FEAR OF FATNESS, EATING ATTITUDES, AND ANTI-FAT PERSPECTIVES: A CROSS-CULTURAL EXPLORATION OF EURO-AMERICAN AND INDIAN UNIVERSITY STUDENTS

A Thesis

by

SUMAN AMBWANI

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2005

Major Subject: Psychology

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David H. Gleaves (Chair of Committee)	Marisol Perez (Member)
Nilesh Chatterjee (Member)	W. Steve Rholes (Head of Department)

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ABSTRACT

Fear of Fatness, Eating Attitudes, and Anti-fat Perspectives: A Cross-Cultural Exploration of Euro-American and Indian University Students. (May 2005)

Suman Ambwani, B.A., Macalester College

Chair of Advisory Committee: Dr. David H. Gleaves

Although recent data suggest the existence of anti-fat attitudes, fear of fatness, and maladaptive eating attitudes among Indian women, few researchers have examined the cross-cultural validity of their instruments before assessing Indian samples. The present study assessed the measurement equivalence of three related measures, the Anti-Fat Attitudes Scale, the Goldfarb Fear of Fat Scale, and the Eating Attitudes Test-26, and tested the invariance of latent means among Indian (n = 226) and Euro-American (n = 211) female college students. Multi-group confirmatory factor analyses using maximum likelihood estimation with robust standard errors demonstrated reasonable measurement equivalence of the instruments across Indian and Euro-American groups. Confidence interval comparisons of latent means suggested that the Indians and Euro-Americans did not differ significantly in levels of fear of fatness or eating attitudes, but there were some group differences in anti-fat attitudes. Structural equation modeling suggested that fear of fatness and anti-fat attitudes predict about 66% of the variance in Indian eating attitudes; however, these results must be interpreted cautiously due to a poorly fitting measurement model. Results of multiple regression analyses suggested that the eating attitudes of the Indian respondents were not significantly predicted by their socioeconomic status or degree of Westernization. In conclusion, these data suggest that there are some similarities, but also some important differences, in the eating-related attitudes and behaviors of Euro-American and Indian women.

ACKNOWLEDGEMENTS

I gratefully acknowledge the contributions of my remarkable advisor, Dr. David Gleaves, whose patience, dedication, and knowledge guided me through the research process. I also thank my committee members, Dr. Marisol Perez and Dr. Nilesh Chatterjee, my research assistants, and my graduate colleagues for their boundless support, encouragement, and practical assistance. Most importantly, I thank my family for giving me the opportunity to pursue this degree and for supporting me throughout the process. And finally, I dedicate this thesis to the memory of Jana Joseph, whose persistence and encouragement gave me the strength to survive and further pursue my graduate education at Texas A&M University.

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INTRODUCTION

Ever since Hilde Bruch (1962, 1975) and Arthur Crisp (1967) described the centrality of body image disturbance and weight-phobia in Anorexia Nervosa (AN), fear of fatness has largely been accepted as the central organizing motive underlying the disorder (Habermas, 1996). Researchers have demonstrated the significance of this construct in its co-occurrence with a drive for thinness (Levitt, 2001), observed tendency in Bulimia Nervosa (Goldfarb, Dykens, & Gerrard, 1985), predictive ability for restrictive eating (Gleaves, Williamson, Eberenz, Sebastian, & Barker, 1995), and uniqueness in addressing the motivation underlying eating pathology (Goldfarb et al.). However, fear of fatness, the alleged *sina qua non* of AN, has recently received a flurry of criticism for its apparent cross-cultural *invalidity*. Further, definitions of the fear of fat construct are teemed with ambiguities. For instance, whereas most researchers operationalize the term *fear of fat* to indicate a fear of *overweight* (e.g., Crandall, 1994), Crisp (1967) argued that anorexics maintain a fear of *normal weight*. Similarly, the interchangeable usage of "weight phobia" and "fear of fatness" suggests that the fear is actually a *phobia* warranting an anxiety disorder diagnosis (Bemis, 1986), thereby exacerbating the vagueness of the construct.

Despite these ambiguities, a number of researchers advocate the salience of fear of fatness in AN. For instance, Habermas (1996) argued that eliminating the fear of fat criterion would result in a loss of diagnostic specificity, wherein any weight loss

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This thesis follows the style and format of *Assessment*.

resulting from extreme dieting would warrant a diagnosis of AN. He reasoned that individuals with AN have no insight about the pathological nature of their desire for thinness, they defend themselves against the weight-gain efforts imposed upon them, yet, food remains attractive and is consciously denied. Further, AN clients are often extremely secretive and may hide their fear of fatness during intake interviews, thus facilitating false conclusions of an absence of this criterion (Habermas). However, the debate over the validity and operationalization of *fear of fatness* continues, thereby warranting further research exploring this phenomenon.

Recent cross-cultural examinations suggest that fear of fatness may not be a universal motivating factor for food refusal (e.g., Lee, Ho, & Hsu, 1993; Ramacciotti et al., 2001). For instance, in their quantitative analysis of 70 clinically diagnosed Chinese AN clients, Lee et al. reported that 58.6% (n = 41) did not exhibit any fear of fatness through the course of illness. The researchers' diagnostic inclusion criteria, however, did not mirror those set by the American Psychiatric Association's (APA) *Diagnostic and Statistical Manual,* 4th Edition *(DSM IV;* APA, 1994) as the former did not require fear of fatness for AN diagnosis. Of the "non fat-phobic" group, clients offered rationales such as no hunger (15.7%) epigastric bloating (31.4%), and simply eating less (12.9%) to explain their self-starvation.

Similarly, more recent research conducted with 48 Chinese "AN" clients revealed 16 non fat-phobic, "atypical" presentations of the disorder (Lee, Lee, Ngai, Lee, & Wing, 2001). Clients in this latter sample were also diagnosed using flexible AN diagnostic criteria, resembling *DSM-IV* (APA, 1994) standards but also encapsulating numerous reasons for food refusal (Lee et al.). Other than underlying motives for food refusal, the only significant difference between the two groups was that the non fat-phobic clients exhibited significantly lower premorbid body mass indices than their fat phobic counterparts. Overall, Lee and colleagues concluded that factors such as stomach bloating, lack of hunger, and stomach pain might be better predictors of self-starvation in non-Western cultural contexts. As summarized by the authors of a recent meta-analysis, "data suggest that Westernization and industrialization bring about certain aspects of Anorexia Nervosa (weight concerns) but are not necessary for producing a self-starvation syndrome" (Keel & Klump, 2003, p. 755). Thus, although fear of fatness is a defining criterion of AN, data are unclear as to whether it is a "cross-culturally valid" (i.e., as relevant to AN across cultures) construct.

Cultural Attitudes towards Fatness

In their investigation of fat phobia, Robinson, Bacon, and O'Reilly (1993) operationalized the term *fat phobia* to reflect anti-fat attitudes and negative stereotypes about fat people, rather than an individual's morbid fear of gaining weight. In doing so, the researchers identified a possible etiological factor in the development of an individual's fear of fatness. Specifically, understanding cultural attitudes towards fatness and the social consequences of overweight can contribute to our conceptualization of fear of fatness. A number of studies have documented the prejudice against obese individuals in Western societies (e.g., Crandall & Biernat, 1990). Further, attributions of blame (i.e., the extent to which the obese individual has control over his or her body weight) seem to play a key role in anti-fat attitudes, wherein obese individuals considered to be responsible for their obesity are disliked more than their un-responsible (e.g., thyroid problem) counterparts (DeJong, 1980). Crandall's (1994) investigation of anti-fat attitudes in the United States indicated that dislike of overweight others and attributions of willpower were significantly associated with each other (r = .43). A more recent exploration of anti-fat attitudes in Poland, Australia, Turkey, Venezuela, India, and the United States confirmed these earlier findings: anti-fat prejudice was predicted by a negative cultural value for fatness and the tendency to hold people responsible for their weight (Crandall et al., 2001).

Eating Attitudes and Fear of Fatness in India

A rapidly industrializing nation of over one billion people, India has been identified as at-risk for the incidence of eating disorders (Srinivasan, Suresh, & Jayaram, 1998). Further evidence for this hypothesis was offered by Gordon (2001), who identified three key cultural trends coinciding with eating disorder incidence: an increase in the consumer economy, a fragmentation of family units (yielding greater intergenerational conflicts), and the upheavals of sex roles as demonstrated by larger numbers of women entering the workforce. The stigmatization of obesity and fashionable emphasis on thinness are also identified as possible etiological factors in Western countries (Gordon), and are patterns that are beginning to permeate Indian society (Crandall et al., 2001). In combining the infiltration of American fast-food chains, beauty products and media images with the structural changes in family, sex roles and consumerism, India is highly prone to the rising incidence of eating dysfunction.

Due to the absence of extant epidemiological studies, the prevalence of eating disorders in India remains unknown. However, Chaturvedi (1991) cautioned against misinterpreting the lack of eating disorder research as indicating low prevalence. Rather, he identified the social stigma towards mental illness and the reluctance of Indians to seek psychological assistance, arguing that eating disorders tend to be seen in gynecological and surgical clinics for co-occurring physical symptoms, rather than in psychiatric facilities.

Of the few published cases of eating disorders in India, evidence suggests a possible *absence* of fear of fatness and body image concerns among some clients. For example, Khandelwal, Sharan, and Saxena (1995) described five young women diagnosed with Eating Disorder Not Otherwise Specified (*DSM III-R;* American Psychiatric Association, 1987) and Eating Disorder Unspecified (*International Classification of Diseases [ICD-10]:* World Health Organization, 1992) presenting with refusal to eat and marked weight loss, three of whom also exhibited persistent vomiting; however, four of these women did not appear to demonstrate a drive for thinness, fear of fatness, or fear of normal weight. Rather, the underlying motives for the abnormal eating behavior appeared to be somatic complaints (e.g., fatigue and aches), a focus on food and fluid restriction (because clients believed their consumption was adequate for sustenance), and abdominal pain. Littlewood (1995) offered another explanation for "atypical" (i.e., non fat-phobic) AN among Indian women, suggesting that bodily denial provides a socially accepted guise for South Asian women to achieve autonomy. He suggested that religious fasting (*vrath* for Hindus, *Ramadan* for Muslims) and fasting for political coercion within the family unit are culturally-specific ways for women to achieve self-determination (Littlewood).

In contrast with Khandelwal et al.'s (1995) case reports of eating disorder clients presenting without fear of fatness, Bhadrinath (1990) reported three AN cases from the Indian subcontinent, all of which met full criteria from the *DSM III-R* (APA, 1987), including fear of fatness. The differences between Bhadrinath's and Khandelwal et al.'s observations elucidate the difficulty in examining the centrality of fear of fatness in eating dysfunction: if researchers employ *DSM* or the *ICD-10* diagnostic criteria for AN, the study participants must fear fatness by definition. It is only when researchers use flexible diagnostic criteria, differentiating between "typical" and "atypical" cases of Anorexia Nervosa that we can observe client variability in fear of fatness.

Previous studies of eating attitudes among Indian women have produced mixed findings. For instance, King and Bhugra (1989) reported 10 independent factors (eigenvalues unspecified) in their factor analysis of a Hindi translation of the Eating Attitudes Test-26 (EAT-26; Garner et al., 1982) administered to late-teen girls in North India. In interpreting these factors, the researchers stated that there did not appear to be discernible patterns within the factors. Further, the factors did not seem to resemble those originally reported by Garner et al. (1982). Closer analysis of individual questions indicated consistent patterns of responses on five items that may have been socioculturally influenced, thus suggesting the salience of cultural and linguistic factors. For instance, the authors proposed that questions 17 ("eat diet foods") and 23 ("engage in dieting behavior") may have been interpreted by participants as relating to religious fasting (King & Bhugra). Although 29% of the respondents scored above the recommended cut-off point for distinguishing between AN clients and normal controls ($\geq$ 20, as specified by Garner et al., 1982), suggesting an extremely high prevalence rate of distorted eating attitudes, we cannot make any definitive conclusions as the questions may have been misinterpreted. Further, methodological limitations of the study (i.e., in constructing the Hindi test, the researchers did not employ a back-translation) restrict our interpretation of these findings.

Sjostedt, Schumaker, and Nathawat (1998) reported higher EAT-26 scores among Indian female college students in comparison to their Australian counterparts. However, no factor analyses were conducted to investigate if the instrument was equally valid for the two groups. In a separate study, similar factor structures for the EAT-26 were found for South Asian schoolgirls in Bradford and their Caucasian counterparts (Mumford et al., 1991), thus suggesting that the instrument may have adequate measurement equivalence across these cultures.

South Asian students in Mumford et al.'s (1991) study scored significantly higher on the EAT-26 than their Caucasian counterparts, and the highest scores were obtained by South Asians with the most "traditional" cultural orientations (as measured by language, dress, and food customs). Mumford and colleagues interpreted these high scores as a consequence of the disparity between the immigrants' traditional orientation and the values of the host culture. In contrast to these findings, Suhail and Nisa (2002) reported higher EAT-26 scores among Pakistani college students with less traditional, more "Western" orientations; here, Westernization was measured as hours spent viewing satellite television. Indeed, differences between these studies are marked by the nature of the samples (i.e., immigrants versus non-immigrants) and the variable measurement of the “Westernization” construct.

In sum, extant data, albeit few, seem to suggest that distorted eating attitudes are frequently manifested among Indian subcontinental women. However, it is often difficult to interpret these data due to methodological flaws of the studies (e.g., King & Bhugra, 1989) and little information on the cross-cultural validity of the assessment instruments being used.

Two published studies have directly examined fear of fatness among Indian male and female respondents. Rozin, Kurzer, and Cohen (2002) employed free association methodology to assess French, American and Indian participants’ (living in their respective countries) attitudes towards food. The researchers coded participants’ first three responses to the word “food” on multiple levels, including, content (e.g., nutrition/health, sensory, cooking/preparation etc.), valence (positive, negative or neutral) and nutritional value (health, unhealthy and neutral). The Indian university students (85 women and 64 men) were found to be less concerned with “fat” (i.e., they made fewer associations of “food” with “fat-“ stem words) and made more positive food associations than their American counterparts, findings that the researchers interpreted as indicative of the Americans being “more fat-phobic.” Indians were not compared to French participants due to large differences in age.

Although Rozin et al. (2002) observed comparatively low levels of fear of fatness among Indians, Sjostedt et al. (1998) detected higher levels of fear of fatness (as assessed by the Goldfarb Fear of Fat Scale) amongst Indians (*n* = 249) in comparison to Australian (*n* = 297) university students. However, these results changed after splitting the sample by gender: Australian women (*n* = 151) did not differ significantly from Indian women (*n* = 124) in fear of fatness, and both groups of women exhibited greater fear of fatness than Australian men (*n* = 146). The GFFS scores for Indian men (*n* = 125) were significantly higher than for Australian men, but were not significantly different from Australian women. Thus, although the data seem to suggest a general trend of greater fear of fatness among male and female Indians, the researchers failed to conduct a two-way ANOVA, thereby preventing any conclusions about gender by country interactions in fear of fatness. Further, the authors failed to test the validity of the fear of fat construct within a non-Western (Indian) population, thereby restricting our interpretation of these findings.

The actual prevalence of obesity and thinness in India has important implications for conceptualizing fear of fat and eating attitudes. If most individuals are premorbidly slim, we might expect lower levels of fear of fatness and maladaptive eating attitudes; conversely, a high prevalence of obesity might suggest high levels of these dysfunctional cognitions. A recent epidemiological study of body mass among urban adults in Mumbai, India, revealed significantly higher prevalence of overweight (29.7%) when compared with excessive thinness (19.1%) among women (Shukla, Gupta, Mehta, & Hebert, 2002). Further, fewer men were obese than women, although the prevalence of excessive thinness was similar between both sexes. Further, age and education were found to be independent risk factors for low BMI, wherein older, illiterate/less educated individuals were at most risk for thinness. Conversely, the college-educated middle-age groups were found to be the most at-risk for overweight (high income individuals were not included in the study). In comparing results of this investigation to a U.S. sample, the authors observed that education and BMI tend to have an inverse relationship in the U.S., whereas education and BMI have a positive relationship in India. Thus, it is important to consider the effects of education (and socioeconomic status) when assessing BMI among Indian respondents.

In sum, researchers consistently propose that eating disorders are uncommon in India because the traditional culture does not stress thinness as an indicator of feminine attractiveness (e.g., Bhadrinath, 1990; Khandelwal et al., 1995). However, given the mixed findings regarding fear of fatness and eating attitudes, the health concerns of obesity and excessive thinness, as well as the transitional phase of the Indian sociocultural environment, eating disorder-related pathology warrant further exploration.

The Goldfarb Fear of Fat Scale is potentially useful in identifying individuals who are particularly susceptible to the development of eating disorders (Goldfarb et al., 1985). Various research supports the psychometric properties of the GFFS, and it has thus been previously employed by researchers (e.g., Cash, Wood, Phelps, & Boyd, 1991; Gleaves et al., 1995; Nicolino, Martz, & Curtin, 2001) to effectively assess fear of fatness. However, the validity of this instrument has not been tested in India or other non-Western cultural contexts. Similarly, although Garner et al. (1982) reported high internal consistency (Cronbach's $\alpha = 0.90$) for the EAT-26 among Western respondents, the reliability of the EAT among South Asian participants has largely been unreported (with the exception of Iyer and Haslam, 2003, who reported α = 0.91 for Indian-American women), and investigations of its validity among South Asians have yielded mixed findings (e.g. King & Bhugra, 1989; Mumford et al., 1991).

Construct Equivalence: Considerations for Cross-Cultural Research

To begin answering these long-range questions about cross-cultural validity, we must start by first assessing the measurement equivalence of our instruments. An assessment instrument's equivalence must be demonstrated by showing analogous functional relationships between variables (Triandis, 1976), a process requiring the conceptual validation of assessment instruments. Tests of cross-cultural measurement equivalence allow researchers to determine whether the construct is present and equally meaningful in the populations of interest, or, the extent to which the content of each item is perceived and interpreted the same way across samples. Failure to establish cross-cultural equivalence may result in biased, inaccurate assessment and misleading inferences about observed mean differences between groups.

In a recent review advocating multicultural research and practices amongst psychologists, the American Psychological Association (2003) emphasized that culture and other contextual variables should be investigated as explanatory, rather than nuisance, variables in psychological research. They argued that psychologists are responsible for recognizing the impact of culture on the research process, from the generation of research questions, to the validity of measures employed, to the interpretation of resultant data. Further, APA emphasized the importance of employing assessment instruments that have demonstrated conceptual (i.e., the same meaning) and functional equivalence of the tested construct across cultures. Lee (1995) further highlighted the importance of establishing cross-cultural validity for eating disorder diagnostic criteria, stating, “the imposition of the criterion of fat phobia on these fasting patients, without regard for its contextual validity, constitutes a ‘category fallacy’ – ‘standardized’ diagnoses then turn into meaningless abstractions and often error-inducing incongruities” (p. 31). In sum, the eating-related constructs of interest must be examined for their cross-cultural equivalence to determine their validity among Indian respondents.

Study Objectives

One way to establish cross-cultural validity is through factor analysis, wherein one hopes to observe similarities in the scale’s factor structures for the two populations (Mumford et al., 1991). Thus, to comprehend the nature of fear of fatness, anti-fat attitudes, and eating attitudes in India, we must first ensure that our instruments, the GFFS, AFA, and EAT-26, all measure valid constructs in the Indian context. Thus, the present study examined the psychometric properties and measurement equivalence of the GFFS, AFA, and EAT-26 across Indian and Euro-American female samples. Further, the study explored group mean differences in fear of fatness, anti-fat attitudes, and eating attitudes, latent constructs purportedly measured by these instruments. The study also sought to investigate how anti-fat attitudes, fear of fatness, BMI, the relative importance of body shape/weight on self-esteem, and degree of Westernization relate to individual eating attitudes for the Indian respondents. And last, the study assessed the relationship between socioeconomic status and eating attitudes for the Indian and Euro-American respondents. Overall, the objective of the study was to better understand: 1) the cross-cultural validity of select eating-related measures, and 2) the predictors of eating attitudes for Indian women.

METHOD

Participants

Female students from three colleges in Mumbai, India (n = 226) and a large public university in the Southern United States (n = 266) participated in the present study. Indian participants volunteered for the study, and were entered in a raffle to win $10 cash prizes; American participants, recruited from Introductory Psychology courses, received credit for their participation. As was proposed, non-Euro-Americans (n = 55) were excluded from the analyses. As indicated in Table 1, overall, Indian participants (M=18.92, SD=.89) were significantly older [$t(369) = 7.66$, $p < 0.01$] than the Euro-Americans (M=18.30, SD=.81). The Indians (M=20.52, SD=3.3) also had lower BMI scores [$t(414.79) = -6.44$, $p < 0.01$] than their Euro-American counterparts (M=22.07, SD=2.84).

Measures

Goldfarb Fear of Fat Scale (GFFS; Goldfarb, Dykens & Gerrard, 1985). The GFFS, a 10-item self-report instrument, assesses an individual's fear of fatness. Participants rate statements such as "I feel like all of my energy goes into controlling my weight" on a 4-point Likert-type scale ranging from "very untrue" to "very true." As shown in Table 2, Cronbach's alphas in the present study were .78 (Indian sample) and .82 (Euro-American sample).

Antifat Attitudes Scale (AFA; Crandall, 1994). The AFA, a 13-item self-report measure of an individual's dislike of fatness, concerns about becoming fat, and beliefs about the controllability of fatness. Participants respond on a 10-point Likert-type scale ranging from 0 to 9. Sample questions include: "I tend to think that people who are overweight are a little untrustworthy," (dislike), "fat people tend to be fat pretty much through their own fault" (willpower), and "I feel disgusted with myself when I gain weight" (fear of fat). In the present study, Cronbach's alphas were .74 (Indian sample) and .82 (Euro-American sample).

Eating Attitudes Test (EAT-26; Garner et al., 1982). The EAT, an objective self-report 26-item inventory, measures AN symptoms such as dieting behavior, bingeing/purging, preoccupation with food, and oral control over eating. Participants indicate their degree of agreement (*always* to *never*, a 6-point scale) with statements such as, "am terrified about being overweight," and "feel that food controls my life." Although Garner et al. recommended that a 0-3 scoring system be used for the EAT-26, the present study employed a 1-6 scoring system to counter the statistical problems of low variability and to facilitate the inclusion of milder problems. In the present study, Cronbach's alphas were .80 (Indian sample) and .90 (Euro-American sample).

Shape- and Weight-Based Self Esteem Inventory (SAWBS; Geller, Johnston, & Madsen, 1997). The SAWBS assesses the extent to which an individual's feelings of self worth are determined by his or her body shape and weight. From a list of 9 attributes underlying self-worth, participants select and rank order attributes according to their contribution to self-esteem; then, participants divide a circle into pieces according to the relative importance of each attribute for their overall self-esteem. Examples of attributes include: intimate or romantic relationships, personality, competence at school or work, and body shape and weight. The SAWBS has previously demonstrated concurrent validity (with EDI composite scores, $r = 0.68$), discriminant validity (i.e., no relationship with BMI or socioeconomic status), an ability to differentiate between eating disordered and non-clinical subjects (Geller et al., 1998), and good 1-week test-retest reliability (r = 0.81; Geller et al., 1997). However, the SAWBS 1-week test-retest reliability estimates for the Indian sample were found to be considerably lower, r = .58 (angle) and r = .26 (rank), thus, the SAWBS was omitted from further analyses.

Modified Shape- and Weight-Based Self Esteem Inventory (MSAWBS). The MSAWBS measures an individual's perceptions of the relative importance of his or her body shape/weight in influencing *other's* opinions of him or her. The MSAWBS was modeled from the SAWBS, with slight modifications in the instructions to participants. The MSAWBS 1-week test-retest reliability estimates for the Indian sample were .57 (angle) and .52 (rank); due to low score reliability, the MSAWBS was excluded from further analyses.

Westernization Index. The Westernization Index, a 15-item self-report inventory, assesses the degree of "Westernization," or, adoption of Western ideals, for Indian participants. Participants indicate their degree of agreement (*always* to *never*, a 6-point scale) with statements such as, "Watch modeling events (e.g., Lakmé Fashion Week, Miss India beauty pageant etc.)," and "Read fashion magazines (e.g., Elle, Vogue, Cosmopolitan, Femina, etc.)." In the present study, Cronbach's alpha was .85 and 1-week test-retest reliability was .90.

Demographic Information Sheet. Participants self-reported age, height, weight, racial/ethnic background, country of origin, fluency in English, parents' education levels, and estimated family income. The height and weight estimates were used to calculate Body Mass Index [BMI = weight (kg)/height (m^2)] for each participant.

Design and Procedure

After providing informed consent, Indian participants were assigned participant numbers and asked to complete a questionnaire packet with a demographic information sheet, the AFA, GFFS, EAT-26, SAWBS, MSAWBS, and Westernization Index. The instructions for the SAWBS and MSAWBS were read aloud for the participants by research assistants before they began answering the questionnaires. After one week, a convenience sub-sample of Indian participants (n = 71) completed the SAWBS, MSAWBS and Westernization Index. Euro-American participants completed the demographic information sheet, AFA, GFFS, and EAT-26. Participants completed the measures in large classrooms in groups of approximately 15-35 women. All participants received debriefing information sheets after completing the measures.

RESULTS

All analyses were conducted using the following software: Statistical Package for the Social Sciences (SPSS for Windows Version 11.0) and LISREL 8.5 (Jöreskog & Sörbom, 2001).

Exploratory and Confirmatory Factor Analyses of the Goldfarb Fear of Fat Scale

Principal components analyses (PCAs) and confirmatory factor analyses (CFAs) compared the factor structure of the GFFS between Indian and Euro-American respondents. The Kaiser-Meyer-Olkin measure of sampling adequacy (MSA; Kaiser, 1974) was assessed individually for the GFFS to determine the appropriateness of the data for factor analysis (see Table 3). Kaiser (1974) recommended that MSA values ideally fall in the .80 - .90 range or higher, but that values greater than .70 were adequate, or "middling." Although individual MSA values ranged from .68 to .85 for the Indian data, and from .61 to .89 for the Euro-American data, the overall MSA values for the GFFS were .80 for the Indian sample and .84 for the Euro-American sample, thereby suggesting the data were appropriate for factor analysis.

Results of a principal components analysis (PCA) with the Indian data indicated that three components had eigenvalues greater than 1.0 and explained 60.76% of the total variance. After an oblimin rotation, the components explained 28.87%, 26.58%, and 16.52% of the total variance respectively. The results of a PCA conducted for the Euro-American sample also suggested retaining 2- or 3- components. Three components had eigenvalues greater than 1.0, explaining 31.14%, 23.49%, and 27.94% of the (oblimin rotated solution) variance respectively. The model explained 64.44% of the total variance. Examination of item content suggested that the same items loaded on the same factors for the Euro-Americans as for the Indian data.

Confirmatory factor analyses tested the adequacy of the 2- and 3- factor solutions for the Indian GFFS data, which were then compared using chi-square difference tests. The estimation method was maximum likelihood with robust standard errors to account for the non-normal distribution of the data. Fit indices were: the goodness-of-fit index (GFI; Jöreskog & Sörbom, 1993), the Satorra-Bentler χ^2 statistic (Satorra & Bentler, 1988, as cited in Byrne & Watkins, 2003), the normed-fit index (NFI; Bentler & Bonett, 1980), the comparative fit index (CFI; Bentler, 1990), the non-normed fit index or Tucker-Lewis index (NNFI; Marsh, Balla, & McDonald, 1988), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). SRMR scores closer to zero (such as 0.08 or 0.09) are indicative of good fit (Hu & Bentler, 1999). RMSEA scores range from 0 to 1.0, where 0.05 indicates a close fit, values under 0.08 suggest an adequate fit, and values greater than 0.10 signal a poor fit (Finch & West, 1997). NFI, GFI, NNFI and CFI values also range from 0 to 1.0, where values closest to 1.0 signify the best fit (e.g. Byrne, 1989; Mulaik et al., 1989). More recently, Hu and Bentler (1999) recommended more stringent criteria be used for evaluating model fit, such as RMSEA scores at or below 0.06 and values greater than .95 for the NNFI and CFI to interpret good model fit; however, other researchers have criticized these recommendations for rejecting adequately fitting models (e.g., Marsh, Hau, & Wen, 2004).

The results of these confirmatory factor analyses comparing 2- and 3-factor solutions for the Indian GFFS data suggested that the 3-factor solution (GFI = 0.95, NNFI = 0.94) fit better than the 2-factor solution (GFI = 0.88, NNFI = 0.85), $\Delta\chi^2(2, N=444) = 76.67$, $p<0.01$. Interpretation of item content for the three-component solution suggested that the factors may be identified as: “belief that one may gain weight” (GAIN), “need for control over weight” (CONTROL), and, “feared consequences of fatness” (CONSEQ). Items 1,2,3, and 6 seemed to load on “GAIN,” items 7,8,9, and 10 on “CONTROL,” and items 4 and 5 on “CONSEQ” (see Table 5 for GFFS factor loadings).

Results of a series of multi-group confirmatory factor analyses (Maximum Likelihood Estimation with robust standard errors), as recommended by Cheung and Rensvold (2002), indicated significant differences between the 1-factor and 2-factor solutions ($\Delta\chi^2[1, N=444] = 26.5$, $p<0.01$), the 1-factor and 3-factor solutions ($\Delta\chi^2[5, N=444] = 109.07$, $p<0.01$), and the 2-factor and 3-factor solutions ($\Delta\chi^2[4, N=444] = 135.57$, $p<0.01$), all assessed using the Satorra-Bentler χ^2 statistic. The error term for item 5 (Indian data) was fixed based on an estimate of the item’s reliability (.26) due to a negative variance, and freed to vary for the Euro-American data. These data suggest that the most “parsimonious” solution (i.e., the 1-factor solution) can be incrementally improved upon by increasing the number of factors.

Following Bollen (1989), Byrne (1989), Cheung and Rensvold (2002), Jöreskog and Sörbom (1993) and Lomax (1983), a series of “stacked” multi-group measurement models were tested by constraining parameters in the 3-factor solution and assessing changes in model fit. Specifically, instrument equivalence was sequentially tested on factor loadings (structure), correlations between the factors, and error matrices. The parameters of interest were estimated separately for each group, and then the matrices (Lambda-X, Phi, and Theta Delta) were constrained and changes in model fit were assessed. Changes in model fit were estimated by changes in chi-square values (see Bollen, 1989; Byrne, 1989; Jöreskog & Sörbom, 1993).

The 3-factor "stacked" model (Indian and Euro-American groups) fit the data very well (RMSEA = 0.047; see Tables 6 and 7). Moreover, the 3-factor solution demonstrated good fit for both groups separately (SRMR = 0.049 for Indian women, and 0.061 for Euro-American women). Constraining the factor loadings to be invariant led to a significant loss of fit, $\Delta\chi^2$ (10, *N*=444) = 23.46, $p<0.01$. Following Cheung and Rensvold's (2002) recommendation that ΔCFI < 0.01 criteria be used (rather than $\Delta\chi^2$), the data do not support the hypothesis of between-group invariance (here, ΔCFI = 0.04). However, constraining the Phi matrix in addition to the Lambda-X matrix (i.e., fixing the factor correlations to be equal) did not further detract from model fit ($\Delta\chi^2$ (3, *N*=444) = 5.21, $p = .16$). Simultaneously constraining factor loadings, correlations between factors, and error matrices to be invariant, led to an incremental loss in model fit [$\Delta\chi^2$ (9, *N*=444) = 27.1, $p<0.01$]. Overall, using CFA, even after constraining factor loadings to be invariant, the GFI statistics were .94 for the Indians and .91 for the Euro-Americans, thereby suggesting adequate model fit. These results are depicted in Tables 6 and 7.

Exploratory and Confirmatory Factor Analyses of the Anti-Fat Attitudes (AFA) Scale

Results of the MSA analyses for the AFA yielded .76 for the Indian sample (with individual scores ranging from .52 to .84) and .81 for the Euro-American sample (with individual scores ranging from .66 to .93) thus suggesting that the data were appropriate for factor analysis (see Table 3). A principal components analysis with oblimin rotation for the Indian AFA data (using the eigenvalues > 1 and scree plot criteria) suggested retaining 4 components, which explained 62.52% of the total variance. The 4 rotated components explained 19.28%, 19.33%, 14.47%, and 16.43% of the total variance respectively. Interpretation of item content for the four-component solution suggested that the factors may be identified as follows: “dislike of overweight others” (DISLIKE), “fear of weight gain” (FEAR), “controllability of fatness” (CONTROLLAB), and “interactions/contact with overweight others” (INTERACT). Items 5, 6, 9, and 10 seemed to load on “DISLIKE,” items 1, 2 and 3 on “FEAR,” items 4, 7, and 8 on “CONTROLLAB,” and items 11, 12 and 13 on “INTERACT” (see Table 8 for AFA factor loadings).

For the Euro-American sample, the scree plot suggested retaining either 3-or 4-components, explaining 61.87% and 69.43% the total variance, respectively. The oblimin rotated structure matrix for the 3-component solution suggested that the components, explaining 31.78%, 19.95%, and 21.05% of the rotated variance, can be identified as follows: “dislike,” “fear of fat,” and “willpower.” Items 5, 6, 9, 10, 11, 12, and 13 seemed to load on “dislike,” items 1, 2, and 3 on “fear of fat,” and items 4, 7 and 8 on “willpower.” These components are essentially the same as those originally proposed by Crandall (1994), the developer of the AFA questionnaire. An examination of the scree plot suggested that a 4-component solution might also be appropriate for these data, and would increase the total variance explained to 69.43%. Forcing 4 factors to be extracted, the oblimin rotated structure matrix suggested a similar pattern of factor loadings for the Euro-American data as for the Indian data, in which the first component broke down into two components (i.e., factor 1, “DISLIKE” and factor 4, “INTERACT”).

Multigroup confirmatory factor analyses tested the adequacy of the 1-factor, 3-factor, and 4-factor solutions for the AFA (see Tables 9 and 10). Results of chi-square difference tests revealed significant differences between the 1-factor and 3-factor solutions ($\Delta\chi^2[6, N=441] = 328.97$, $p<0.01$), as well as between the 3-factor and 4-factor solutions ($\Delta\chi^2[6, N=441] = 27.05$, $p<0.01$). A comparison of select fit indices suggested that the 4-factor solution (e.g., CFI=0.92, RMSEA<0.01, non-significant χ^2) fit better than the 1-factor solution (e.g., CFI=0.51, RMSEA=0.11) and the 3-factor solution (e.g., CFI=0.88, RMSEA=0.02). Moreover, the 4-factor solution demonstrated adequate fit for both groups separately (SRMR = 0.056 for Indian women, and 0.07 for Euro-American women). Consequently, the 4-factor solution was selected for further analysis.

The parameters in the 4-factor solution were sequentially constrained and changes in model fit were assessed. Constraining the factor loadings (i.e., Lambda-X matrices) to be invariant led to a significant loss in fit, $\Delta\chi^2$ $(13, N=441) = 30.99$, $p<0.01$. However, constraining the Phi matrix did not further detract from model fit $\Delta\chi^2$ $(6, N=441) = 4.89$, $p=.56$. Lastly, constraining the Theta-Delta matrix (i.e., the error terms) to be invariant led to a significant loss in model fit $\Delta\chi^2$ (13, N=441) = 154.88, p<0.01. These results are depicted in Table 10.

Exploratory and Confirmatory Factor Analyses of the Eating Attitudes Test-26 (EAT-26)

Exploratory and confirmatory factor analyses tested the measurement invariance of the EAT-26 with Indians and Euro-Americans. Once again, although individual MSA values ranged from .54 to .90 (Indian) and from .52 to .94 (Euro-American), overall MSA values fell well within an acceptable range (.82 for the Indians and .90 for the Euro-Americans), thus suggesting that the data could be analyzed through factor analysis (see Table 4).

According to Garner et al. (1982), the EAT-26 has 3 factors: dieting behavior, bulimia and preoccupation with food, and oral control over eating. An exploratory factor analysis of the EAT-26 Indian data, however, suggested retaining 8 components (using the eigenvalues >1 criteria), explaining 63.88% of the total variance. Alternately, examination of the scree-plot suggested that fewer components (i.e., 4-6 components) might be adequate. Similarly, an exploratory factor analysis of the EAT-26 Euro-American data suggested retaining a large number (i.e., 5-6) of components, with 6 components meeting the eigenvalues >1 criterion and explaining 64.7% of the total variance.

Given the discrepancy in number of components for the two groups, I tested the adequacy of 1-factor and 8-factor solutions through multigroup confirmatory factor analyses. The 1-factor solution resulted in a poorly fitting model (CFI=0.61, PNFI=0.49) as did the 8-factor solution (CFI=0.72, PNFI=0.72). Further, the sample size was too small for robust maximum likelihood to account for the non-normality of the data. Consequently, following the example set by McCarthy, Simmons, Smith, Tomlinson, and Hill (2002), I randomly parceled within-scale items into 4 groups, thereby reducing the subjects to estimated parameters ratio (see Table 11 for parceled EAT-26 factor loadings). As shown in Tables 12 and 13, the 1-factor solution (tested with 4 parcels) seemed to fit well, with SRMR = .03, CFI = .95, and GFI = .98 (Euro-American) and .95 (Indian).

Constraining the EAT-26 factor loadings to be invariant did lead to a loss in model fit, $\Delta\chi^2$ (4, N = 434) = 31.17, p<0.01, and further constraining the error matrices compounded the loss in model fit $\Delta\chi^2$ (4, N=434) = 24.92, p<0.01. However, even after constraining Lambda-X to be invariant, the model seemed to fit reasonably well (CFI = .92, GFI Indian = .90, GFI Euro-American = .96).

Group Mean Difference Tests

To test the equivalence of latent means for the Indian and Euro-American respondents, the freed Kappa matrix for the Euro-American respondents was compared to the fixed (to zero) Kappa matrix for the Indian respondents. For the GFFS, the confidence intervals for all three factors included zero, thereby indicating that none of the factors were significantly different for the Indian and Euro-American respondents (see Table 15 for further details). Similarly, a comparison of the two groups on the AFA scale Kappa matrix indicated that they were not significantly different in mean responses to two factors, “Controllab” and “Interact.” Indians and Euro-Americans did, however, exhibit significantly different mean scores for the other two AFA factors, “Dislike” and

"Fear." Whereas Euro-American respondents exhibited lower mean scores on AFA "Dislike," [t(153) = -2.98, *p*<0.01] they demonstrated higher scores on "Fear" in comparison to their Indian counterparts [t(153) = 2.04, *p*<0.05]. Finally, results did not suggest the presence of group mean differences in eating attitudes [t(15) = -1.33, *p*=*ns*].[1]

Structural Equation Modeling

Following the two-step approach for structural equation modeling (Anderson & Gerbing, 1988), I tested a 3-dimensional measurement model through confirmatory factor analysis. The latent dimensions measured were fear of fatness, anti-fat attitudes, and eating attitudes, and the items were constructed using the item parceling method described earlier. The item parceling method (three items for the GFFS, and four items each for the AFA and EAT-26) allowed for: 1) reducing the subjects to items parameter, and 2) increasing the likelihood that the indicators for each factor would correlate similarly with each other. Maximum likelihood with robust standard errors was the estimation method due to the data not being multivariate normal.

As indicated in Table 16, the goodness-of-fit indices varied in their support for the hypothesized model. The modification indices for the factor loadings (i.e., Lambda-X) matrix suggested that the model would fit better if the second and third EAT-26 parcels were freed to load on the GFFS. The factor loadings for the measurement model are shown in Table 17. An examination of the correlations among the factors (the phi matrix) suggested significant problems with discriminant validity. For instance, GFFS

[1] Significant group differences emerged when examining the EAT-26 non-parceled 1-factor solution, with Euro-Americans reporting poorer eating attitudes than the Indians [t(675) = 4.34, *p*<0.01]. However, this analysis did not account for the non-normal distribution of the data.

and AFA correlated at $r = 0.86$ (standard error = 0.04; C.I. = 0.78 - 0.94), thereby suggesting that the two constructs overlap highly. The EAT also correlated with the GFFS at $r = 0.79$ (C.I. = 0.71-0.87) and with AFA at $r = 0.59$ (C.I. = 0.47-0.71); however, these constructs do appear to have some discriminant validity as the confidence intervals did not include 1.0.

Although the data produced mixed findings regarding support for the hypothesized measurement model, a structural equation model was tested for exploratory purposes. The squared multiple correlations for structural equations indicated that GFFS and AFA explained 66% of the total variance in EAT. However, these data must be interpreted with caution given the lack of adequate model fit.

Assessment of EAT-26 Predictors

Multiple regression analyses assessed the relationship between EAT-26 score and income, mother's education level, father's education level, Westernization score, and body mass index (BMI) among the Indian and Euro-American respondents. It was hypothesized that income, mother's education level, and father's education level would be correlated indicators of socioeconomic status, and would predict EAT-26 score. It was also hypothesized that Westernization score and BMI would significantly predict variance in EAT-26 sum scores. A regression equation was thus constructed where income, mother's education level, father's education level, Westernization score, and BMI were independent variables and EAT-26 sum score was the dependent variable. The overall regression equation was statistically significant [$F\ (5, 182) = 4.495$, $p<0.01$]. These predictors explained 11% (R^2) of the total variance.

An examination of the individual predictors demonstrated that BMI significantly predicted EAT-26 sum score [$t(187) = 4.19$, $p<0.01$; partial correlation = .30; zero-order correlation = .29].[2] Contrary to expectations, EAT-26 was not significantly predicted by income [$t(187) = -.85$, $p=.40$; partial correlation = -.06; zero-order correlation = -.06], mother's education level [$t(187) = -0.88$, $p=.38$; partial correlation = -0.07; zero-order correlation = -.10], father's education level [$t(187) = -.13$, $p=.90$; partial correlation = -.01; zero-order correlation = -.09], or Westernization score [$t(187) = 1.49$, $p=.14$; partial correlation = .11, zero-order correlation = .12]. Interestingly, the three purported indicators of socioeconomic status (i.e., income, mother's education level, and father's education level) did not correlate as highly as expected; whereas mother's education level correlated significantly with father's education level ($r = .46$), the correlations with income (see Table 14) were non-significant ($p>0.05$). Another regression analysis that included the interaction effect (i.e., income*mother's education*father's education) as a predictor for EAT-26 sum score was not statistically significant [$F\ (4, 191) = 1.41$, $p= .23$].

It was hypothesized that income, mother's and father's education levels, and BMI would predict EAT-26 scores among the Euro-American respondents. A regression equation was thus constructed with income, BMI, and parental education levels as independent variables and EAT-26 sum score as the dependent variable. The overall regression equation was not statistically significant [$F\ (4, 174) = .87$, $p = .49$].[3] A

[2] When Garner et al.'s (1982) coding system was used (a 0-3 scale), EAT-26 sum scores were not significantly predicted by BMI, Westernization, income, or parental education levels.
[3] A similar regression equation, constructed with Garner et al.'s (1982) EAT-26 scoring system, was also non-significant [$F\ (4, 175) = .40$, $p = .81$],

closer examination of the correlation matrix once again indicated weak associations between income and mother's education (*r* = 0.07) and father's education (*r* = 0.32). The interaction effect of the three SES indicators was tested in regression model, after accounting for the individual effects of the indicators, with EAT-26 sum score as the dependent variable; this analysis was not statistically significant [F (4, 181) = .39, p = .81].

DISCUSSION AND CONCLUSIONS

The present study assessed the measurement equivalence of the Anti-Fat Attitudes Scale, Goldfarb Fear of Fat Scale, and Eating Attitudes Test-26, and tested the invariance of latent means among Indian and Euro-American female college students. The study further sought to explore the relationship between eating attitudes, fear of fatness, anti-fat attitudes, degree of Westernization, the relative importance of shape/weight on self-esteem, BMI, and indicators of socioeconomic status (SES) with the Indian respondents, and the ability of SES and BMI to predict eating attitudes among Euro-Americans. Overall, the study examined whether Western assessment instruments could reasonably be employed with Indian urban women, and further assessed the predictors of poor eating attitudes among the same.

Psychometric Properties and Measurement Invariance Analyses

In general, scores from the measures appeared to have reasonable internal consistency (in both samples) and test-retest reliability (in the Indian sample), with the exception of the Shape-and-Weight-based-Self-Esteem Questionnaire (SAWBS) and modified SAWBS. Whereas Geller et al. (1997) observed 1-week test-retest reliabilities of .81 (nonclinical sample) and .94 (eating disorder subjects, Geller et al., 1998), the SAWBS reliability in the present study ranged from .26 to .58. A closer examination of item responses indicated that participants were inconsistent in their responses to the SAWBS and MSAWBS. For instance, some participants ranked “body shape/weight” as number 1, suggesting that it was the most important characteristic for their self-esteem, but then attributed a relatively small portion of the pie-chart to “body shape/weight”.

Other participants neglected to answer the "rank" question and only responded to the pie-chart question; thus, it seems that, in general, participants did not understand this questionnaire well.

Following Geller and colleagues' (1997) instructions, the validity of the SAWBS necessitates that the respondent maintain consistency in rank and angle (proportion of the pie) attributed to "body shape/weight." One possible reason for the disparity between Geller et al.'s (1997) test-retest reliability coefficient and that observed in the present study may be that Geller and colleagues omitted "invalid" responses, thereby yielding higher reliability coefficients among the remaining data. Another cross-cultural study conducted in Georgia (formerly in the Soviet Union) also demonstrated problems with this measure; although the researchers did not assess test-retest reliability, they did observe a moderately low correlation ($r = 0.22$, $p < 0.01$) between the SAWBS and another measure of the relative importance of weight and shape on self esteem (Tchanturia, Troop, & Katzman, 2002). Thus, it is possible that the SAWBS is easily misunderstood by respondents. In general, given that numerous respondents in the present study were inconsistent in their responses, the SAWBS and MSAWBS data were omitted from further analyses.

Constraining the factor loadings to be invariant for the GFFS 3-factor solution, AFA 4-factor solution, and the EAT-26 1-factor (parceled) solution led to significant losses in model fit. However, an examination of the confidence intervals for the unstandardized parameter estimates suggested that although the differences in loadings may be statistically significant, some of them may have little practical significance. For instance, 5 (of the 10) of the Euro-American factor loadings for the GFFS fell within the confidence intervals for the Indian parameter estimates. Similarly, 6 (of the 13) AFA items and 2 (of the 4) EAT-26 parcels did not appear to be significantly different across groups based on the confidence intervals of the standardized parameter estimates.

In general, the differences in factor loadings suggest that although the overarching constructs may have been measured by similar factors, the relative importance of some items for each factor differed by country of origin. Another possible explanation for the factor loading non-invariance may be the divergent base rates of items with low loadings. For example, an examination of item frequencies for EAT parcel 4 (see Table 11 for EAT-26 factor loadings) suggests that the Indians endorsed high scores at lower frequencies than the Euro-Americans (i.e., 70.8% of the Indians had scores of 16 or lower on EAT p4, whereas 51.9% of Euro-Americans had scores of 16 or lower). Similarly, for GFFS item 4, "I don't understand how overweight people can live with themselves" 41.1% of the Indians responded with 1 ("very untrue"), whereas 19.4% of the Euro-Americans responded with the same. An examination of the factor loadings (see Table 5) indicates that item 4 loads .34 on factor 3 for the Indians, and .66 for the Euro-Americans. Thus, it seems likely that the low base rates of item endorsement may have influenced the pattern of factor loadings, thus rendering them non-invariant across groups.

Fixing the correlations between factors and the error terms to be invariant across groups further detracted from model fit in most cases. However, this loss in model fit was measured by the χ^2 difference test, which is highly susceptible to sample size. Other fit indices (e.g., CFI) indicated that the models upheld adequate model fit until the error matrices were made invariant across the Indian and Euro-American data. Indeed, Byrne, Shavelson, and Muthen (1989) argued that models with partial measurement invariance are rejected too frequently, and that researchers should examine and possibly retain these models based on closer examination of the data. Overall, the data suggest that the EAT-26, GFFS, and AFA may be used with Indian and Euro-American populations with reasonable confidence that the instruments are measuring similar constructs in similar ways. The data also suggest that the instruments' factor structures are better represented by different models than originally proposed by the developers. Future researchers may be interested in weighting items differently for the two samples (based on the respective factor loadings) to allow for more accurate comparisons of mean differences. However, the reliability of these factor loadings should be assessed with independent samples before employing the item-weighting approach, as the items may differ in relative importance across samples.

The AFA 4-factor solution differed from the 3-factor solution originally proposed by Crandall and his colleagues (1994). Specifically, one of Crandall's factors, "Dislike," appeared to split into two factors, "dislike," and "interact" in the present study. One hypothesis for this discrepancy is that an individual's dislike for overweight others may be distinct from an individual's interactions with overweight others. Given that the PCA with the Indian sample seemed to advocate a 4-component solution more strongly (relative to the Euro-American sample, where a 3-component solution also appeared feasible), the factor difference may be reflecting a cross-cultural difference in anti-fat attitudes. It is possible that the Indians do not dislike overweight others, but simply do not have the opportunity to interact with them as much given the relatively low prevalence of obesity among Indians compared to Euro-Americans. Indeed, Indians (M=20.52, SD=3.3) had significantly lower (d = .63) mean BMIs in comparison to their Euro-American counterparts (M=22.07, SD=2.84). Conversely, it is possible that the two factors, "interact" and "dislike" are inextricably linked for the Euro-Americans, thus preventing them from emerging as distinct factors in the PCA. Nonetheless, the 4-factor solution also appeared to fit moderately well for the Euro-Americans.

The EAT-26 did not appear to be measured by the three factors identified by Garner et al. (1982), dieting behavior, bulimia and preoccupation with food, and oral control over eating. Rather, the PCAs suggested 6 to 8 factor solutions, neither of which could be verified through confirmatory factor analyses. CFAs, however, frequently fail to support models identified in PCAs because they often ignore the fact that items tend to load on multiple factors; by assuming that items on a multifactorial questionnaire purely measure the unitary factors, CFAs can result in poorly fitting models as a result of errors of omission (Ferrando & Lorenzo-Seva, 2000). A 1-factor solution, selected to assess the unidimensionality of eating attitudes, appeared to fit reasonably well for both samples, suggesting that the EAT-26 does measure a similar construct, purportedly eating attitudes, for the two groups. Researchers have commented that the clinical/non-clinical status of participants may play a role in the factor structure of the EAT-26 (e.g., Koslowsky et al., 1992), a possible explanation for the difference between Garner et al.'s conceptualization of the EAT-26 and that suggested by the present study. Although other researchers have used this instrument with non-clinical samples, there has been some disagreement over its factor structure (see Garfinkel & Newman, 2001, for a review of this literature) across groups. Time lapses since Garner et al.'s study and the scoring system (a 1-6 scale, versus a 0-3 scale) are other possible explanations for the differences between Garner et al.'s proposed factor structure and that suggested by the present study.

Comparisons of Latent Means

Indians and Euro-Americans exhibited significantly different mean scores on two latent dimensions measured by the AFA: dislike and fear. Whereas Indians presented with greater dislike of overweight others, the Euro-Americans displayed greater fear of gaining weight. These data seem to suggest that disliking fatness in others may not be as closely related to fearing one's own fatness as expected. One hypothesis for this is the social desirability bias: whereas it may be more socially acceptable for Indians to express their dislike of overweight others, the Euro-Americans may have suppressed their true responses to appear more "politically correct," and avoid social censorship. Another possible explanation may be the collectivist versus individualistic orientations typically attributed to Indian and Euro-American cultures respectively. As suggested by Bhugra, Bhui, and Gupta (2000), an Indian woman's self-understanding is more likely to be influenced by her social network than her individual belief systems; thus, whereas Indian women may focus their anti-fatness on others, Euro-Americans may be more likely to focus it on themselves. In sum, it remains unclear why the Indians and Euro-Americans differed in fear of gaining weight and dislike of overweight others.

Consequently, future researchers may opt to assess dislike of overweight others through observation (e.g., of marital partner selection) or experimental designs to minimize social desirability effects.

The literature offered mixed findings about fear of fatness and eating attitudes among Indian samples. Results of the present study suggest that the Indians and Euro-Americans were not significantly different in GFFS scores ($p = .12$, $d = .15$) or in levels of fear of fatness (measured as a latent construct through confirmatory factor analysis). Although the initial *t*-test suggested that the two groups were significantly different in EAT-26 scores ($p < 0.01$; $d = .29$), confidence interval testing of the latent construct, eating attitudes, did not suggest significant differences between groups. Comparison of the Indians and Euro-Americans on the full version of the EAT-26 (i.e., non-parceled), however, suggested that the latter reported significantly poorer eating attitudes. Thus, it is likely that the item-parceling method influenced the results; nonetheless, the non-parceled EAT-26 data must also be interpreted cautiously as the high subjects to parameters ratio prevented us from accounting for the data being multivariate non-normal. Overall, these data have important implications for our understanding of eating related attitudes and behaviors in India. Whereas others have suggested that eating disorders are inconsistent with Indian traditional values (e.g., Bhadrinath, 1990; Khandelwal et al., 1995), the present data suggest that this may not be the case, and that Indians and Euro-Americans may be more similar in their eating attitudes and fear of fatness than previously understood.

Predictors of Eating Attitudes in India

A closer examination of the Indian data through structural equation modeling was restricted by an inadequately fitting measurement model. Nonetheless, the data do appear to strongly suggest that fear of fatness and anti-fat attitudes explain a large proportion of the variance (66%) in eating attitudes among Indian women. However, the GFFS and AFA appeared to tap into much of the same variance, as the correlation between the two indicators was $r = .86$, with a standard error of .04. Further, the modification indices of the measurement model seemed to suggest that the EAT-26 and GFFS may have poor discriminant validity, as freeing the EAT-26 parcels to load on the GFFS would improve model fit; thus, these data suggest that the EAT-26 and GFFS may also be measuring similar constructs.

Contrary to expectations, the Westernization scale was not significantly associated with the EAT-26, the AFA, or the GFFS. Whereas others have suggested that individual eating attitudes are influenced by the adoption of Western ideals (e.g., Mumford et al., 1991; Suhail & Nisa, 2002), the present study did not support these previous findings. Although the Westernization index had good internal consistency, test-retest reliability, and was significantly correlated with all three indicators of socioeconomic status, it is possible that the instrument did not measure “true” Westernization. Indeed, eight of the fifteen items on this measure directly addressed or alluded to the respondent’s use of the English language; as participants were all students at English-medium colleges, it is possible that their use of English may not be a reflection of Westernization. Nonetheless, the instrument successfully differentiated the students at the three colleges, arguably based on their levels of Westernization, thus suggesting that the English-language focus of the questionnaire was not a problem. Interestingly, Suhail and Nisa (2002) argued that Indian culture is so highly “Westernized” that Pakistani students viewing Indian programs on television should also be considered “Westernized.” Clearly, further research into the construct of “Westernization” among Indians and the validity of Westernization measures is required before drawing conclusions about the true relationship between eating attitudes and Westernization.

Limitations, Future Directions, and Conclusions

There are several limitations of this study. First, the low reliability of the SAWBS/MSAWBS data prevented a comparison of the relative importance of body shape and weight on self-esteem for Indian and Euro-Americans. Future researchers may opt to use multiple measures of this construct and ensure that participants fully understand the directions before employing the SAWBS questionnaire. Further, as participants may have been unfamiliar with the pie-chart concept of the SAWBS and MSAWBS, future researchers may seek to investigate the same using alternate methods such as percentages and monetary analogies. Similarly, the socioeconomic status variables had weak intercorrelations among items, suggesting that they were disparate or unreliable measures of the construct. Indeed, several students commented during data collection that they did not know their family income, thus, these estimates are unlikely to be accurate. Consequently, it may be worthwhile for future researchers to seek better ways, perhaps with more indicators and multiple methods, to measure socioeconomic status among Indian women. Third, the present study employed female college student samples in two cities, thus restricting the generalizability of the findings to individuals of different ages, cultural backgrounds, and to clinical populations. And last, direct measurement may have provided more accurate assessment of height and weight than self-report.

Is fear of fatness central to AN across cultures? The results of this study do not directly answer this question. However, by examining the measurement equivalence of select eating disorder-relevant measures, the present study offers a first step towards answering this question. Additional research with clinical and sub-clinical populations is required before we can understand the centrality of this construct in AN symptomatology across cultures. Moreover, further research with an independent sample may be necessary to confirm the models proposed by the present data, and to test the tenability of the models with clinical populations. It may also be of interest for future researchers to investigate the nature of the overlap between the AFA and GFFS by including both in an exploratory factor analysis. In addition, given the high degree of overlap observed through structural equation modeling, future researchers may be interested in selecting just one facet of the EAT-26, such as "dieting behavior," (rather than the full scale) and assessing its predictors. Thus, by separating eating behaviors from eating attitudes, one may be able to reduce multicollinearity and better understand the relationship among these variables. In addition, researchers may benefit from selecting samples hypothesized to vary in their levels of "Westernization," such as women in rural farming communities in India as well as those in urban locations, thus facilitating a better understanding of the nuances of “Westernization” and their impact on eating attitudes and behavior. And last, future researchers may opt to assess role of other possible predictors of eating disorder-related pathology, such as body dissatisfaction, childhood teasing/criticism, awareness/internalization of the sociocultural thin-ideal, and compare these constructs across Indian and Euro-American samples.

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APPENDIX

Table 1

Descriptive Statistics

	Indians *M* (*SD*)	Euro-Americans *M* (*SD*)	*t*	*df*	*p*	*d*
Age (years)	18.92 (.89)	18.30 (.81)	7.66	369	<.01	.80
BMI	20.52 (3.3)	22.07 (2.84)	-5.26	430.42	<.01	.63
GFFS	20.04 (5.80)	20.89 (5.62)	-1.55	425.91	.12	.15
AFA	43.58 (16.47)	45.36 (16.39)	-1.13	423.89	.26	.11
EAT-26_1	8.30 (6.8)	9.5 (8.6)	-1.59	383.3	.11	.16
EAT-26_2	61.55 (14.02)	66.01 (16.31)	-3.04	411.39	<.01	.29
Westernization Score	43.91 (16.47)	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
SAWBS						
Rank	3.99 (1.83)	3.59 (2.45)	*n/a*	*n/a*	*n/a*	*n/a*
Angle	34.73 (37.49)	41.22 (30.87)	*n/a*	*n/a*	*n/a*	*n/a*
MSAWBS						
Rank	3.33 (1.82)	3.0 (2.51)	*n/a*	*n/a*	*n/a*	*n/a*
Angle	42.35 (43.24)	33.11 (26.40)	*n/a*	*n/a*	*n/a*	*n/a*
Mother's education*	4.24 (1.69)	4.84 (1.17)	*n/a*	*n/a*	<.01	*n/a*
Father's education*	4.78 (1.48)	4.95 (1.19)	*n/a*	*n/a*	.64	*n/a*

Note: *d* = Cohen's *d*. EAT-26_1 items were scored using Garner et al.'s (1982) 0-3 scale; EAT-26_2 items were scored using a 1-6 scale; *Group mean differences were assessed using the Mann-Whitney Test.

Table 2

Internal Consistency and Test-Retest Reliability of Measures

Questionnaire	Population	Internal Consistency	Test-retest Reliability
EAT-26	Euro-Americans (n=210)	.90	*n/a*
	Indians (n=225)	.80	*n/a*
GFFS	Euro-Americans (n=211)	.82	*n/a*
	Indians (n=226)	.78	*n/a*
AFA	Euro-Americans (n=210)	.82	*n/a*
	Indians (n=231)	.74	*n/a*
Westernization Scale	Indians (n=232)	.85	.90 (n = 71)
SAWBS (angle)	Indians (n=70)	*n/a*	.58
SAWBS (rank)	Indians (n=70)	*n/a*	.26
MSAWBS (angle)	Indians (n=68)	*n/a*	.57
MSAWBS (rank)	Indians (n=68)	*n/a*	.52

Table 3

Kaiser's Measure of Sampling Adequacy Estimates for GFFS and AFA Individual Items

Item	GFFS		AFA	
	Indian	Euro-American	Indian	Euro-American
1	.79	.88	.72	.70
2	.81	.89	.70	.66
3	.85	.72	.76	.83
4	.68	.61	.78	.79
5	.82	.75	.84	.81
6	.82	.87	.82	.82
7	.85	.88	.52	.81
8	.75	.83	.75	.83
9	.83	.73	.82	.77
10	.76	.77	.79	.79
11	*n/a*	*n/a*	.81	.93
12	*n/a*	*n/a*	.80	.82
13	*n/a*	*n/a*	.78	.79

Table 4

Kaiser's Measure of Sampling Adequacy Estimates for EAT-26 Individual Items

Item	Indian	Euro-American	Item	Indian	Euro-American
1	.87	.93	14	.84	.92
2	.89	.90	15	.70	.52
3	.67	.88	16	.83	.88
4	.83	.90	17	.84	.88
5	.63	.81	18	.59	.92
6	.90	.90	19	.83	.74
7	.90	.92	20	.70	.86
8	.75	.68	21	.76	.93
9	.54	.80	22	.82	.94
10	.86	.94	23	.91	.93
11	.89	.94	24	.88	.75
12	.87	.91	25	.70	.75
13	.80	.62	26	.65	.83

Table 5

Completely Standardized Parameter Estimates for the GFFS

GFFS item	Indian Women			Euro-American Women		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
1	.88			.62		
2	.82			.61		
3	.54			.47		
4			.34			.66
5			.95			.79
6	.76			.68		
7		.50			.61	
8		.52			.62	
9		.51			.49	
10		.51			.42	

Table 6

Model Fit of the GFFS 3-Factor Solution

Population	Model Specification	Contribution to χ^2 (%)	GFI	SRMR
Indians	Parameters unconstrained.	37.30	.95	.049
Euro-Americans		60.70	.92	.061
Indians	Constrained factor loading matrix.	36.06	.94	.076
Euro-Americans		61.94	.91	.091
Indians	Constrained factor loading and factor intercorrelations matrices.	38.05	.94	.074
Euro-Americans		61.95	.90	.091
Indians	Constrained factor loading, factor intercorrelations, and error terms matrices.	38.37	.93	.087
Euro-Americans		61.63	.89	.097

Note: χ^2 = the Normal Theory Weighted Least Squares Chi-Square; GFI = Goodness of Fit Index; SRMR = Standardized Root Mean Square Residual.

Table 7

Global Goodness-of-Fit Statistics for the GFFS 3-Factor Solution

Model	χ^2	*df*	NFI	CFI	NNFI	RMSEA	Δ *df*	Δ $\chi^2$1	*p*1
1	97.24	65	0.93	0.95	0.94	0.05			
2	120.70	75	0.86	0.91	0.89	0.05			
			Compare Model 1 to 2				10	23.46	<.01
3	125.91	78	0.91	0.94	0.93	0.05			
			Compare Model 1 to 3				13	28.67	<.01
			Compare Model 2 to 3				3	5.21	.16
4	153.01	87	0.82	0.88	0.87	0.06			
			Compare Model 1 to 4				22	55.77	<.01
			Compare Model 2 to 4				12	32.31	<.01
			Compare Model 3 to 4				9	27.1	<.01

Model 1: baseline (parameters unconstrained); Model 2: constrained factor loading (LX) matrix; Model 3: constrained factor loading (LX) and factor intercorrelations (PH) matrices; Model 4: constrained factor loading (LX), factor intercorrelations (PH), and error terms (TD) matrices; NFI = Normed Fit Index; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index/Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation. χ^2 is the Satorra-Bentler Scaled Chi-Square.

Table 8

Completely Standardized Parameter Estimates for the AFA

AFA item	Indian Women				Euro-American Women			
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2	Factor 3	Factor 4
1		0.84				0.83		
2		0.85				0.92		
3		0.81				0.68		
4			0.55				0.63	
5	0.51				0.76			
6	0.61				0.82			
7			0.30				0.52	
8			0.71				0.80	
9	0.55				0.68			
10	0.69				0.68			
11				0.46				0.48
12				0.61				0.81
13				0.83				0.83

Table 9

Model Fit of the AFA 4-Factor Solution

Population	Model Specification	Contribution to χ^2 (%)	GFI	SRMR
Indians	Parameters unconstrained.	31.22	.95	.06
Euro-Americans		68.78	.88	.07
Indians	Constrained factor loading matrix.	35.20	.93	.08
Euro-Americans		64.80	.86	.09
Indians	Constrained factor loading and factor intercorrelations matrices.	35.59	.93	.08
Euro-Americans		64.61	.86	.09
Indians	Constrained factor loading, factor intercorrelations, and error terms matrices.	31.05	.89	.12
Euro-Americans		68.95	.76	.13

Note: χ^2 = the Normal Theory Weighted Least Squares Chi-Square; GFI = Goodness of Fit Index; SRMR = Standardized Root Mean Square Residual.

Table 10

Global Goodness-of-Fit Statistics for the AFA 4-Factor Solution

Model	χ^2	*df*	*p*	NFI	CFI	NNFI	RMSEA	Δ *df*	Δ χ^2	*p*1
1	108.89	118	0.71	0.87	0.92	0.89	<0.01			
2	139.88	131	0.28	0.84	0.90	0.88	0.02			
			Compare Model 1 to 2					13	30.99	<.01
3	144.77	137	0.31	0.84	0.90	0.89	0.02			
			Compare Model 1 to 3					19	35.88	.01
			Compare Model 2 to 3					6	4.89	.56
4	299.65	150	<0.01	0.70	0.75	0.74	0.07			
			Compare Model 1 to 4					32	190.76	<.01
			Compare Model 2 to 4					19	159.77	<.01
			Compare Model 3 to 4					13	154.88	<.01

Note: Model 1: baseline (parameters unconstrained); Model 2: constrained factor loading (LX) matrix; Model 3: constrained factor loading (LX) and factor intercorrelations (PH) matrices; Model 4: constrained factor loading (LX), factor intercorrelations (PH), and error terms (TD) matrices; NFI = Normed Fit Index; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index/Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation. χ^2 is the Satorra-Bentler Scaled Chi-Square.

Table 11

Completely Standardized Parameter Estimates for the EAT-26 4-Parcels 1-Factor Solution

Item parcel	Indian Women	Euro-American Women
	Factor 1	Factor 1
1	0.79	0.84
2	0.87	0.86
3	0.53	0.74
4	0.19	0.59

Table 12

Model Fit of the EAT-26 4-Parcels 1-Factor Solution

Population	Model Specification	Contribution to χ^2 (%)	GFI	SRMR
Indians	Parameters unconstrained.	77	.95	.08
Euro-Americans		23	.98	.03
Indians	Constrained factor loading matrix.	68.96	.90	.13
Euro-Americans		31.04	.96	.15
Indians	Constrained factor loading and factor intercorrelations matrices.	68.96	.90	.13
Euro-Americans		31.04	.96	.15
Indians	Constrained factor loading, factor intercorrelations, and error terms matrices.	56.38	.89	.15
Euro-Americans		43.62	.91	.16

Note: χ^2 = the Normal Theory Weighted Least Squares Chi-Square; GFI = Goodness of Fit Index; SRMR = Standardized Root Mean Square Residual.

Table 13

Global Goodness-of-Fit Statistics for the EAT-26 4-Parcels 1-Factor Solution

Model	χ^2	*df*	NFI	CFI	NNFI	RMSEA	Δ *df*	Δ $\chi^2$1	*p*1
1	20.91	4	0.94	0.95	0.94	0.14			
2	52.08	8	0.91	0.92	0.88	0.16			
			Compare Model 1 to 2				4	31.17	.01
3	77	12	0.86	0.88	0.88	0.16			
			Compare Model 1 to 3				8	56.09	<.01
			Compare Model 2 to 3				4	24.92	.01

Model 1: baseline (parameters unconstrained); Model 2: constrained factor loading (LX) matrix; Model 3: constrained factor loading (LX) and error terms (TD) matrices; NFI = Normed Fit Index; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index/Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation. χ^2 is the Satorra-Bentler Scaled Chi-Square.

Table 14

Correlations among Hypothesized Predictors of EAT-26 Sum Scores (Indian Data)

	WEST	EAT-26	BMI	AFA	GFFS	MOMEDUC	DADEDUC	Income
WEST	—	-.08	.08	-.11	-.03	.30**	.17**	.15
EAT-26		—	.27**	.40**	.62**	-.06	<.01	-.07
BMI			—	.17*	.39**	.02	-.02	.04
AFA				—	.63**	-.03	.04	-.09
GFFS					—	-.09	-.04	<-.01
MOMEDUC						—	.46**	-.08
DADEDUC							—	.02
Income								—

*Note: *Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). WEST represents the sum scores of the "Westernization index"; EAT-26, GFFS, and AFA represent sum scores of the respective scales; MOMEDUC and DADEDUC represent mother's and father's education levels, respectively; Income represents annual combined family income in Indian Rupees.*

Table 15

Comparison of Indian and Euro-American Latent Means

	GFFS		
	Gain	Control	Conseq
Parameter Estimate	0.27	0.11	-0.38
Standard Error	0.33	0.39	0.29
Confidence Interval	-0.39 – 0.93	-0.67 – 0.89	-0.96 – 0.2
t-statistic	0.80	0.29	-1.33

	AFA			
	Dislike	Fear	Controllab	Interact
Parameter Estimate	-0.33	0.21	0.00	0.06
Standard Error	0.11	0.10	0.11	0.11
Confidence Interval	-0.55 – 0.11*	0.01 – 0.41*	-0.22 – 0.22	-0.16 – 0.28
t-statistic	-2.98	2.04	-0.03	0.53

	EAT-26
	EatAtt
Parameter Estimate	-0.10
Standard Error	0.10
Confidence Interval	-0.3 – 0.1
t-statistic	-0.93

*Note: * comparison is significant at the 0.05 level (2-tailed).*

Table 16

Global Goodness-of-Fit Statistics (AFA, GFFS, and EAT-26)

Model	χ^2	*df*	NFI	CFI	NNFI	RMSEA	GFI
Measurement model	137.43	41	0.93	0.95	0.93	0.11	0.89
Structural equation model	137.43	41	0.88	0.91	0.88	0.11	0.89

NFI = Normed Fit Index; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index/Tucker-Lewis Index; RMSEA = Root Mean Square Error or Approximation; GFI = Goodness of Fit Index. χ^2 is the Satorra-Bentler Scaled Chi-Square.

Table 17

Completely Standardized Parameter Estimates (Factor Loadings) for the Indian Measurement Model

Item Parcel	GFFS	AFA	EAT-26
GFFS P1	0.70		
GFFS P2	0.76		
GFFS P3	0.81		
AFA P1		0.75	
AFA P2		0.43	
AFA P3		0.38	
AFA P4		0.88	
EAT-26 P1			0.61
EAT-26 P2			0.60
EAT-26 P3			0.81
EAT-26 P4			0.85

Note: P1, P2, P3, and P4 represent the first, second, third and fourth parcels of each questionnaire respectively.

VITA

Suman Ambwani
c/o Mr. N.K. Ambwani
30, Forjett Street
Mumbai, 400036, India

Education

B.A. Summa Cum Laude, Psychology and Sociology. Macalester College, May 2003.
M.S. Psychology. Texas A&M University, May 2005.

Publications

Gleaves, D.H. and Ambwani, S. (in press). Is BDD a culturally determined expression of a body image disorder? In M. Maj, H.S. Akiskal, J.E. Mezzich, and A. Okasha (Eds.) *Evidence and Experience in Psychiatry* Vol.9, Chichester: Wiley.

Presentations

Brown, K.T., & Ambwani, S. (2002, July). *Consequences of self-identification on first impression discrepancy for Black Americans*. Poster presented at the annual meeting of the Society for Psychological Study of Social Issues, Toronto, Canada.

Ambwani, S., Strauss, J., & Kousha, M. (2003, Nov.) *Unraveling 'Guys' and 'Dolls': A psychosocial assessment of body image, gender and romantic relationships*. Poster presented at the annual meeting of the Association for Advancement of Behavior Therapy, Boston.

Ambwani, S., Warren, C. S., Gleaves, D. H., Cepeda-Benito, A., & Fernandez, M. C. (2004, July). *Culture, gender and fear of fatness.* Poster presented at the annual meeting of the American Psychological Association, Honolulu.

Ambwani, S., Gleaves, D.H., & Busa, S. (2004, November). *Motappa ka Darr: A cross-cultural study of fear of fatness in India.* Poster presented at the annual meeting of the Association for Advancement of Behavior Therapy, New Orleans.

Graham, E., Ambwani, S., & Gleaves, D.H. (2004, November). *Measuring "Orthorexia": Development of the Eating Habits Questionnaire.* Poster presented at the annual meeting of the Association for Advancement of Behavior Therapy, New Orleans.

Ambwani, S., Strauss, J., Busa, S., & Peterson, K. (2005, April). *Body image and romantic love: An exploration of gender differences.* Poster accepted for presentation at the International Conference on Eating Disorders, Montreal, Canada.

Ambwani, S., Gleaves, D.H., & Reaux-Dismukes, M. (2005, August). *Assessment of eating attitudes in India and the United States.* Poster accepted for presentation at the annual meeting of the American Psychological Association, Washington, D.C.