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Another Look at Impulsivity: A Meta- Analytic Review Comparing Specific Dispositions to Rash Action in their Relationship to Bulimic Symptoms

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Abstract

Recent advances in personality theory indicate that there are distinct constructs that dispose individuals to rash action and risky behavior, as opposed to one broad trait of impulsivity. Two are emotion based, two represent deficits in conscientiousness, and one is sensation seeking. Previous studies of impulsivity and its relationship to bulimia nervosa have yielded mixed findings. The authors applied this advance in personality theory to the study of bulimia nervosa (BN) to test the hypothesis that the emotion-based disposition of negative urgency (the tendency to act rashly when distressed) relates most strongly to BN symptoms. A meta analysis of 50 articles indicated the following. Negative urgency had by far the largest effect size (weighted $r = .38$), followed by sensation seeking (weighted $r = .16$); lack of planning (weighted $r = .16$) and lack of persistence (weighted $r = .08$). Methodological moderators of the effect of distinct traits on BN symptoms were the use of scales that precisely measured one construct as opposed to general impulsivity scales that measured several constructs, clinical vs. non-clinical samples, and whether or not the personality scale was translated from its original language or not. Negative urgency appears especially important for BN; more broadly, researchers should consider the role of emotion-based dispositions to rash acts in their risk theories.

This paper reports the results of a meta analysis investigating the role of impulsivity in bulimia nervosa, with a focus on recent advances in the field's understanding of the personality basis for rash action. Rash or impulsive actions characterize many different recognized disorders, including binge eating and purging symptoms of eating disorders, substance abuse, borderline personality disorder, antisocial personality disorder, attention-deficit/hyperactivity disorder, as well as the set of impulse-control disorders (intermittent explosive disorder, kleptomania, and pyromania (Whiteside & Lynam, 2001). It is therefore crucial to understand the personality contribution to rash or impulsive actions. This meta analysis contributes to that end by studying the role of impulsivity in relation to one disorder characterized by such actions: bulimia nervosa (BN).

Theoretical Advances in the Study of Personality and Impulsivity

Recent studies indicate that the term impulsivity encompasses a wide range of traits that are only moderately related, rather than a single uni-dimensional personality characteristic (Smith, Fischer, Cyders, Annus, Spillane, & McCarthy, 2007; Whiteside & Lynam, 2001; Cyders & Smith, 2007). First, emotion based dispositions to rash action have been identified. Negative urgency is the tendency to act rashly when experiencing negative mood. More recently, positive urgency, the tendency to act rashly when experiencing extremely positive mood, has been described (Cyders, Smith, Spillane, Fischer, Peterson, & Annus, 2007). Deficits in

conscientiousness include lack of planning, the tendency to act without forethought; and lack of perseverance, a failure to tolerate boredom or remain focused despite distraction. Finally, sensation seeking is described as the tendency to seek out novel or thrilling stimulation. Recent work suggests that these different traits have different concurrent and prospective behavioral correlates, even though they have all been labeled 'impulsivity.' (Breen & Zuckerman, 1999; Grau & Ortet, 1999; Claes et al., 2005; Cyders & Smith, 2007; Cyders, Flory, Rainer, & Smith, 2007; Fischer, Smith, & Anderson, 2003; Miller, Flory, Lynam, & Leukefeld, 2003; Fischer & Smith, 2008; Lynam, Miller, & Smith, 2007; Smith et al., 2007; Whiteside & Lynam, 2001, 2003; Whiteside, Lynam, Miller, & Reynolds, 2005).

Although there is clear evidence that the experience of affect relates to many different risky behaviors and psychiatric diagnoses (Ball, Tennen, Poling, Kramzler, & Rounsaville, 1997; Chambless, Cherney, Caputo, & Rheinstein, 1987; Clark, 2005; Krueger, et al., 1994; Schuckit & Smith, 2006; Trull, 2001), early models of impulsivity tended not to specifically address the contributing role of affect. In fact, theories of dysfunction tend to separate internalizing syndromes (generally involving mood dysfunction) from externalizing syndromes (generally involving maladaptive, risky behaviors) (Achenbach & Edelbrock, 1978; Krueger & Markon, 2006), and leave the substantial intercorrelation between the internalizing dimension and the externalizing dimension largely unexplained. The finding that there are individual differences in the tendency to respond to extreme emotion with rash actions provides a specific description of a process linking affect and risky, maladaptive behaviors.

Trait Theory, Impulsivity, and Distinct Dispositions to Rash Action

Historical descriptions of impulsivity from both temperament and trait perspectives do suggest the presence of multiple dispositions to rash action. While several different personality researchers have presented models of impulsivity, they all have common elements. A construct representing lack of forethought is represented in Buss and Plomin's (1975) model of temperament, Costa & McCrae's (1992) representation of the Five Factor Model of personality, Zuckerman's "alternative five factor model" of personality (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993), Barratt's three factor model of impulsivity (1993), Dickman's model of functional and dysfunctional impulsivity (1990), and Eysenck's two part model of impulsivity (Eysenck & Eysenck, 1985).

Similarly, a construct representing the inability to delay gratification or withstand boredom is represented in several personality models. Inhibitory control and persistence seem to contain elements of this general construct in Buss and Plomin's model (Buss & Plomin, 1975). This construct is also represented in the Five Factor Model of personality (Costa & McCrae, 1992; Goldberg, 1990), and Barratt's model of impulsivity (Barratt, 1985).

Sensation seeking, the tendency to seek out novel and thrilling sensations, is widely acknowledged as a component of impulsivity. It is represented in almost every major model of temperament or personality, including Buss and Plomin's model of temperament (Buss & Plomin, 1975) and the Five Factor model of personality (Costa & McCrae, 1992; Goldberg, 1990), and Cloninger's three part model of temperament (Cloninger, Svrakic, & Przybeck, 1993). Other researchers describe sensation seeking as one aspect of a general non-planning/sensation seeking factor, because of the consistent positive association of thrill seeking with lack of planning (Eysenck & Eysenck, 1985; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

The role of emotion in disposition to rash action has been less consistently defined than the previously described constructs, but is present in several trait models. Gray (1987, 1990) described impulsivity as a combination of Eysenck's (1967) neuroticism and extraversion. Neurotic extraverts are thus thought to experience emotional lability, emotional intensity, and

high rates of impulsive acts (Patterson & Newman, 1993). Watson and Clark (1993) included disinhibition as one of three dimensions in their General Temperament Survey. This disinhibition scale was highly related to the five factor conscientiousness scale and largely unrelated to the Positive Temperament and Negative Temperament dimensions. They also discussed high levels of disinhibition in terms of emotion regulation, so that high disinhibition scores may involve reckless, bold, or perhaps defiant reactions to the experience of intense affect (Watson & Clark, 1993). Costa and McCrae described acting without thinking when upset (which they called impulsiveness) as a facet of Neuroticism (1992).

Based on this body of research, researchers drew three general conclusions. First, there appears to be a personality basis for impulsive action. Second, there are many different conceptualizations of what that personality basis is; and third, many different constructs appear to have been included under the impulsivity umbrella (Barratt, 1993; Depue & Collins, 1999; Evenden, 1999; McCarthy & Smith, 1995; Petry, 2001; Smith et al., 2007; Whiteside & Lynam, 2001; Zuckerman, 1994).

One of the most promising attempts to identify and define the specific constructs embedded within impulsivity research was a factor analysis of many well recognized measures of impulsivity by Whiteside and Lynam (2001). They identified four distinct constructs. One was urgency, now referred to as negative urgency. Scales loading on their urgency factor included Buss and Plomin's inhibitory control, Barratt's attentional impulsiveness, and the impulsiveness facet of neuroticism from the NEO-PI-R. More recently, rash action in response to positive emotion has been identified, and positive and negative urgency form facets of an overall urgency disposition (Cyders & Smith, 2007). The second was lack of planning: scales loading on this factor included a measure of the deliberation facet of conscientiousness from the NEO-PI-R, Dickman's dysfunctional impulsivity, Eysenck's impulsiveness, Barratt's motor and non-planning impulsiveness, and Buss and Plomin's decision time.

The third factor was lack of perseverance: scales loading on this factor measured self-discipline from the conscientiousness factor of the NEO-PI-R and Buss and Plomin's persistence. The fourth was sensation seeking: scales loading on this factor measured excitement seeking from the extraversion factor of the NEO-PI-R, Buss and Plomin's sensation seeking, Dickman's functional impulsivity, and Eysenck's venturesomeness. This factor structure has been confirmed on multiple, independent samples (Lynam & Miller, 2004; Smith et al., 2007).

Personality, Eating Disorders, and the Role of Negative Urgency

The search for personality contributors to eating disorders has suggested the potential importance of both negative emotionality and impulsivity (Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006; Stice, 2002). Negative emotionality or neuroticism seems consistently to be associated with binge purge symptoms (Cassin & von Ranson, 2005; Lilenfeld et al., 2006), whereas the evidence for impulsivity has been less clear. On the one hand, clinicians describe binge eating behavior, and subsequent purging behavior, as apparently impulsive; and bulimic symptoms tend to co-occur with other risky behaviors associated with impulsivity (Lilenfeld et al., 2006). On the other hand, empirical studies of the relation have produced mixed results. In a recent meta analytic review on prospective risk factors for BN, impulsivity had a small (but significant) effect size of .07 (Stice, 2002).

In light of the recent, successful parsing of the impulsivity construct, prior mixed findings are not surprising. Past research was not based on the precise measurement of each of the distinct dispositions that have gone into "impulsivity" measurement. As we address in the meta analysis below, measures of different constructs sometimes had the same name, and some measures included items tapping multiple, different constructs. Without separate, precise measurement of each of the constructs, inconsistent findings seem inevitable.

It is hypothesized that negative urgency, among the impulsivity constructs described above, contributes the most substantially to vulnerability to binge eating. The construct negative urgency provides an integration of negative emotionality and impulsivity in the risk process: perhaps women who respond to their negative affect with rash action constitute the group at greatest risk for bulimic symptomatology. Consistent with this view, both state effects of distress and stable traits such as neuroticism are consistently related to bulimic symptoms (Agras & Telch, 1998; Engel, et al., 2007; Leon, Kell, Klump, & Fulkerson, 1997; Sanftner & Crowther, 1998; Smyth et al., 2007). These cross-sectional, ecological momentary assessment, and longitudinal findings indicate that eating disordered individuals are more likely to experience mood variability and negative mood states, and to binge eat when experiencing those negative states.

Negative urgency has been positively associated with binge eating and purging in several different samples (Anestis, Selby, & Joiner, 2007; Claes, et al., 2005; Fischer et al., 2003; Fischer et al., 2004; Fischer et al., 2007; Fischer & Smith, 2008; Smith et al., 2007). Additionally, change scores on measures of negative urgency over time have predicted changes in symptoms of BN (Anestis, et al., 2007). Evidence suggests that individuals who experience problems with binge eating and purging may experience more negative mood states than others, and may cope with these negative mood states by eating. Perhaps their binge eating behavior is negatively reinforced, because it distracts from the original source of distress and provides short-term positive experience (Fischer et al., 2006; Heatherton & Baumeister, 1991). It is therefore more likely in the future. Indeed, Smyth et al. (2007) found that bulimic women engaged in higher rates of binge eating on days in which they were experiencing intense negative affect, and that after a binge, their negative affect declined and their positive affect increased.

Individual differences in negative urgency may therefore capture an important part of the personality contribution to eating disorders. It seems less likely that there is a similar process by which other dispositions to rash action influence bulimic symptoms. For example, several studies indicate that women with BN score in the normative range on scales measuring acting with forethought (Bushnell, Wells, & Oakley Browne, 1996; Fahy & Eisler, 1993), and lack of planning does not account for significant variance in BN symptoms (Fischer, et al., 2003; Fischer & Smith, 2008). The same is true of lack of persistence (Fischer & Smith, 2008; Smith et al., 2007) and sensation seeking (Claes, Vandereycken, & Vertommen, 2002; Fischer & Smith, 2008). Thus, the goal of this meta analysis is to test the hypothesis that negative urgency is the disposition to rash action most relevant to bulimic symptoms or diagnosis.

Method

Selection of Studies

A literature search was conducted using four different methods. The search covered articles published up to October 2007. First, PsychInfo and Medline databases were examined using several combinations of key words. Key words included all possible combinations of dependent variables of interest: "bulimia, binge eating, binge, eating, and purging;" and personality variables of interest: "impulsivity, sensation seeking, deliberation, urgency, persistence, perseverance, and novelty seeking." Additionally, a search was conducted using all possible combinations of outcome variables and names and corresponding abbreviations of major personality measures assessing impulsivity: "I7 (Eysenck Impulsiveness Questionnaire), NEO FFM, NEO-PI-R, Multidimensional Personality Questionnaire, Temperament and Character Inventory, Barratt Impulsivity Scale, Sensation Seeking Scale, Zuckerman-Kuhlman Personality Questionnaire, and the phrase 'Five Factor Model' ." After these searches, an ancestry search was conducted by examining the reference list of articles included after the computer based examination. An author based search was also conducted by searching the

computer data bases for more articles by leading eating disorder researchers. Finally, the previous ten years of issues of *The International Journal of Eating Disorders*, *Personality and Individual Differences*, and *Journal of Consulting and Clinical Psychology* were reviewed to search for articles that may have been missed in the computer based search.

Criteria for inclusion and exclusion—The following inclusion and exclusion criteria were used. First, studies were included that examined personality characteristics in a clinical group of patients diagnosed with BN *and* a control group of individuals without eating disorder symptoms, or examined the relationship of personality variables to a continuous measure of bulimic symptoms in a heterogeneous sample of individuals with BN and controls. Second, studies were included if they used an impulsivity-related construct that represented a major trait based theory of personality, such as the lexical model (e. g. Goldberg; Costa & McCrae,) or one of the biologically based three factor models of impulsivity (e. g. Cloninger; Eysenck). Studies had to either provide examples of items used in the assessment of personality or utilize a previously validated trait based personality instrument. Third, studies had to clearly define the assessment of BN symptoms through the use of previously validated instruments or descriptions of items used to assess these symptoms. Such instruments included the Eating Disorder Examination, (EDE), the Eating Disorders Inventory –Bulimia Scale (EDI), the Bulimia Test (BULIT or BULIT-R), or the Structured Clinical Interview for DSM-IV (SCID-I). Studies were not used if the authors stated that they assessed BN symptoms but did not provide the measure used.

Previous meta-analytic reviews of possible risk factors for BN have excluded cross sectional studies (Stice, 2002). However, as the specific distinctions among these traits have not previously been explored in a meta-analysis, we included cross-sectional as well as longitudinal data.

Studies were excluded based on the following criteria. Studies were not used for analysis if they compared a patient group with anorexia nervosa (AN) to a patient group with BN *without* a normal control group. A fairly consistent model of personality features in AN has been noted both empirically and anecdotally (Vitousek & Manke, 1994). Researchers tend to agree that patients with AN exhibit a more controlled, less impulsive, personality profile than normal controls and patients with bulimia nervosa. Therefore, we believe that studies that compare individuals with BN and controls will provide more information regarding the role of impulsivity-like traits than studies that compare individuals with AN and BN. The latter comparison may provide exaggerated effect sizes due to the personality differences previously noted. Additionally, studies were excluded if they provided comparisons between different groups of individuals with BN (i. e., BN with and without comorbid substance use disorder) *without* a comparison to a normal control group. Studies were also excluded if the sample of bulimic patients had an *N* of < 10.

Finally, studies were excluded if the authors did not provide a definition of impulsivity as described in the inclusion criteria or if the impulsivity-like scale was a measure of “multi-impulsivity”. Multi –impulsivity has been described as the tendency to engage in multiple ‘impulsive’ behaviors in conjunction with BN, such as para-suicidal behaviors, suicide attempts, risky sex, stealing, shopping, and substance abuse (Lacey, 1993). Measures of this construct often count up the number of other impulsive acts an individual engages in, and so do not provide a measure of a trait-based personality construct. While women with these comorbid problems appear to be a distinct sub-type of individuals with BN (Myers, et al., 2006), any of the traits analyzed in this study could influence the development of these comorbid behaviors. For example, sensation seeking could be related to both bulimic symptoms and substance abuse. Therefore, one cannot determine which trait contributes to symptom

expression from studies that solely relied on a measure of multi-impulsivity to assess personality.

Coding

Information gathered from the studies was coded by the first author. The third author coded a random sample of 10 studies, as well as recalculated the effect sizes from those studies.

Disposition to Rash Action—First, studies were coded for which trait was studied, such as sensation seeking vs. lack of planning. Each trait construct in each study was assigned to one of the four construct categories described by Whiteside and Lynam (2001). There was only one study that investigated the relation between the recently described positive urgency and BN symptoms, and that study found no effect (Cyders et al., 2007a). Therefore, positive urgency was not investigated in this meta analysis. Assignment to trait was based on Whiteside and Lynam's (2001) exploratory factor analysis of multiple impulsivity measures. The first author determined which scale was used in the article, and assigned it to the category that the scale loaded on in the factor analysis. If a scale used in any study was not included in the factor analysis of Whiteside and Lynam, the author examined the content of the scale items to determine category placement. Table 1 displays the questionnaires used in the included studies and which construct they represented in the factor analysis of Whiteside and Lynam. (Scales are denoted that were not included in the factor analysis and were content analyzed by the author). Content analysis of the scales was also coded by the third author. Any discrepancy between coding of items on the scales was discussed until 100% inter rater agreement was reached. In all cases, scales measuring the precise constructs were used instead of scales representing composites of constructs when they were available in the coded article. For example, if an author used the Zuckerman Sensation Seeking Scale and provided total sensation seeking scores as well as individual facet scores, the facet scores were coded by construct and used instead of the total scale score. (See *Type of Scale* below for further description).

Language—All personality measures used were self report. Each study was coded for the use of a translated version of a personality scale vs. the use of a scale in its original language. (The vast majority of studies used scales that were originally developed in English).

Type of Scale—Personality measures were coded for whether or not the scale was a specific measure of one of the impulsivity related constructs, or, instead, was considered general by inclusion of items representing more than one construct. For example, the TCI Novelty Seeking scale contains a sensation seeking facet and a non-planning facet. However, many authors use the entire scale to assess novelty seeking. The use of this entire scale to assess sensation seeking was coded as 'general'. Scales were considered specific measures if 75% or more of the items on a scale assessed only one of the impulsivity related constructs. This rating was made independently by the first and third authors. Any discrepancy between coding of items on the scales was discussed until 100% inter rater agreement was reached. The categorization of scales included in the meta-analysis into 'general' or 'specific' scales is displayed in Table 2.

Design—All studies included were either comparisons of clinical and control groups on a personality measure, or reported the correlation of a personality measure to a composite assessment of bulimic symptoms in a heterogeneous sample of individuals with BN and controls. This was coded for the purpose of exploring possible methodological moderators of effect size.

As the vast majority of studies included (92%) were cross sectional, we did not examine longitudinal vs. cross sectional data collection as a potential methodological moderator.

Meta Analytic Method

The relationship of each specific impulsivity-related construct to binge eating and purging symptoms and the diagnosis of BN was examined. Mean effect sizes were assessed separately for each construct. We hypothesized that negative urgency would have the largest mean effect size. All analyses were conducted according to procedures recommended by Rosenthal (1991). All studies expressed the relationship between impulsivity and BN in either Pearson's product moment correlation (r) or as mean differences between groups using a t or F statistic. Following Rosenthal (1994), we used the effect size indicator r , as it is most familiar to most readers. Resulting effect size estimates were interpreted according to guidelines by Cohen (1988); where .10 is considered a small effect, .24 a medium effect, and at least .37 a large effect. The mean effect size of the relationship of a trait to bulimic symptoms or diagnosis was calculated for each of the four traits. When converted to r , weighted mean effect sizes were calculated by following a Fisher's z transformation and weighting it by sample size. As sample size varied widely among studies, the weighted effect sizes were used for the remainder of the analyses. Positive r values indicate that individuals with BN had higher levels of the target trait.

Several articles contributed more than one effect size. For example, some articles reported data from multiple samples, while others used multiple different measures in the same sample. When results for multiple distinct samples were reported in the same article, they were considered separate study samples for the purpose of calculating effect sizes. Additionally, if a study reported effect sizes for two different traits, such as sensation seeking and negative urgency, these were also considered separate effect sizes. In this situation, independence of effect sizes was ensured because we analyzed mean effect sizes separately for each of the four dispositions to rash action. However, if the data from two measures of one trait were reported in the same sample, such as two lack of planning scales, these were averaged to ensure that each study only contributed one effect size to the mean effect of the construct being examined. Additionally, this method was used to generate one effect size if studies reported the relationship between personality and binge eating, and personality and purging symptoms separately. When authors reported that there was no difference between groups on a personality measure without providing group means and standard deviations, we assigned a correlation of 0 (Pigott, 1994).

In addition to analyzing the main effects for each trait construct, we also examined the homogeneity of these estimates. The chi square statistic was used for this purpose (Rosenthal, 1991). A significant chi square in this case indicates that the variation across weighted mean effect sizes is greater than is expected by chance. Effects of three different potential moderators of the relationship between each construct and BN were tested, using the contrast Z approach advocated by Rosenthal (1991). The first potential moderator was study design. All studies included used one of two methods for examining the association between personality and BN: either the use of self-report measures of bulimic symptoms collected in a heterogeneous sample of convenience, or a comparison between two distinct groups, BN and control, on personality measures. As there may be higher levels of personality disturbance among clinical samples (Fairburn, Welch, Norman, O' Connor, & Doll, 1996), we hypothesized that studies that compare clinical samples of individuals with eating disorders to normal controls would have larger effect sizes than studies that used continuous self report data in samples of convenience.

Second, studies were contrasted on whether a precise or general personality scale was used to assess a trait, as described above. We hypothesized that the use of general scales would (a) attenuate effect sizes when the primary construct in a measure is negative urgency, because items measuring other constructs will relate less to BN symptoms, thus reducing the overall effect; and (b) produce larger effect sizes for scales that primarily measure a trait other than negative urgency, because they may include questions tapping each construct, including

negative urgency. Third, studies were contrasted on whether or not a scale was administered in its original language or a translation.

Finally, a fail -safe N analysis was conducted for each personality construct. This procedure is recommended when there is an unequal distribution of published studies to unpublished studies in an analysis, because of the tendency of published studies to have higher effect sizes. This procedure estimates the number of studies with null findings that would cause the effect sizes found in a meta-analysis to drop to non-significant levels. For this analysis, we calculated the number of studies with an effect size of zero required to reduce the weighted mean effect size to a non-significant level (Rosenthal, 1979; Orwin, 1983; Lipsey & Wilson, 2001).

Results

Study Sample

A total of 222 studies were retrieved based on the literature search described above. Of these, 50 articles met inclusion criteria. Table 3 displays the studies included in the meta-analysis, grouped by trait construct, with a brief description of the design of the study, sample size, and effect size. (Note that several studies contributed more than one effect size as they assessed multiple constructs). Among the non-included articles, 47 were non meta -analytic review articles or theoretical chapters. A total of 31 studies were excluded because they compared two types of clinical samples, such as AN and BN, and did not include a normal control group, and 13 were excluded because the participants had a primary diagnosis of AN. Another 26 studies were excluded because the authors used multi-impulsivity as the sole personality variable, and five were excluded because the clinical sample was $N < 10$. Among the remaining articles retrieved, one did not define the trait measure used, six used the Rorschach, MMPI, or other measure not based on trait theory to assess personality, and 16 used laboratory tasks to assess impulsivity. Four other studies did not report results that could be calculated into effect sizes, and three studies were found in which the data had previously been published in an article already used in the meta analysis. Five studies did not define binge eating and purging or did not describe the measure used to assess these symptoms. The remaining articles did not report data that related to specifically to eating disorder symptoms, but rather nutrition or appetite. Out of the 50 articles, 38 presented data on lack of planning, 20 presented data on sensation seeking, 15 presented data on negative urgency, and 13 presented data on lack of persistence.

Mean effect sizes by Trait

The effect sizes, total N , Z scores, and confidence intervals for each trait are displayed in Table 4. As hypothesized, the effect size for negative urgency was the largest at .38. The effect size for lack of persistence was the smallest, at .08. Because several studies contributed effect sizes to multiple categories, statistical tests of the differences between category type were not possible due to non-independence of the data.

Sensation Seeking—Sensation seeking had a mean r of .16, and a weighted mean r of .16. The combined significance was calculated with the Stouffer method. The Stouffer combined Z indicated that relationship between sensation seeking and BN was significant ($Z = 9.36$), with a 95% confidence interval of .13 – .19. A stem and leaf plot did not reveal outliers in the data. Chi square tests of heterogeneity were conducted, ($X^2(19) = 71.76, p < .001$), indicating that effect sizes varied significantly.

The contrast of study design (group comparison or correlation of self report measures) was not significant. However, the Stouffer combined Z for the contrast of the use of specific versus general scales indicated that this had a significant moderating effect on the relationship between sensation seeking and BN ($Z = 2.32$). The mean weighted r for studies that used a general

measure was .23, with a confidence interval of .19 – .27. The mean weighted r for studies that used a specific measure of sensation seeking was .09, with a confidence interval of .04 – .14.

Finally, studies that administered scales in the original English version were contrasted with studies that administered scales translated into another language. This contrast was not significant. The fail-safe N analysis indicated that 86 studies with an effect size of zero are required to reduce the effect to non-significance ($r = .03$).

Negative Urgency—The mean r for negative urgency was .40, with a weighted mean r of .38. The Stouffer combined Z indicated that relationship between negative urgency and BN symptoms was significant ($Z = 16.85$), with a 95% confidence interval of .34 – .42. There were no outliers in the data. Chi square tests indicated significant heterogeneity of effect sizes ($X^2 = 38.72, p < .001$). Therefore, the same series of contrasts were conducted as described above.

The first contrast, of method, was not significant. The second contrast, specific versus general scales, could not be conducted because all scales assessing negative urgency sample were rated as specific measures. The contrast for language was significant ($Z = 4.63$). Studies that used a translated version of the measures had a mean weighted effect size of .52, with a confidence interval of .44– .60. Studies that used measures administered in their original language yielded a mean effect size of .35, with a confidence interval of .30 – .40. The fail-safe N analysis indicated that 127 studies with an effect size of zero are required to reduce the effect to non-significance ($r = .04$).

Lack of Persistence—The mean r for lack of persistence was .08, and the weighted mean r was .08. The Stouffer combined Z indicated that relationship between lack of persistence and BN symptoms was significant ($Z = 3.67$), with a 95% confidence interval of .04 – .12. There were no outliers in the data. Chi square tests did not indicate significant heterogeneity of effect sizes ($X^2(12) = 8.77, ns$). The fail-safe N analysis indicated that 13 studies with an effect size of zero are required to reduce the effect to non-significance ($r = .04$).

Lack of Planning—The mean r for lack of planning was .20, with a weighted mean r of .16. The Stouffer combined Z indicated that relationship between lack of planning and BN symptoms was significant ($Z = 9.36$), with a 95% confidence interval of .14 – .18, and no outliers were found. Chi square tests indicated significant heterogeneity in the sample ($X^2 = 120.09, p < .001$). All contrasts described above were conducted.

The first contrast, comparing study design, was significant ($Z = 3.77$). Contrast results indicated that studies that utilized a group comparison method yielded a higher weighted mean effect size ($r = .21, CI = .17 – .25$) than did studies using self report symptom and trait measures in heterogeneous samples ($r = .13, CI = .10 – .16$). The second contrast, comparing the use of specific versus general scales, was also significant ($Z = 3.56$). Studies that used general measures yielded a mean weighted effect size of .17 ($CI = .14 – .20$), while studies that used specific measures of lack of planning had a lower mean weighted effect size of .13 ($CI = .10 – .16$). The contrast of translated scales to original language scales was not significant. The fail-safe N analysis indicated that 288 studies with an effect size of zero are required to reduce the effect to non-significance ($r = .02$).

Discussion

At the broadest level, the results of this meta analysis offer two conclusions to clinical researchers. The first is that when one measures the personality basis for rash action, one should define precisely the nature of the trait of interest. Not all traits have the same relationships to at least some forms of dysfunction. The second is to appreciate the importance of emotion-

based dispositions to rash action. In the case of symptoms of BN, affect appears to play a central role in the rash actions in which individuals engage.

For eating disorders researchers, the present findings suggest the central importance of negative urgency with respect to BN symptom expression. While all four constructs had significant relationships to BN symptoms, negative urgency had by far the largest effect size. This finding lends support to our hypothesis that acting rashly under distress increases vulnerability for binge eating and purging. The results are consistent with our theory that high levels of negative urgency increase the likelihood of experiencing significant negative reinforcement from binge eating, thus increasing risk for BN. The findings are also consistent with a large body of research that identifies negative mood as an antecedent of binge eating episodes (Smyth, et al., 2007). It seems clear that negative urgency should be examined more closely in relation to eating disordered symptoms. In particular, longitudinal studies in which negative urgency is tested as a predictor of symptom onset or increase are indicated. While the effect of negative urgency on symptoms of BN was moderated by whether or not the scale was presented in its original language or not, the weighted mean effect sizes in the translated studies and the original language studies were both medium to large. Thus, while there may be some linguistic or cultural difference in the way that individuals perceive these traits, they consistently had a large effect on symptoms.

Sensation seeking and lack of planning had small to medium effect sizes. Steiger, et al. (1999) examined lack of planning as a moderator of the relationship between urges to binge and dietary control. They found that while this trait is not directly related to binge eating, levels of impulsivity affected the relationship between urges to binge and restraint, so that binge eating in highly impulsive women was less related to restriction. Persistence had a small effect size, and 'file drawer analysis' indicates that only 13 studies demonstrating a null relationship between this trait and BN are required to diminish this effect to non-significance.

The effects of lack of planning and sensation seeking on BN symptoms were moderated by precision of measurement. This was especially pronounced with sensation seeking. The weighted mean effect size for studies that used measures with items assessing multiple forms of impulsivity was .23, while the weighted mean effect size for studies that used a specific measure was .09. Thus, the overall effect sizes for these two traits appear to be overestimates due to confounding of items on individual scales. For example, a scale labeled 'sensation seeking' may have multiple items that assess other impulsivity related constructs, such as negative urgency. When using such a scale, one cannot be sure if the positive association between the personality measure and BN symptoms is due to the items that reflect sensation seeking, or the items that reflect negative urgency. This indicates that the estimates provided by studies using precise measurement should be relied on more heavily by researchers. The use of scales that contain items that tap multiple constructs may obscure the true relationship between trait and behavior.

For only one trait, lack of planning, was the effect size bigger when an identified clinical group was compared to a control group. No such difference was found for negative urgency or the other traits. Thus, particularly with respect to negative urgency, it appears that correlational studies with heterogeneous samples produce effect sizes comparable to those obtained with clinical samples. Correlational studies do not appear to either underestimate or overestimate the relationship between negative urgency (or the less important traits of sensation seeking and lack of perseverance) and BN symptoms.

Limitations

The major limitation of this study is that the data used for the meta analysis were cross-sectional. Thus, although the findings are consistent with our risk theory, they are not a test of that theory.

These data document the concurrent relationship between the negative urgency and BN symptoms. It may be that negative urgency is not a risk factor for the development of the disorder, but rather a maintenance factor once the disorder has started. For example, an individual could develop binge eating and purging symptoms after a period of restricted eating and failed dieting. Negative urgency's role may be to maintain these symptoms as maladaptive means of affect regulation once they have been initiated. This possibility, and the risk factor possibility we favor, need to be tested explicitly.

Future Directions

Given that the effect size of negative urgency was larger than the effects of the other three traits, and that this has not been examined longitudinally, future studies should examine this trait in a prospective design. Meanwhile, laboratory analog studies could be conducted examining how individual differences in negative urgency moderate the effect of negative affect on eating. Additionally, the findings of this analysis indicate that it is essential to use precise measures of well-defined constructs; failing to do so risks lack of clarity in theory and application.

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Table 1

Scales used in meta analysis as classified by the factor analysis of Whiteside and Lynam (2001)

* Denotes scales that were content analyzed by the author and categorized for type of impulsivity

Lack of Planning

NEO-PI-R Deliberation (Costa & McCrae, 1992)

Multidimensional Personality Questionnaire - Control Scale (MPQ) (Tellegen, 1982)

I-7 Impulsivity (Eysenck, Pearson, Easting, & Allsop, 1985)

Temperament and Character Inventory Impulsiveness vs. Control Facet (TCI) (Cloninger, et al, 1991)

Barratt Impulsivity Scale Nonplanning (BIS) (Patton, et al, 1995)

Barratt Impulsivity Scale Motor Impulsivity (BIS) (Patton, et al, 1995)

UPPS-R Deliberation Scale (Whiteside & Lynam, 2001)

* IPIP Cautiousness Facet (Goldberg, 1999)

* Dimensional Assessment of Personality Pathology Basic Questionnaire (Livesley, Jackson, & Schroeder, 1992) Impulsivity items

Dysfunctional Impulsivity Scale (Dickman, 1990)

Urgency

NEO PI-R Impulsiveness (Costa & McCrae, 1992)

Barratt Impulsivity Scale Attentional Impulsivity (Patton, et al, 1995)

* IPIP Immoderation Facet (Goldberg, 1999)

UPPS Urgency scale (Whiteside & Lynam, 2001)

Sensation Seeking

NEO PI-R Excitement Seeking (Costa & McCrae, 1992)

I-7 Venturesomeness (Eysenck, Pearson, Easting, & Allsop, 1985)

* Dimensional Assessment of Personality Pathology Basic Questionnaire (Livesley, Jackson, & Schroeder, 1992) Stimulus Seeking items

UPPS- R Sensation Seeking Scale (Whiteside & Lynam, 2001)

* TCI Novelty Seeking (Cloninger, et al, 1991)

* Total Sensation Seeking Scale (SSS) (Zuckerman, 1994)

* Sensation Seeking Scale Thrill and Adventure Seeking Facet (Zuckerman, 1994)

* Sensation seeking/ risky impulsiveness scale designed by Steiger, et al (Steiger, et al., 1991)

Lack of Persistence

NEO PI-R Self Discipline Facet (Costa & McCrae, 1992)

Sensation Seeking Scale Boredom Susceptibility (Zuckerman, 1994)

* TCI Persistence Scale (Cloninger, et al, 1991)

* IPIP Self-Discipline Facet (Goldberg, 1999)

UPPS -R Perseverance Scale (Whiteside & Lynam,2001)

Table 2

Categorization of General vs. Specific Scales by the authors. Scales in which 75% of items solely assessed one impulsivity construct were categorized as specific. All urgency and persistence scales were classified as specific.

Lack of Planning	
<i>General Scales</i>	<i>Specific Scales</i>
Total BIS scale (Patton, et al, 1995)	UPPS- R Deliberation Scale (Whiteside & Lynam, 2001)
Total I-7 (Eysenck, et al, 1985)	NEO-PI-R Deliberation Facet (Costa & McCrae, 1992)
	IPIP Cautiousness Facet (Goldberg, 1999)
	Temperament and Character Inventory Impulsiveness vs. Control Facet (Cloninger, 1991)
	Dimensional Assessment of Personality Pathology Basic Questionnaire (Livesley, Jackson, & Schroeder, 1992) Impulsivity items
	I-7 Impulsiveness scale (Eysenck, et al, 1985)
	Dysfunctional Impulsivity (Dickman)
Sensation Seeking	
<i>General Scales</i>	<i>Specific Scales</i>
TCI Novelty Seeking (Cloninger, et al, 1991)	NEO PI-R Excitement Seeking (Costa & McCrae, 1992)
Total Sensation Seeking Scale (Zuckerman, 1994)	I-7 Venturesomeness (Eysenck, et al, 1985)
Sensation seeking/ risky impulsiveness scale designed by Steiger, et al (Steiger, et al., 1991)	UPPS - R Sensation Seeking Scale
	Sensation Seeking Scale TAS Facet (Zuckerman, 1994)

Table 3

Studies analyzed for each type of impulsivity

<i>Sensation Seeking</i>			
Study	N	Design	Weighted ES
Abbate- Daga, et al., 2005	260	Group comparison	.34
Baker, 1998	196	Continuous symptom measure	.04
Berg, et al., 2000	57	Group comparison	.08
Brookings & Wilson, 1994	137	Continuous symptom measure	.12
Claes, et al., 2005	143	Continuous symptom measure	.10
Claes, et al., 2006	105	Group comparison	.04
Claes, et al., 2002	133	Group comparison	-.13
Fassino, et al., 2001	95	Group comparison	.21
Fassino, et al., 2002	202	Group comparison	.19
Fassino, et al., 2003	57	Group comparison	.30
Fischer & Smith, 2008	246	Continuous symptom measure	-.04
Fischer, et al., 2007	66	Group comparison	.13
Gendall, et al., 1998	223	Group comparison	.08
Nagata, et al., 2003	176	Group comparison	-.11
Newton, et al., 1993	85	Group comparison	.03
Rossier, et al., 2000	112	Group comparison	.29
Rosval, et al., 2006	138	Group comparison	.34
Schumaker, et al, 1986	65	Group comparison	-.01
Steiger, et al., 1991	667	Group comparison	.34
Vervaet, et al, 2003	318	Continuous symptom measure	.27
<i>Urgency</i>			
Study	N	Design	Weighted ES
Brookings & Wilson, 1994	137	Continuous symptom measure	.50
Bruce, et al., 2002	67	Group comparison	.42
Claes, et al., 2006	106	Group comparison	.25
Claes, et al., 2005	146	Continuous symptom measure	.50
Fischer, et al., 2007	66	Group comparison	.44
Fischer & Smith, 2008	246	Continuous symptom measure	.22
Fischer, et al., 2004	217	Continuous symptom measure	.25
Fischer, et al., 2003	291	Continuous symptom measure	.30
Fischer, et al., 2003	101	Continuous symptom measure	.49
Heaven, et al., 2001	167	Continuous symptom measure	.56
Lyke & Spinella, 2004	112	Continuous symptom measure	.42
Newton, et al., 1993	85	Group comparison	.14
Rosval, et al., 2006	138	Group comparison	.58
Steiger, et al., 2001	48	Group comparison	.30

Study	N	Design	Weighted ES
Steiger, et al., 2000	51	Group comparison	.66
<i>Lack of Persistence</i>			

Study	N	Design	Weighted ES
Abbate Daga, et al., 2005	260	Group comparison	.11
Claes, et al., 2005	143	Continuous symptom measure	.39
Fassino, et al., 2002	202	Group comparison	-.02
Fassino, et al., 2001	95	Group comparison	.10
Fischer & Smith, 2008	246	Continuous symptom measure	.11
Fischer, et al., 2007	66	Group comparison	.22
Gendall, et al., 1998	162	Group comparison	.11
Heaven, et al., 2001	167	Continuous symptom measure	.17
Nagata, et al., 2003	176	Group comparison	-.26
Rossier, et al., 2000	112	Group comparison	.09
Schumaker, et al., 1986	65	Group comparison	-.14
Tylka & Subich, 1999	169	Group comparison	.13
Vervaeet, et al., 2003	318	Continuous symptom measure	.09
<i>Lack of Planning/Deliberation</i>			

Study	N	Method	Weighted Effect Size
Baker, 1998	196	Continuous symptom measure	.25
Benjamin & Wulfert, 2005	335	Continuous symptom measure	.13
Bruce, et al., 2002	69	Group Comparison	.34
Casper, et al., 1992	28	Group Comparison	.14
Claes, et al., 2005	146	Continuous symptom measure	.39
Claes, et al., 2006	105	Group Comparison	.07
Claes, et al., 2006	105	Group Comparison	.06
Claes, et al., 2002	133	Group Comparison	.17
Culbert & Klump, 2005	500	Continuous symptom measure	.18
Diaz-Marsa, et al., 2000	102	Continuous symptom measure	.23
Fassino, et al., 2002	202	Group Comparison	.19
Fischer, et al., 2003	291	Continuous symptom measure	.06
Fischer, et al., 2003	101	Continuous symptom measure	.19
Fischer & Smith, 2008	246	Continuous symptom measure	.06
Fischer, et al., 2007	66	Group comparison	.10
Fossati, et al., 2001	663	Group comparison	.18
Franko & Omori, 1999	124	Group comparison	0
Harnden —Fischer, 2000	352	Group comparison	.20

Study	N	Method	Weighted Effect Size
Heaven, et al., 2001	167	Continuous symptom measure	.21
Kane, et al., 2004	43	Group comparison	.54
Kent, et al., 1997	48	Continuous symptom measure	.50
Klump, et al., 2002	512	Continuous symptom measure	.07
Lehoux & Howe, 2007	78	Group comparison	.37
Leon, et al., 1999	736	Continuous symptom measure	.05
Loxton & Dawe, 2007	131	Continuous symptom measure	.19
Lyke & Spinella, 2004	112	Continuous symptom measure	.17
Newton, et al., 1993	85	Group comparison	.19
Shaye, et al., 1986	64	Group comparison	.12
Steiger, et al., 1999	51	Continuous symptom measure	.26
Steiger, et al., 2000	51	Group Comparison	.32
Steiger, et al., 2001	48	Group Comparison	.21
Steiger, et al., 2003	85	Group Comparison	.44
Steiger et al., 2004	121	Group comparison	.45
Stice, et al., 2001	231	Continuous symptom measure	.08
Stice & Agras, 1998	218	Continuous symptoms measure	.06
Stein, et al., 2002	26	Group comparison	0
Rosval, et al., 2006	138	Group comparison	.21
Wolfe, et al., 1994	40	Group Comparison	.62

Table 4

Main effects for each type of impulsivity

Type of Impulsivity	<i>r</i>	Weighted <i>r</i>	Z score	Confidence Interval	χ^2	Total N	K	Fail Safe N
Sensation Seeking	.16	.16	9.36	.13-.19	71.76 ($p < .001$)	3481	20	86
Urgency	.40	.38	16.85	.34-.42	38.72 ($p < .001$)	2000	15	127
Persistence	.08	.08	3.67	.04-.12	8.77 (ns)	2181	13	13
Lack of Planning	.20	.16	9.36	.14-.18	120.09 ($p < .001$)	6749	38	288