Altered cognitive processing has been implicated in the development and maintenance of numerous clinical phenomena, including mood, anxiety, and eating disorders. Moreover, evidence-based treatments for these disorders frequently include a cognitive component that emphasizes the explicit identification, evaluation, and modification of distorted thinking patterns. To date, however, clinical scientists have capitalized to a limited degree on theoretical, measurement, and analytical models of quantitative cognitive science when characterizing clinically relevant individual differences in cognitive processing. Consequently, the concepts and procedures employed in contemporary cognitive therapy often bear little resemblance to the constructs and methods of cognitive science, and the potential of an integrative discipline of clinical-cognitive science remains largely untapped.

My research program in quantitative clinical-cognitive science aims to apply the theoretical, measurement, and computational models of contemporary cognitive science to facilitate understanding, assessment, and modification of the role of cognitive processing in clinical phenomena (e.g., McFall & Treat, 1999; Treat & Dirks, 2007; Treat et al., 2002, 2007). Pursuit of this goal necessitates examining and extending the generalizability and robustness of the models and methods of cognitive science, which traditionally have been used to examine normative processing of simple, artificial stimuli. To investigate the feasibility and utility of this hybrid clinical-cognitive approach, I deliberately pursue parallel lines of research in multiple areas of psychopathology, with a primary focus initially on eating disorders and acquaintance-initiated sexual aggression, and more recently on anxiety disorders, depression, and alcohol-related problems. Ultimately, my goal is to represent clinically relevant individual differences in cognitive processing within cognitive scientists’ formal computational models, such that a single model of human cognition accounts for both normal and abnormal processing and behavior. These modeling efforts may challenge and advance our theories about cognitive influences on psychopathology, as well as suggest novel intervention strategies. For example, current cognitively oriented treatments rely on verbally mediated techniques that emphasize the identification and modification of specific maladaptive thoughts and beliefs. However, greater reliance on the models and methods of contemporary cognitive science may afford the development of performance-based interventions that target specific deficits in cognitive processing. To this end, some of my recent work focuses on the development and evaluation of learning paradigms for the modification of clinically relevant cognitive processing.

**Acquaintance-Initiated Sexual Aggression**

Male-initiated sexual aggression toward female acquaintances is a major public-health problem on college campuses (Krebs et al., 2007). Sexual-assault prevention programs are now widespread on college campuses, but the effects of existing, primarily didactic, programs have been shown to be inadequate (Anderson & Whiston, 2005). Contemporary theoretical models implicate misperception of women’s sexual interest in sexual aggression between acquaintances (e.g., Abbey et al., 2011), and a burgeoning literature links impoverished affective processing to increased sexual-aggression risk, as indexed either by significant endorsement of rape-supportive attitudes or by a self-reported history of sexually aggressive behavior (see Farris et al., 2008, for a review). In particular, work in my Clinical-Cognitive Science Lab with prior graduate student Coreen Farris and current graduate student Jodi Smith has shown that higher-risk college men, relative to lower-risk college men, show less attention to, sensitivity to, and memory for women’s nonverbal affective (or emotional) cues, as indicated by women’s facial expressions and body language in full-body photographs (Farris et al., 2008, 2010; Treat et al., 2001, 2011, 2015, in press, under review). Moreover, non-affective cues, such as normative attractiveness and provocativeness of dress, interfere with affective processing to a greater degree among men at greater risk of sexual aggression. For example, in three studies, when judging how sexually interested women feel “right now,” high-risk men focused less on women’s affect, and more on physical attractiveness and provocativeness of dress, when compared to their low-risk peers (Treat et al., in press, under review, in preparation). We also have demonstrated that the relevance of the social
environment to dating and sexual activity influences men’s perceptions of women’s sexual interest, particularly among men who report more frequent misperception of women’s sexual interest (Treat et al., in press). This suggests that the sexual relevance of the environmental context, in addition to a woman’s clothing and attractiveness, may disrupt particularly high-risk men’s processing of a woman’s current sexual interest.

Recently, we have begun to develop and evaluate laboratory-based training procedures designed to enhance the accuracy of men’s judgments of women’s sexual interest by increasing focus on women’s affect and decreasing focus on women’s physical characteristics and the social environment. In one study, participants received trial-by-trial feedback on the accuracy of their sexual-interest judgments (Treat et al., in press); in another, participants received instructions about non-verbal affective indicators of women’s sexual interest and were told to focus on these affective cues when judging how sexually interested women feel (Treat et al., under review). In both cases, men’s focus on women’s affective cues increased, and their focus on women’s non-affective cues decreased, suggesting the potential utility of feedback and instruction for enhancing men’s cue-reading abilities. Currently, Richard Viken and I are conducting an NIAAA-funded study to evaluate the extent to which an enhanced version of our training procedures produces cognitive changes that are retained after consumption of a moderate dose of alcohol (target BrAC = .06). This is important because alcohol consumption plays a central role in sexual aggression between acquaintances (Abbey et al., 2011; Krebs et al., 2007), and we have demonstrated in prior work that alcohol selectively decreases men’s sensitivity to women’s affect and reduces men’s threshold for perception of sexual interest (Farris et al., 2010).

A second NIAAA-funded study examines for the first time the role of eye-movement behavior in men’s perceptions of women’s sexual interest. Andrew Hollingworth and I are using eye-tracking technology to investigate whether individual differences in the overt allocation of visual attention to women’s faces and bodies, as well as the social environment, account for individual differences in men’s reliance on affect. For example, reduced reliance on affect may be caused in part by a delayed or reduced tendency to fixate women’s faces. Participants are assigned randomly to consume alcoholic or non-alcoholic beverages prior to completing the sexual-interest judgment task, which allows us to examine the effect of alcohol consumption on overt attentional allocation while men judge women’s sexual interest. This approach is well suited to the development of training interventions, in which gaze behavior could be shaped to modify gaze patterns when making judgments about sexual interest, whether via instructional manipulation, the provision of feedback, or cueing diagnostic regions of the scene.

Whereas men’s misperception of a woman’s sexual interest has been implicated in the perpetration of sexual aggression, women’s misperception of the sexual riskiness of heterosocially relevant situations has been implicated in the experience of sexual victimization (e.g., Soler-Baillo et al., 2005; Yeater et al., 2010). In 2010, we demonstrated that college women who reported a history of sexual victimization, in comparison to their non-victimized peers, relied less on sexual risk information, and more on popularity-relevant information, when judging sexual risk in social situations (Yeater et al., 2010). Previously victimized women also showed a higher threshold for judging social situations to be risky. In a study funded by NIAAA, we currently are evaluating whether risk-processing patterns prospectively predict sexual victimization experiences during the freshman year of college, particularly among women who report heavier alcohol consumption. A separate study funded by NIAAA examines whether alcohol consumption (target BrAC = .08) produces effects on risk processing similar to those observed for sexual victimization. Should encouraging findings emerge from both studies, we then would pursue the development and evaluation of risk-training approaches for college women in parallel with our efforts to develop cognitive-training approaches for college men.

**Disordered Eating**

Disordered eating is a serious behavioral-health problem characterized by a diverse array of symptoms, including binge eating, regular use of compensatory measures to avoid weight gain, an overemphasis on the relevance of body shape and weight to self evaluation, and dangerously low weight (APA, 2006). In keeping with the “cognitive revolution” in clinical psychology, researchers increasingly have focused on the role of cognitive factors in the etiology, maintenance, and treatment of eating-disorder symptoms (e.g., Cooper, 1997; Vitousek, 1996). Research has focused primarily on deficits in the processing of information about the self,
rather than others, although social-comparison processes seem to play a critical role in the development and maintenance of eating disorders (e.g., Cash, 2002; Rosen, 1997). Furthermore, research has focused almost exclusively on the processing of disorder-specific information (i.e., shape, weight, eating, and food), although preoccupation with shape, weight, eating, and food may result in or from impoverished processing of other significant information, such as affective information. Many women who struggle with eating-disorder symptoms report a keen sense of social ineffectiveness and display marked deficits in interpersonal problem solving and affect regulation (e.g., McFall et al., 1999). Thus, my research program draws on the tools of cognitive science to investigate whether women reporting eating-disorder symptoms differentially process body-size and affective information presented in photos of other women.

In two studies, we documented that high-symptom women, relative to their peers, attended relatively more to other women’s weight than to their affect, displayed relatively greater sensitivity to women’s weight than to their affect, and showed relatively better memory for women’s weight than their affect (Treat et al., 2010; Viken et al., 2002). These findings suggest that difficulties in tracking and remembering others’ affect may contribute to the maintenance of eating-disorder symptoms via interpersonal and affect-regulation difficulties. The second study also evaluated a novel approach based on signal detection theory to conceptualizing, assessing, and analyzing individual differences in the processes hypothesized to underlie judgments of the covariation of two stimulus dimensions, such as other women’s body size and affect. When viewing photo sets in which no relationship was present, both symptomatic and non-symptomatic women exhibited a similarly strong illusory correlation in a stereotypically consistent direction, such that heavier women were judged to be unhappy and thinner women were judged to be happy (see also Viken et al., 2005). However, symptomatic women exhibited superior sensitivity to the manipulated covariation between other women’s body size and affect. Ironically, therefore, symptomatic women’s society-based and symptom-linked greater exposure to social environments that idealize thinness and denigrate heaviness may provide an evidence-based rationale for their eating-disorder symptoms. A third study used preference-scaling methods to investigate clinically relevant individual differences in undergraduate women’s utilization of body-size, affect, and attractiveness information when defining who they “really” are, who they “ideally” would like to be, and who they think men find to be “ideal” (Treat et al., in preparation). Attractiveness was included as a third dimension in the photo stimulus set to facilitate evaluation of hypotheses that group differences would emerge for processing of body size but not attractiveness. Relative to controls, symptomatic women used affect less and body-size more when defining their real and ideal selves. Moreover, they perceived both their personal ideal and men’s ideal as less happy and more thin, and they perceived their real body size to be much more discrepant from their ideal body size. Symptom severity also was unrelated to processing of other women’s attractiveness, highlighting the specific relevance of body-size processing to disordered eating.

The findings observed across these studies provide further support for cognitive theorists’ assumptions about the role of cognitive processing of shape- and weight-related information in disordered eating. They also challenge and extend these theories by suggesting that emotional processing and perceptions of other women (as well as oneself) may play a role in disordered eating. Finally, this work points to the potential utility of developing a more performance-based form of cognitive therapy that endeavors to redress deficits in cognitive processing by re-training problematic attentional patterns and perceived associations or by bolstering memory for previously unattended information. Another project lays some of the necessary basic-research foundation for future exploration of this possibility, by demonstrating the critical role that stable individual differences in attention to weight and affect play in the rapidity with which persons learn category structures based on weight and affect (Treat et al., 2011).

In recent years, graduate students and I have begun to investigate women’s processing of food-related information, which also is prioritized in theoretical models of eating- and weight-related difficulties. Creation of a large set of photos of foods that vary along fat, sugar, fiber, protein, and processing dimensions has allowed Ashley Gearhardt, Halley Woodward, and Marianne Rizk to examine a number of interesting topics, including a) the extent to which food cravings based on fat, sugar, and processing differentially predict disinhibited eating problems (Gearhardt et al., 2014); b) the role of valence- and arousal-based affective evaluations of food in
disordered eating (Woodward et al., 2015, under review); c) the relevance of fat, sugar, fiber, and protein to women’s perceptions of food healthiness (Rizk & Treat, 2014, in press); and d) portion-size perception of processed foods (Rizk & Treat, 2015).

The Role of Visual Attention Processes in Clinical Phenomena

Numerous theoretical models implicate visual attention to clinically relevant information in the development, maintenance, and increasingly the modification, or a wide variety of clinical phenomena. Clinical scientists’ conceptualization and measurement of visual attention tend to lag behind those of vision scientists, however. Thus, a prior graduate student (Mariann Weierich), Andrew Hollingworth, and I published a critique of the theoretical and measurement models bearing on the role of attention in clinical anxiety (Weierich et al., 2008). We stressed the importance of distinguishing initial attention to a stimulus from withdrawal of attention from a stimulus, both conceptually and methodologically, which necessitates moving beyond Stroop and dot-probe paradigms to Posner cueing, visual search, and eye-tracking paradigms. Subsequently, we have published several empirical papers with graduate students (Ashley Gearhardt, Blair Wisco, Mariann Weierich, Frank Farach) that rely on more contemporary measurement approaches to examine the role of visual attention in disordered eating (Gearhardt et al., 2012), depression (Wisco et al., 2012), spider phobia (Weierich & Treat, 2015), and trait anxiety (Farach et al., 2014). Currently, Hollingworth and I are completing an internally funded project that examines community women’s vigilance for and distraction by healthy and unhealthy food subsequent to manipulated induction of cravings for either healthy or unhealthy food. Future research will delineate further the role of vigilance, avoidance, distraction, and disengagement processes in various clinical phenomena and evaluate the effectiveness and utility of attentional-retraining strategies that rely on more contemporary visual-attention paradigms.

Additional Research

Apart from work at the conjunction of clinical and cognitive science, graduate students, faculty colleagues, and I also have made significant contributions in three other areas: 1) measure development and psychometrics (Farris et al., 2006; Lease et al., 2003; McFall et al., 1999; McFall & Treat, 1999; Morean et al., 2012, 2013, 2015; Rizk & Treat, 2014, 2015; Treat & Viken, 2012; Treat et al., 2002, 2010, 2011; Wang et al., 2008; Weierich & Treat, 2015; Woodward et al., 2014, 2015); 2) treatment development, evaluation, and dissemination (Treat et al., 2005, 2008; Perepletchikova et al., 2007; Stuart et al., 2000; Wade et al., 1998); and 3) youth social competence (Dirks et al., 2007a,b, 2010, 2011, 2014).

Conclusions

Psychological science to date has but scratched the surface of what (a) quantitative cognitive science has to offer clinical scientists’ efforts to characterize and ameliorate processing deficits associated with psychopathology; and (b) clinical science has to offer cognitive scientists’ efforts to evaluate and extend the generalizability of their models, methods, and analytic strategies to more complex, socially relevant circumstances. My research program in clinical-cognitive science highlights the promise of an integrative approach for the enhancement of our understanding of sexual aggression and eating- and weight-related problems, but the approach could be applied more broadly to any area of psychopathology in which deficiencies in cognitive processing are implicated. I am eager to continue advancing this research agenda, by progressing further on the research program outlined above, helping to train a new generation of quantitative clinical-cognitive scientists, and serving more generally as a spokesperson for the training and support of integrative psychological scientists (Treat, Bootzin, & Baker, 2007).