering the degree of voluntary restraint exercised by many who binge-eat when they avoid high-calorie or “forbidden” foods.^{5,27,49,50}

To this, it is interesting to note that the foods accounting for most of the variance in concocting in the ad hoc AN group was cheese. Cheese may be craved for its fat content, a particular macronutrient that AN patients tend to fear and avoid.^{51,52} For the BN group it was refined flour items. Although also caloric, refined flours add bulk to food, which is consistent with the bulimic tendency for food quantity over food quality.^{5,27} In BED, the most commonly used concocting ingredient was sugar. In BED, especially in women with BED who comprised the majority of our BED group, the use of sugar is consistent with the abnormally elevated craving and intake of highly hedonic foods, even compared to obese individuals without BED.^{51,53,54} Hence, the composition of concoctions can hint at underlying motives that are more specific than simply craving a particular food. There may be valuable implications in knowing what individuals with specific EDs use to concoct (e.g., to aid patients in identifying trigger foods likely to initiate concocting, to initiate a binge episode, and/or enlarge the size of a binge).

To our knowledge, this was the first study to systematically investigate food concocting and food concocting in the context of binge-eating. In this regard, it is also preliminary and with limitations. Future studies can improve on this first one by: (1) recruiting clinical populations to verify the predictions made here with the ad hoc ED groups and by utilizing clinical questionnaires to assess binge-eating status; (2) improving the qualitative analysis of concocting by itemizing presently grouped ingredients or food items into single items; (3) using mood scales or other quantitative methods of measuring emotions, especially assessments of emotions reported here, e.g., depression scales; and (4) being sensitive to the possibility that participants with high social fear may be more likely to report concocting

since it is being defined as shameful or embarrassing compared to participants with no social fear.

Despite these limitations we believe that the results have valuable implications for the understanding of the mechanisms that underlie binge-eating and for treating binge-eating disorders. To the ED literature, we have provided some quantifiable evidence for a behavior that was previously described only anecdotally. We predict that the intensely negative and self-deprecating emotions linked to concocting in the present population are likely to be substantively worse and to carry graver consequences in clinical populations. Hence, concocting may be worth assessing and monitoring in these populations. In doing so, it may also be worth testing the independent influence of ED-comorbid anxiety and depression on concocting and the emotions associated with concocting, especially at the moment they are occurring (such as with experience sampling methods). Nonetheless, we do not expect these comorbid conditions to account for all the variance in concocting since binge-eating and concocting were still correlated in the ad hoc noED group. Behavioral treatments with sustained efficacy are needed for binge-eating disorders.^{6,55–57} In addition, any therapies to be translated from genetic research hinge on how well we can phenotype, including behaviorally phenotype, newly discovered variants.^{45,58} Assessment of concocting in patients may speed recovery by serving as an indicator of persistent dieting that is a common relapse trigger,^{59,60} and by helping to break through the wall of secrecy and shame that plague so many with binge-eating disorders.^{10,28,41,55} Hippocrates advised, “Let food be thy medicine . . .”⁶¹ We would add that food and feeding must first be free of any association with shame for it to heal.

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APPENDIX A: Food Concocting Survey

Instructions: Here, the word “concocting” refers to making strange food mixtures that you would be too ashamed or embarrassed to make in front of others. Think of times you have concocted during a binge. If you are not familiar with the term “binge”, think of times you may have concocted while overeating. Please circle the one best answer.

1.	<u>How often have you made strange mixtures of foods or “concoctions” that you would be too embarrassed to make in front of others?</u>				
	Never	Rarely	Sometimes	Often	Always
	<u>If you marked anything other than “never” please continue with the following questions.</u>				
2.	How often have the strange food mixtures contained sugar or other sweeteners (e.g., saccharine, nutrasweet, honey, syrup)?				
	Never	Rarely	Sometimes	Often	Always
3.	How often have the strange mixtures contained condiments (e.g., salsa, hot sauce, ketchup, mustard, mayonnaise, BBQ sauce, or salad dressings)?				
	Never	Rarely	Sometimes	Often	Always
4.	How often have the strange mixtures contained milk or cream?				
	Never	Rarely	Sometimes	Often	Always
5.	How often have the strange mixtures contained butter (or other oils or margarines)?				
	Never	Rarely	Sometimes	Often	Always
6.	How often have the strange mixtures contained dry food (milk powders, pancake mix, cake mix)?				
	Never	Rarely	Sometimes	Often	Always
7.	How often have the strange mixtures contained cereals (hot or cold), bread, rolls, or tortillas?				
	Never	Rarely	Sometimes	Often	Always
8.	How often have the strange mixtures contained chocolate (chocolate bars, chips, or chocolate syrup)?				
	Never	Rarely	Sometimes	Often	Always
9.	How often have the strange mixtures contained ice cream or pudding or yogurt?				
	Never	Rarely	Sometimes	Often	Always
10.	How often have the strange mixtures contained cheese (any kind, solid, melted, or creamed)?				
	Never	Rarely	Sometimes	Often	Always
11.	How often have the strange mixtures contained peanut butter?				
	Never	Rarely	Sometimes	Often	Always
12.	How often have the strange mixtures contained meats (including processed lunch meats, salami, ham, hotdogs or hamburger)?				
	Never	Rarely	Sometimes	Often	Always
13.	How often have the strange mixtures contained vegetables?				
	Never	Rarely	Sometimes	Often	Always

14. How often have the mixtures contained salty snacks (tostadas, chips, popcorn, nuts)?
Never	Rarely	Sometimes	Often	Always
15. How often have the strange mixtures contained fruit (any kind including dried, fresh, canned)?
Never	Rarely	Sometimes	Often	Always
16. How often have the strange mixtures contained cake frosting or whipped cream?
Never	Rarely	Sometimes	Often	Always
17. What other ingredients, not mentioned above, have you used to make strange mixtures?
Please list: _____
18. Please describe in as much detail as possible some of made during a binge or overeating: the mixtures that you, personally, have made during a binge or overeating: _____
19. Circle A or B:
- A. You make strange food mixtures only when there are no other appealing foods available.
- B. You prefer to make strange food mixtures even if there are other appealing foods available.
20. What most motivates you to make these mixtures of food? Circle ONLY ONE:
boredom	hunger	nothing else to eat	craving	other (if "other", what? _____)
21. While you are making these food mixtures, what are you feeling (emotionally) at that moment?

22. How do you feel (emotionally) after eating these mixtures?

APPENDIX B DSM-IV Binge-Eating Criteria Questions Used to Determine the Binge Criteria Score*

Instructions: Throughout this questionnaire you will be asked to recall times when you have binged. If you are not familiar with the term "binge" or "binge-eating," please think of a time you have overeaten.

PLEASE CIRCLE "YES" OR "NO" TO THE FOLLOWING QUESTIONS:

1. When you binge, does it take longer than 2 hours?	YES	NO
2. When you binge, is the amount of food definitely larger than most people would eat in a similar period of time and <u>under similar circumstances</u> ?	YES	NO
3. While bingeing do you eat at a leisurely pace?	YES	NO
4. While bingeing do you eat until you are uncomfortably full?	YES	NO
5. Do you binge only when you are hungry?	YES	NO
6. Do you binge alone because you're embarrassed by how much you are eating	YES	NO
7. Do you feel disgusted with yourself, depressed, or guilty after overeating?	YES	NO
8. Do you feel distressed (deeply bothered) about binge-eating?	YES	NO
9. Does your binge-eating occur, on average, 2 days a week or more?	YES	NO
10. While bingeing, do you feel that you can easily stop any time you want?	YES	NO
11. After bingeing, do you vomit, fast, use laxatives, diuretics, or exercise excessively?	YES	NO

*Items # 1, 3, 5, and 10 were reverse-coded. Question #11 was added to examine associations between purging behavior and concocting measures and to confirm self-report

of suspected or diagnosed bulimia nervosa. This item was not included in the derivation of the binge criteria score. Items 1–10 are from the DSM-IV Appendix B: Research Criteria for BED.⁵

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FIGURE 1.

Percent of individuals per exploratory ad hoc ED group created from the entire population (concocting and no-concocting participants, $N = 552$); $\chi^2 = 50.4$, $p < .01$. B: Mean concocting salience scores $\pm$ SEM across the exploratory ad hoc ED groups; *** $p < .001$ vs. noED group. AN, BN, and BED scores were not statistically different.

TABLE 1

Characteristics of participants comprising the no-concocting (no-C) vs. concocting (C) group

	No-Concocting	Concocting
Total (N)	416 (75.4%)	136 (24.6%)
Mean frequency of concocting (SD) ^a	0 (0.0)	2.66 (0.8)
Mean concocting score ^a	0 (0.0)	33.3 (9.9)
Sex (N) ^{#b}		
Men	115 (81%)	27 (19 %)
Women	301 (74%)	109 (26 %)
Mean Age (SD) ^b	24.9 (9.7)	26.8 (10.8)
Ethnicity (N) ^{#b}		
Non-Hispanic White	179 (72%)	70 (28%)
Hispanic	168 (77%)	51 (23%)
African American	50 (89%)	6 (11%)
Asian	8 (73%)	3 (27%)
Native American	6 (55%)	5 (45%)
Mean dieting scores (SD)		
DEBQ-R ^a	26.9 (10.0)	31.0 (10.4)
Past dieting frequency ^a	2.8 (1.3)	3.6 (1.3)
Mean disordered eating scores (SD)		
DSM-based binge criteria score ^a	4.8 (2.5)	7.0 (2.5)
Purging/compensatory behavior (yes/no) ^a	0.2 (0.4)	0.3 (0.5)
ED suspected or diagnosed (yes/no) ^a	0.25 (0.4)	0.6 (0.5)

Refer to Methods section for derivation of measures used to assign participants into the C or no-C group. Mean of 0 = “never” (used to assign no-C status), mean of 2.66 = “sometimes” to “often.”

^a $p < .001$;

^b $p < .05$.

[#] The proportion of men and of women and of varying ethnicities classified into the C vs. no-C group was not significant.

TABLE 2

Matrix of bivariate correlation coefficients among concocting, binge-eating, and dieting measures in the sample of participants that concocted (C group)

Measure	1	2	3	4	5
1. Concocting frequency score	—	0.31**	0.09	0.20*	0.10
2. Concocting salience score	0.31**	—	0.22*	0.31**	0.27**
3. Binge criteria scores	0.09	0.22*	—	0.39**	0.54**
4. DEBQ-R scores	0.20*	0.31**	0.39**	—	0.66**
5. Past dieting scores	0.10	0.27**	0.54**	0.66**	—

Refer to Methods for details on the derivation of the measures;

* $p < .05$;

** $p < .01$

significant association between variables.

TABLE 3

Regression model with concocting measures as the dependent variables

<i>Variable</i>	Concocting Frequency			Concocting Saliency		
	β	<i>t</i>	<i>p</i> <	β	<i>t</i>	<i>p</i> <
Constant		8.37	0.001		7.20	0.001
Binge criteria scores	0.06	0.62	ns	0.12	1.22	ns
DEBQ-R scores	0.25	2.17	0.05	0.25	2.22	0.05
Past dieting scores	-0.10	-0.79	ns	0.04	0.35	ns

Concocting frequency model $R^2 = .05$; Concocting saliency model $R^2 = .12$. Only participants in the C-groups were included in the analyses.

TABLE 4

Partial list of descriptions of food concoctions (out of 85 provided) by participants who also reported negative emotions while making, and after consuming, the mixtures

Examples of Sweet Concoctions
A paste of hot chocolate mix, powder coffee creamer or powdered skim milk, and sweetener.
Sugar on scrambled eggs; peanut butter and chocolate chip sandwiches; condensed milk on bread.
Brown sugar, peanut butter, chocolate chips sprinkled into cool whip mixed w/ pudding or jello.
Protein powder mixed with butter and sugar and raisins.
Oatmeal with brown sugar, butter, and Oreo® cookies.
Mix of ice cream, cookies, syrup and canned fruit.
Cream of wheat with flavored coffee creamer, hot cocoa, sugar, butter, and syrup.
Chocolate syrup in raw oatmeal or raw cookie dough with peanut butter.
Flour or Bisquick® with eggs, oil, sugar, cinnamon and milk eaten raw.
Peanuts and raisins in a cup mixed with cereal and honey or syrup.
Examples of Mixed Sweet and Salty Concoctions
Mashed potatoes w/ Oreos®; Oreo® cookies with peanut butter, pickles, and chocolate.
Bananas with peanut butter wrapped in cheddar cheese.
Tortilla chips and peanut butter.
Peanut butter, mayonnaise, banana, and potato chip sandwiches.
Pickles in caramel or caramel w/ chocolate and Oreos®.
French fries in ice cream or Doritos® sandwiches.
Ham and cheese and syrup.
Ice cream and popcorn together.
Ice cream with chocolate bars, cookies, cereal, fruit or crumbs from tortilla chips.
Sandwich of peanut butter, jelly, chips, and pickles.
Example of a Salty Concoction
Chips with lemon, pork rinds, Italian dressing, and salt.
Examples of Non-sweet non-salty Concoctions
Butterbeans, mayo, cornbread and onions mix.
Mayonnaise with cheese, beans, ketchup, and beef.
Chips in grits, potatoes, and milk mixed together.
Cheese with eggs, marinara sauce, pasta and cut-up Slim Jims.
Mix of cream, starches, butter, cheese, vegetable, and meat.
Frozen vegetables mixed with mayo and eaten frozen.

Each line is an example(s) provided by a different participant.

TABLE 5

Emotions reported while creating food concoctions and after eating the concoctions

Emotions While Concocting (N)	Emotions After Eating Concoctions (N)
Excited (10)	Disgust ^a (18)
Depressed (9)	Guilty, extreme guilt (21,1)
Anxious (9)	Depressed, very depressed (12, 2)
Out of control (8)	Angry ^a (10)
Desperate (8)	Ashamed
Nothing (6) ^b	Sad (6)
Guilty (5)	Fat ^c (3)
Numb (4)	Worthless (3)
Lonely (4)	Crazy (3)
Ashamed (4)	Tired (2)
Angry (4)	Lonely (2)
Stressed (3)	Regretful (2)
Panicky (3)	Unsatisfied (2)
Disgust (3)	Dirty (2)
Fearful or afraid (2)	Scared (2)
Frantic (2)	Bad, very bad (1,2)
Bad (1)	Awful (1)
Agitated (1)	Terrible (1)
Sad (1)	Miserable (1)
Discouraged (1)	Disbelief (1)
Uncomfortable (1)	Disappointed (1)
Tired (1)	Numb (1)
Bored (1)	Calmed down (1)
Disappointed (1)	Nothing (1)

N= number of different participants reporting the emotion; some participants reported more than one emotion.

^a A majority of the participants qualified these emotions with the words “at” or “in myself” (e.g., I felt “angry at myself” or “in myself”).

^b It is unclear whether “nothing” was the same as “numb,” a symptom commonly reported in BED⁵ and also reported here.

^c Although not an emotion, it was reported as an emotion.

TABLE 6

Percent of participants classified into exploratory ad hoc eating disorder (ED) groups and differences in ED-related measures used to support the classifications

ED Groups	noED	AN	BN	BED
Number of participants	370	23	44	112
Percent of total sample	67.4%	4.2%	8.0%	20.4%
DEBQ-R scores	25.2 (0.8)	41.0 (5.7) ***	39.1 (7.9) ***	30.1 (7.7) ***
Frequency of past dieting	2.46 (1.2)	4.1 (0.9) ***	4.2 (0.9) ***	4.0 (1.1) ***
Binge criteria score	4.1 (2.0)	6.8 (2.1) ***	8.0 (2.1) ***	8.1 (1.8) ***
Purging (N)	39	15	40	13

Total participants = 549 (three marked “other,” not included). See text for details on the ED classification strategy. DEBQ-R, past dieting, and binge criteria scores are means (SD), *** $p < .001$ vs. noED group; (for DEBQ-R scores: AN = BN > BED, $p < .001$). Purging values are the number of participants endorsing the purge/compensatory behaviors criterion; endorsement was unevenly distributed across ED groups, $\chi^2 = 197.3$, $p < .001$.