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HOW DO FAMILY FUNCTIONING AND AGE OF ONSET OF WEIGHT PROBLEMS RELATE TO OVERWEIGHT ADOLESCENTS' INTERNALIZING SYMPTOMS?

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HOW DO FAMILY FUNCTIONING AND AGE OF ONSET OF WEIGHT PROBLEMS RELATE TO OVERWEIGHT ADOLESCENTS' INTERNALIZING SYMPTOMS?

By

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ABSTRACT

HOW DO FAMILY FUNCTIONING AND AGE OF ONSET OF WEIGHT PROBLEMS RELATE TO OVERWEIGHT ADOLESCENTS' INTERNALIZING SYMPTOMS?

By

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Objective: Family functioning and age of on set of weight problems have been identified as correlates of psychopathology in the adult obesity literature, but have not sufficiently been investigated in overweight adolescents' functioning. This study aimed to explore the effects of individual perceptions of family functioning (FF) in adolescents and parents, as well as the influence of discrepancies between family members in perceptions of FF, on adolescent internalizing symptoms. A secondary aim included examining whether earlier age of onset of weight problems predicted adolescents' experience of internalizing symptoms. Method: Participants included two samples of families who sought family-based pediatric weight management treatment: 1) 626 mother-adolescent dyads; and 2) 396 mother-adolescent-father triads ("intact families"). Adolescent reports of depression, anxiety, and worthlessness were examined along with adolescent and parent reports of family cohesion and adaptability. Structural equation modeling was used to examine predictive relationships between FF (both perceptions and discrepancies), age of onset, and internalizing symptoms for each sample and adolescent gender. Results: The best-fitting models were essentially identical for both samples across gender. Findings illustrated that: a) parental perceptions of decreased FF predicted psychological distress in both overweight male and female adolescents; 2) adolescents suffering from internalizing symptoms were more likely to report negative perceptions of

FF; and 3) greater parental-adolescent discrepancies were predicted by adolescents' internalizing symptoms. Earlier age of onset, however, was not found to predict increased internalizing symptoms. Finally, parental perceptions of FF were found to predict adolescent perceptions of FF for adolescents in intact families only. Discussion: These findings provide evidence that adolescent weight management programs and other health care providers should address the significant influence that poor family functioning plays in predicting overweight adolescents' internalizing symptoms. The current results also emphasize the need of obtaining multiple reports of FF (including parental reports) given that adolescents' internalizing symptoms appear to adversely influence their perceptions of FF. As such, programs should focus on decreasing adolescents' symptomatology by helping families achieve more adaptive levels of family cohesion and adaptability. Results also illustrate the important role adolescent internalizing symptoms play in predicting greater discrepancies in parental-adolescent perceptions of FF. Consequently, programs should also educate families about the impact of adolescent internalizing symptoms on FF and the importance of adjusting family relations to address the needs of its members. Finally, age of onset of weight problems was not found to exert any influence on overweight adolescents' internalizing symptoms. Possible reasons for this finding are provided along with recommendations for future research.

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KEY FOR THE MEASUREMENT MODELS

Predictors of Adolescent Internalizing Symptoms

Age of Onset	Observed Variable
Age of Onset–Parent Report	*onset*

Family Functioning (FF)	Observed Variable
FACES-III	
Family Cohesion	
Cohesion–Adolescent	*adolcoh*
Cohesion–Maternal	*allmomc*
Cohesion–Paternal	*alldadc*
Family Adaptability	
Adaptability–Adolescent	*adolad*
Adaptability–Maternal	*allmoma*
Adaptability–Paternal	*alldada*
Parent-Adolescent Relative Discrepancies in FF	
Maternal-Adolescent Relative Discrepancies in:	
Cohesion	*amdisco*
Adaptability	*amdisad*
Paternal-Adolescent Relative Discrepancies in:	
Cohesion	*addisco*
Adaptability	*addisad*

Adolescent Internalizing Symptom Variables

Internalizing Symptoms	Observed Variable
BDI-SF	
Depression	*depress*
RCMAS	
Total Anxiety	*totanx*
SPPA	
Global Self-Worth	*lesswrth**

*(*Reverse scored to measure worthlessness).*

INTRODUCTION

Approximately 16% of all children and adolescents are overweight in the United States (Hedley et al., 2004; Ogden, Flegal, Carroll, & Johnson, 2002; U.S. Department of Health and Human Services [USDHHS], 2002) and are at increased risk of becoming obese adults (Guo et al., 2000; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994; Guo, Wu, Chumlea, & Roche, 2002; Mossberg, 1989; Power, Lake, & Cole, 1997; Whitaker, Wright, Pepe, Seidel & Dietz, 1997). Specifically, studies have shown that roughly 50% - 80% of all overweight children and adolescents will become obese adults (Freedman, Dietz, Srinivasan, & Berenson, 1999; Moran, 1999; Mossberg, 1989). In addition, the transitional period between adolescence and young adulthood (i.e., 5 year period) has been identified as a "period of *increased* risk of development of obesity" for adolescent males and females from all major US ethnic groups (Gordon-Larsen, Adair, Nelson & Popkin, 2004).

The physical consequences of child and adolescent obesity are numerous and have correspondingly tripled pediatric obesity-related hospital costs over the past 20 years (Wang & Dietz, 2002). For example, childhood and adolescent obesity have been related to elevations in blood pressure, cholesterol, abnormalities in respiration, and sleep apnea (Dietz, 1998; Freedman et al., 1987; Must & Strauss, 1999; Unger, Kreeger, & Chistoffel, 1990). Additionally, an increased prevalence of two health conditions thought to occur mostly in adults, glucose intolerance and hyperinsulinemia, have been increasingly found in overweight children and adolescents (Cook, Weitzman, Auinger, Nguyen, & Dietz, 2003; Fagot-Campagna et al., 2000; Pinhas-Hamiel et al., 1996; Rosenbloom, Joe, Young, & Winter, 1999; Srinivasan, Myers, & Berenson, 2002).

The long-term effects of childhood obesity on rates of adult disease have also been documented. Overweight in adolescence has been related to increased risk factors for coronary heart disease (Freedman et al., 1999; Raitakari, Juonala, & Viikari, 2005), and increased rates of atherosclerosis, gout, hip fracture (Must, Jacques, Dallal, Bajema, & Dietz, 1992) and hypertension in adulthood (Mijailović, Micić, & Mijailović, 2001). In addition, evidence of increased mortality rates related to coronary heart disease has been found in adult males who were obese in adolescence (Must et al., 1992). As a result, the reduction of obesity in children and adolescents has engendered national concern and become an objective in the Healthy People 2010 initiative (Healthy People 2010).

Psychological Problems of Overweight/Obese Adolescents

In addition to the physical costs of obesity, research has shown that emotional and psychological factors may affect the course and outcome of obesity. This research suggests that internalizing symptoms in particular may affect these features of obesity, and that internalizing symptoms may also have important health consequences for children who are overweight. Several types of internalizing symptoms have been investigated; however, findings suggest that depressive symptoms, anxiety, and low self-esteem may be particularly important to examine.

Depressive and Anxious Symptoms

A number of studies have found higher levels of depressive symptoms and anxiety in overweight or obese adolescents as compared with normal-weight peers (Britz

et al., 2000; Erermis et al., 2004; Falkner et al., 2001; Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002; Pinhas-Hamiel et al., 2006; Schwimmer, Burwinkle, & Varni, 2003; Vila et al., 2004). Indeed, obese adolescents have been found to be more likely to report "serious emotional problems" in the last year as compared with normal weight peers (Falkner et al., 2001). Obese adolescent girls, in particular, have been found to be more likely to report having attempted suicide within the last year (Falkner et al., 2001). In addition, a recent study found that obese French children and adolescents met DSM-IV criteria (APA, 1994) for anxiety disorders, especially separation anxiety and social phobia (Vila et al., 2004). A small study of extremely obese German adolescents (N = 47) also found that a relatively high percentage met DSM-IV criteria for a mood or anxiety disorder (i.e., 43% and 40%; Britz et al., 2000).

In contrast, other studies have indicated that not all overweight adolescents have increased rates of depression or anxiety (Friedman, Wilfley, Pike, Striegel-Moore, & Rodin, 1995; Gordon-Larsen, 2001; Lamertz, Jacobi, Yassouridis, Arnold, & Henkel, 2002; Swallen, Reither, Haas, & Meier, 2005). For example, Swallen et al. (2005) found evidence of a significant relationship between overweight/obesity and depression for only *young* adolescents (ages 12-14) and not those in other age groups. It is important to note that the incongruent results of these studies may be related to methodological differences in the assessment of depression and anxiety (i.e., structured interviews, self-reports, parental reports) and the use of different control groups (i.e., treatment-seeking, inpatient, population-based clinical controls, school-based samples, etc.). Moreover, a recent review of the literature on mood disorders and obesity (i.e., from 1966 to 2003) found

mood disorders to be common in children and adolescents who seek treatment for overweight, especially severe obesity (McElroy et al., 2004).

The importance of examining depression and anxiety in overweight adolescents has also been underscored by the identification of poor psychological functioning as a risk factor for obesity. In a nationally representative sample, Goodman and Whitaker (2002) found that depressed mood in adolescence predicted both the persistence of obesity (i.e., through increased age-adjusted Body Mass Index) in already obese adolescents, and the development of obesity in non-obese adolescents one year later. These findings were found to persist even after controlling for a number of personal (i.e., baseline BMI, age, race, gender, low self-esteem, low levels of physical activity) and familial factors (i.e., family SES, parental obesity, number of parents living in the home) related to obesity and depression. Pine, Goldstein, Wolk, and Weissman (2001) also found depression during childhood and adolescence predicted increased body mass index in adulthood. In fact, a dose-response relationship has been demonstrated between the number of episodes of depression experienced during adolescence and women's risk of becoming obese in adulthood (Richardson et al., 2003).

Additional support for the relationship between depressive symptoms during childhood (i.e., before age 17) and BMI in adulthood was found by Hasler et al. (2005). Results illustrated a strong relationship between childhood-onset depressive symptoms and both increased BMI and obesity in adulthood in women, even after controlling for adult psychopathology and family history of weight problems. Men were found to have similar results. Taken together, these studies suggest that depression and its related

constructs are important features to investigate in overweight adolescents, especially in those who seek weight management treatment.

Self-Worth and Self-Esteem

Similar to the results of research examining depression and anxiety in overweight adolescents, divergent results have been found when overweight adolescents' self-worth and self-esteem have been compared to normal-weight controls. Indeed, findings from a number of studies have found significant decreases in overweight adolescents' self-worth (Stradmeijer, Bosch, Koops, & Seidell, 2000) and self-esteem (Erermis et al., 2004; French, Story, & Perry, 1995; Mendelson & White, 1985; Sallade, 1973; Strauss, 2000; Strauss, Smith, Frame, & Forehand, 1985; von Almen, Figueroa-Colon, & Suskind, 1992; Zeller, Saelens, Roehrig, Kirk, & Daniels, 2004). Significant decreases in body-esteem (i.e., self-esteem regarding one's body; Mendelson & White, 1985; Stradmeijer et al., 2000) have also been reported by overweight male and female adolescents.

On the other hand, some studies have failed to find differences in self-esteem between overweight and obese adolescents and community samples of normal-weight adolescents (Mendelson & White, 1982; Swallen et al., 2005; Wadden, Foster, Brownell, & Finley, 1984). Much in the same way that findings differed regarding mood symptoms in overweight adolescents, the inconsistent results in the self-esteem/self-worth literature may be an outcome of methodological limitations (i.e., use of inconsistent measures, various sample sizes, combining children with adolescents, broad membership of normal-weight control groups) (French et al., 1995). Even so, the examination of overweight adolescents' feelings of worthlessness continues to be an important area to research. For

example, evidence exists that overweight adolescents are more socially marginalized (i.e., by their school peers) than normal weight adolescents (Strauss & Pollack, 2003). In addition, the self-esteem of overweight adolescents (including their overall emotional well-being) has been found to decrease significantly when weight-based teasing was experienced from family and peers (Eisenberg, Neumark-Sztainer, & Story, 2003). Thus, it is possible that adolescents who enter obesity treatment may be at particular risk of having low self-worth or self-esteem given their increased likelihood of having been socially marginalized and teased. Finally, additional research is necessary within this subgroup to clarify our understanding of their perceptions of self-worth and identify factors that may predict decreases in their self-worth.

Summary and Directions for Additional Research

Although not all studies have supported a link between depression and obesity (e.g., Bardone et al., 1998; Pine, Cohen, Brook, & Coplan, 1997; Richardson et al., 2003), the bulk of findings for obesity and other physical ailments (e.g., Cuneo & Schiaffino, 2002) suggest a need to further investigate internalizing symptoms in children who are overweight. In particular, it will be important to investigate factors that influence the development of depression in overweight adolescents who appear to be at greater risk of chronic obesity. By investigating potential risk factors for depression and its related constructs, implications for clinical interventions can be made that have the potential to decrease the course of obesity and internalizing symptoms in overweight youth.

Most of the research discussed above has also examined mean differences in

psychological functioning between overweight (i.e., children, adolescents and their parents) and normal-weight controls. A call for a "second generation of studies" that identifies possible risk factors related to psychological problems *within* an overweight population has been made (Friedman & Brownell, 1995). The present dissertation addresses this research gap by examining family functioning and age of onset of weight problems as predictors of adolescent depression and its related constructs (i.e., anxiety & worthlessness) in a sample of overweight adolescents and their parents.

Results from the proposed study have the potential to explain the heterogeneity of psychological and family functioning found within populations of overweight adolescents and their parents. Knowledge of potential mechanisms related to decreased emotional well-being in adolescents could prevent the development of obesity in adolescents who are not already obese. In addition, the proposed study's findings may influence the design of assessment and treatment protocols that address internalizing difficulties and weight problems separately and in tandem (Goodman & Whitaker, 2002). Thus, family-based weight management intervention programs, family and adolescent psychotherapy, and counseling provided by various providers (e.g., dietitians, nutritionists, & pediatricians) may also be informed through the identification of potential issues to target.

Family Functioning and Age of Onset as Predictors of Psychological Difficulties

Several factors may affect overweight adolescents' psychological functioning. While family influences and age of onset of weight problems are two potential contributors that have been examined as correlates of psychopathology in the adult

obesity literature, they have not been sufficiently investigated in overweight adolescents' functioning. In general, adolescents' developmental tasks of establishing autonomy and healthy individuation call upon the ability of their families to adjust and modify their standards of relatedness. Problems in family functioning have been found to lead to internalizing and externalizing problems in adolescents (Allen, Hauser, Eickholt, Bell, & O'Connor, 1994; Crawford, Cohen, Midlarsky, & Brook, 2001). Age of onset of weight problems has also been related to greater psychological distress in adults (Mills, 1995; Mills & Andrianopoulos, 1993). Investigating the role of family functioning and age of onset in overweight adolescents' internalizing symptoms has the potential to decrease adolescents' risk of chronic obesity by identifying psychological symptoms that can be targeted for treatment.

Family Functioning

Several theorists have argued for a role of family functioning in pediatric obesity. Childhood and adolescent obesity have been conceptualized as a "family condition" (Bjornson, 1997) where the obese child serves as a "compensatory mechanism" (Bruch, 1975; Hecker, Martin, & Martin, 1986) that attempts to simultaneously mask and call attention to disturbances in family relationships and communication. Communication within families of obese children has been described as "grossly disturbed in content, in conflicting emotional messages, and in role allocation" (Klingman, 1981). Research has also found that families with obese children avoid conflict resolution (Ganley, 1986) likely due to a lack of effective communication, negotiation, and emotional regulation skills. In addition, families with obese children have also been hypothesized to share

similarities with psychosomatic families in their level of overinvolvement in each other's lives and rigid patterns of functioning (Minuchin, Rosman, & Baker, 1978).

Despite the above research, few empirical studies have investigated the family dynamics of overweight adolescents. Research has generally found poor family functioning in some families of overweight adolescents. For example, Mendelson, White, and Schliecker (1995) found an inverse relationship between increases in overweight and adolescent perceptions of decreased family cohesion, expressiveness, and participation in family decision-making (i.e., democratic parenting) by obese adolescent females. Results of a recent study found poor family communication to be a risk factor for higher BMI values in older male children (Chen & Kennedy, 2004). In addition, obese adolescents and their parents have been found to endorse family problems as one possible cause of adolescent obesity (Uzark, Becker, Dielman, Rocchini, & Katch, 1988). Indeed, obese adolescents who attributed their obesity to difficulties in family functioning were found to report more problems in their families *and* lost less weight during hospital-based obesity treatment (Uzark et al., 1988).

Together, these findings suggest that disturbed family functioning is present in some families of overweight adolescents. It is possible that the mechanism through which these disturbed patterns influence overweight is through the influence on internalizing symptoms. For example, lower levels of family cohesion and adaptability may increase overweight adolescents' symptoms of depression, anxiety, and low self-worth due to the increased likelihood of emotional disengagement and inconsistent parental support. In addition, increased symptomatology may influence the adoption and/or maintenance of health compromising behaviors (i.e., overeating, sedentary

behavior, poor nutrition), which in turn, can lead to increased weight gain. While previous research has not examined these potential relationships, studies have begun to delineate the potentially important characteristics of family functioning that contribute to internalizing symptoms in the general population of children and adolescents. Thus, examining these characteristics of family functioning in families of overweight adolescents might elucidate why some overweight adolescents experience internalizing symptoms while others do not.

Family Cohesion and Adaptability

Circumplex Model. Currently, the role of family functioning in the psychological health of overweight adolescents remains largely unknown. Family cohesion and adaptability are two areas of family functioning that have been found to be related to internalizing symptoms (i.e., depression, anxiety, and self-worth) in adolescents (Ohannessian, Lerner, Lerner, & von Eye, 1995, 1998, 2000; Shek, 1998). Thus, they may be important for the psychological functioning of overweight adolescents. Both dimensions of family functioning play integral roles in the Circumplex Model of family functioning (Olson, 1986; Olson, Russell, & Sprenkle 1983), which highlights optimal family functioning as a balance between cohesion and adaptability.

Family cohesion has been referred to as the level of emotional connectedness or bonding that family members feel in their family (Olson, McCubbin, et al., 1989). Cohesion can be reflected in the amount of time, space, and interests family members share as well as in the coalitions and family boundaries they uphold (Kouneski, 2000). Family adaptability or flexibility has been described as the degree of change in a family's

relationship structure and guidelines of functioning (Olson, McCubbin, et al., 1989). Adaptability can be reflected in the discipline and rules families maintain as well as the leadership and degree of negotiation endorsed within a family (Kouneski, 2000). Too much or too little connectedness or adaptability has been hypothesized to be problematic in families over time (Olson, McCubbin, et al., 1989).

Effectively balancing cohesion and adaptability may be especially challenging for families during important developmental transitions (i.e., between elementary, middle, and high school; prepubescence to puberty), which call for increased autonomy from parents (Conger & Petersen, 1984; Lerner & Galambos, 1998; Petersen & Hamburg, 1986; Smith & Rutter, 1995; Steinberg & Silverberg, 1986). In fact, family conflict has been found to increase during early adolescence as parent-child relationships become transformed via adolescents' practice of increased autonomy (Montemayor, 1983). Given that family therapy techniques are frequently successful in pediatric weight management programs to assist families in improving their interpersonal relationships and lifestyles (Mellin, 1987), it is likely that family-based treatments may be effective by decreasing family stress.

Negative family interactions may result from parent-adolescent struggles around weight management that may be experienced by adolescents as intrusive and shaming despite parents' intentions to be of help. It is likely that repeatedly tense interactions may negatively impact family cohesion, and increase adolescents' negative affective and cognitive self-perceptions. Adolescent perceptions of family interactions may be particularly critical to research given recent findings that highlight the predictive role of adolescents' perceptions of parental rejection on adolescent depression and aggression

(Akse, Hale, Engels, Raaijmakers & Meeus, 2004; Hale, Van Der Valk, Engels, & Meeus, 2005). Thus, improved family functioning may, in turn, decrease adolescent psychological distress and increase the likelihood that overweight adolescents achieve treatment success. Altogether, it would seem important to examine family functioning as a predictor of psychological difficulties in overweight adolescents. However, a paucity of research exists examining these relationships in *overweight* adolescents and their families.

Empirical Research on Family Cohesion and Adaptability. Research in the general family functioning literature has demonstrated an inverse relationship between cohesion and adaptability, and internalizing symptoms in adolescents (Cuffe, McKeown, Addy, & Garrison, 2005; Kashani, Suarez, Jones, & Reid, 1999; McKeown, Garrison, & Jackson, 1997). For example, low family cohesion has been found to be associated with increased depressive symptomatology (Garrison et al., 1992; McKeown et al., 1997) and psychiatric diagnoses of affective or anxiety disorders in adolescents (Cuffe et al., 2005). In addition, lower levels of cohesion and adaptability have been found in school refusing adolescents who exhibit comorbid anxiety and major depressive disorders (Bernstein, Warren, Massie, & Thuras, 1999). Finally, clinically depressed adolescents seeking inpatient treatment have reported low family adaptability (Kashani et al., 1999).

To date, there are no studies that have examined both family cohesion and adaptability as correlates of psychological difficulties among overweight US adolescents. One notable exception includes a study conducted by Mellin et al. (2002) which examined the relationship between adolescent perceptions of family connectedness (i.e., a possible proxy for family cohesion), self-reported health-related behaviors (e.g., eating

breakfast, physical activity, extreme dieting), and psychosocial well-being (i.e., emotional distress, school performance, future educational plans) in a very large, diverse and statewide representative sample of overweight and non-overweight adolescents. Results indicated that overweight adolescents reported greater levels of emotional distress as compared to their non-overweight peers. In addition, overweight adolescents' level of emotional distress was found to be inversely related to their perceived family connectedness for males and females. These findings illustrate the importance of cohesion in family relationships and the role of adolescent perceptions of constrained family relations in overweight adolescents' negative psychological health.

Summary and Directions for Additional Research. Prior research has generally not examined family functioning as a predictor of internalizing symptoms in overweight adolescents despite promising results obtained by Mellin et al. (2002). Family cohesion and adaptability appear to be particularly important to investigate in families of overweight adolescents given their link to internalizing symptoms in the general adolescent population. Future studies examining the relationship between family functioning and overweight adolescents' internalizing symptoms should improve upon past research by including multiple informants of family functioning, examining discrepancies in perceptions of family functioning, and investigating the reciprocal relationship between overweight adolescents' psychological adjustment and multiple informants' perceptions of family functioning.

Obtaining multiple sources of family functioning would be especially important since adolescents tend to report different perceptions of their family's functioning, often more negative, as compared with their parents (Mendelson et al., 1995; Noller & Callan,

1986; Ohannessian et al., 1995). Examining multiple family members' perceptions of FF would also elucidate how differences in adolescent perceptions of FF may be confounded by their psychological functioning. For example, depression or anxiety may color adolescents' perceptions of their family functioning and result in reports of even lower cohesion and/or flexibility than might be related to the normal developmental process of adolescent individuation.

Another limitation of previous research is the failure to examine the influence of discrepancies in perceptions of family functioning (between adolescents and their parents) on overweight adolescents' psychological health. Longitudinal research on general adolescent emotional adjustment and family functioning has found larger discrepancies in adolescent-parent perceptions of family cohesion and adaptability to be related to higher levels of depression and anxiety (Ohannessian et al., 1995), and lower levels of self-esteem (Shek, 1998) and self-competence during adolescence, especially for adolescent girls (Ohannessian et al., 2000). Discrepancies in perceptions of family cohesion and adaptability have been hypothesized to be related to adolescents' development of emotional and behavioral autonomy, respectively (Ohannessian et al., 1995). While minor discrepancies are developmentally appropriate (Steinberg, 1990), large discrepancies may be indicative of family stress that hold implications for adolescent psychological distress. As such, discrepancies in perceptions of family functioning may be better predictors of adolescent psychological distress than individual family members' perceptions. To date, discrepancies in perceptions of FF have never been explored in families of overweight adolescents.

Previous research has also failed to investigate the possibility that overweight adolescents' internalizing symptoms may predict parent-adolescent relations (rather than, or in addition to, the reverse). Theories of human development from ecological (e.g., Bronfenbrenner, 1979) and developmental contextualistic perspectives (e.g., Lerner, Hultsch, & Dixon, 1983) have demonstrated the reciprocal relationship (i.e., bidirectional) between characteristics of individuals such as negative affect and the systems within which they live. Empirical evidence has also documented the reciprocal relationship between adolescents' internalizing symptoms (e.g., depression, anxiety, self-worth) and their family's cohesion and adaptability (Ohannessian et al., 1995, 2000).

Given these associations, it is possible that overweight adolescents' internalizing symptoms may influence levels of family cohesion and adaptability as well as the discrepancies found between adolescent and parent reports. For example, symptoms of internalizing difficulties such as irritability and withdrawal in adolescents may negatively impact adolescent-parent interactions and result in lower levels of perceived cohesion for both adolescents and their parents. The dynamics of power within adolescent-parent relationships may also shift. In addition, poor family cohesion and adaptability may hinder the communication and teamwork required of overweight adolescents and their families in order to effect lifestyle changes that result in weight loss.

Evidence does not exist in the overweight literature regarding causation between areas of family functioning and adolescent psychological distress. However, research examining causation modeling between parenting behavior and psychological distress in adult female twins suggests a better fit between latent constructs of recollected parenting and psychological distress than the reverse relationship (Gillespie, Zhu, Neale, Heath, &

Martin, 2003). Hence, it is possible that perceptions of family functioning may demonstrate stronger effects on overweight adolescent internalizing symptoms as compared with the opposite direction.

Conversely, findings from a recent study suggest that the opposite direction of effects, from overweight adolescents' psychological adjustment to perceptions of family functioning, might be significant. Research conducted by Zeller et al. (2004) investigated the relationship between degree of overweight and adolescent reports of parent-adolescent relations in a sample of obese children and adolescents and their mothers. Results demonstrated that increases in adolescent BMI (i.e., via retrospective chart review) significantly predicted adolescent perceptions of poor maternal-adolescent relations. This relationship was only found for obese adolescents. Given that adolescent internalizing symptoms have been identified as a potential risk factor for obesity (Goodman & Whitaker, 2002), it is possible that increases in overweight adolescents' internalizing symptoms may also predict adolescents' perceptions of family functioning.

Clearly a need for research into the family dynamics of overweight adolescents is necessary to test some of these ideas. Research investigating the effect of multiple perspectives of family functioning on overweight adolescent-reported internalizing symptoms is essential for obtaining a more accurate understanding of the dynamic relationship between family environment and overweight adolescents' emotional adjustment.

Age of Onset of Weight Problems

In addition to family functioning, age of onset of weight problems has been

identified as a potential risk factor of psychological problems in overweight individuals due to its relation to weight-related social stigmatization that individuals with excess weight frequently experience (Friedman & Brownell, 1995). For example, weight-based teasing experienced by adolescents from family members or peers (regardless of adolescents' weight status) has been related to low self-esteem, as well as greater symptoms of depression, suicidal ideation and attempts in adolescents (Eisenberg et al., 2003). While weight-based teasing has been found to be greater for overweight and underweight adolescents, the emotional well-being among all adolescents has been found to decrease when teasing was experienced from *both* family members and peers (Eisenberg et al., 2003). Thus, it is likely that overweight adolescents with earlier onset of weight problems may experience more negative comments and feedback throughout adolescence when compared to adolescents who become overweight during adolescence.

Evidence also exists that overweight adolescents are more socially marginalized by their school peers than normal weight adolescents (Strauss & Pollack, 2003). In addition, a recent large-scale study (i.e., National Longitudinal Study of Adolescent Health) found that the likelihood of being in a romantic relationship for adolescent girls decreased (i.e., by 6%) with every point increase in body mass index irrespective of socioeconomic status or race (Halpern, King, Oslak, & Udry, 2005). Although Strauss and Pollack (2003) did not examine the relationship between social marginalization and adolescents' emotional well-being, they suggested that increased symptoms of depression and low self-esteem in overweight adolescents might be related to fewer and less reciprocal friendships. It is likely that overweight adolescents with earlier age of onset of weight problems may begin experiencing social marginalization during childhood.

Indeed, studies have found that obese children are systematically ranked by their peers to be the "least desirable" as friends or playmates when compared to facially or physically disfigured (i.e., missing a hand), functionally disabled (i.e., uses crutches or wheelchair), and healthy peers with no visible disabilities (Richardson, Goodman, Hastorf, & Dornbusch, 1961). A replication 40 years later of Richardson et al.'s study demonstrated that not only were obese children still ranked the "least desirable" by their peers, but stigmatization of obese children had increased over time (Latner & Stunkard, 2003). Obese preadolescent males and females have also been found to be at a greater risk for overt bullying victimization (i.e., having been hit, beaten up, threatened, called-names, belongings stolen, or spiteful, mean games played on them) over a one year period when compared to their average weight peers (Griffiths, Wolke, Page, Horwood, & the ALSPAC Study Team, 2006). In addition, obese male pre-adolescents were found to be 1.78 times more likely to be perpetrators of overt bullying.

Evidence in the adult obesity literature has found obese adults with childhood age of obesity onset to report significantly greater and more severe levels of both general psychological distress and psychotic symptoms than adults with adolescent- or adult-obesity onset (Mills, 1995; Mills & Andrianopoulos, 1993). Onset of obesity before the age of 18 has also been related to increased body image dissatisfaction in obese adults as compared with adult-onset subjects, even after weight reduction (Adami et al., 1998; Sorbara & Geliebter, 2002). These findings suggest that early onset of obesity may play a role in the development of negative affective and cognitive perceptions in childhood or adolescence that have the potential to persist into adulthood (Sorbara & Geliebter, 2002). However, the majority of studies examining the role of age of onset of weight problems

on individuals' psychological health have been conducted retrospectively using adult samples.

To date, there has been only one study examining the role of age of onset of weight problems on overweight adolescents' psychological functioning. Mustillo et al. (2003) investigated the relationship between four age-related trajectories of obesity and psychiatric disorders in a representative sample of predominantly rural white non-Hispanic children and adolescents over an 8-year period. Age-related trajectories of obesity included: no obesity, chronic obesity (i.e., children who were obese before the age of 9 and who continued to be obese throughout the study), childhood-limited obesity (i.e., children who were obese during childhood but of normal weight during adolescence), and adolescent-limited obesity (i.e., adolescents who were normal weight during childhood but became obese during adolescence). Results showed that while obesity was found to be 3 to 4 times greater than national estimates based on CDC criteria (Kuczmarski et al., 2000), the risk of psychopathology (with age, sex, and income controlled for comorbidity) was found only in the chronically obese group relative to the nonobese group. Specifically, chronically obese boys were found to primarily evidence oppositional defiant disorder and depressive disorders (i.e., major depression, dysthymia, and depression not otherwise specified), while chronically obese girls were found to have oppositional defiant disorder only. These findings provide some evidence that adolescents with early onset of weight problems that persist into adolescence may be at greater risk of psychological difficulties than overweight adolescents with later onset. Nonetheless, the effect of age of onset of weight problems on the psychological

functioning of overweight adolescents remains largely unknown because of the dearth of studies in this area.

Limited research has also been conducted on the relationship between age of onset of weight problems and adolescent weight loss success. Mellin, Slinkard, and Irwin (1987) found later onset of weight problems (i.e., at 12 years of age or older) was related to greater weight loss success in a family based weight management program. Despite also finding significant improvements in levels of depression reported by their treatment group at follow-up, Mellin et al. did not investigate the relationship between age of onset and levels of depression or self-esteem. Additional research investigating the role of age of onset on overweight adolescent depression, anxiety, and worthlessness is necessary in order to increase our understanding of the emotional health of overweight adolescents and the prognoses of overweight children with chronic weight problems. Findings have the potential to assist in the design of programs that identify adolescents at risk for psychopathology and decrease the course and outcome of their weight problems.

Present Study

The overall objective of the present dissertation is to study the effects of family functioning and age of onset of weight problems on psychological functioning in overweight adolescents. Importantly, the current research addresses several limitations of previous research. First, this study contributes to the current literature by examining a range of internalizing difficulties such as depression, anxiety, and worthlessness in overweight adolescents. Second, paternal, maternal, and adolescent perceptions of FF were investigated. Third, both intact (i.e., adolescent lives with both biological parents)

and single-parent families were included to both determine whether differences in family dynamics existed, and examine how they might impact overweight adolescents' psychological difficulties. These differences in family composition have not generally been investigated in previous studies of overweight children or adolescents' psychological functioning due to limited diversity in study samples.

Finally, this study aimed to examine numerous aspects of the relationship between adolescent overweight/obesity, FF, and age of onset. Specifically, the present research: a) examined the role of parent-adolescent *discrepancies* on adolescent internalizing symptoms; b) examined the influence of individual perceptions and discrepancies in perceptions of FF on the psychological functioning of overweight adolescents; c) investigated the influence of overweight adolescents' internalizing symptoms *on* multi-informant perceptions of FF (i.e., both overall perceptions and discrepancy scores); and d) examined the role of age of onset of weight problems on adolescent internalizing symptoms.

Aims and Hypotheses

Primary Aim I

The primary aim of this study was to explore the effects of family functioning and dyadic discrepancies in perceptions of family functioning on adolescent internalizing symptoms in a large sample of at-risk-for (between 85% and 95% of expected BMI for age and sex) and overweight (above 95% of expected) adolescents. Adolescent internalizing symptoms were assessed in the areas of depression, anxiety, and worthlessness. Family functioning was assessed in the areas of family cohesion and

adaptability. Multiple informants' reports of family functioning were examined in order to explore the individual and joint contribution of adolescent and parent perceptions of family functioning on adolescent internalizing symptoms. In addition, discrepancies in perceptions were examined and defined by two indicators for each parent-adolescent dyad (i.e., parent-adolescent discrepancies in family cohesion and adaptability). Finally, age of onset (defined by parental report) was investigated as an independent predictor of internalizing symptoms. The interaction between family functioning and age of onset was also explored as a potential moderator between age of onset and internalizing symptoms. All aims and hypotheses were examined using structural equation modeling (SEM).

1. The first primary goal of the proposed study was to examine the relationship between adolescent and parent reports of family functioning, discrepancies in perceptions of family functioning, and adolescent depression, anxiety, and worthlessness (see Figures 1-2).
    a. Hypothesis 1: There will be a reciprocal relationship between adolescent, maternal, and paternal perceptions of family functioning and adolescent internalizing symptoms. However, the path from family functioning to internalizing symptoms will be stronger.
    b. Hypothesis 2: There will be a reciprocal relationship between parental-adolescent discrepancies in perceptions of family functioning (i.e., absolute and relative differences in maternal-adolescent and paternal-adolescent perceptions) and adolescent internalizing symptoms. However, the path from parental-adolescent discrepancies to internalizing symptoms will be stronger.

c. Hypothesis 3: Parental-adolescent discrepancies in perceptions of family functioning will be stronger predictors of adolescent internalizing symptoms than maternal, paternal, and adolescent perceptions of family functioning.

Primary Aim II

II. The secondary aim of the proposed study was to examine the relationship between age of onset of the adolescent's weight problems and adolescent depression, anxiety, and worthlessness (see Figures 1-2).

d. Hypothesis 4: A significant negative relationship will exist between age of onset and adolescent internalizing symptoms. Adolescents with earlier ages of onset of weight problems will report greater internalizing symptoms.

It is important to note that of all the above aims and hypotheses were tested on two subsamples: a) adolescents with maternal data (N = 626), and b) adolescents with both maternal and paternal data (N = 396). These samples were examined separately in order to allow for the examination of paternal effects, in spite of the fact that only a minority of the sample had paternal reports. The first sample included adolescents from single-parent and two-parent families and their mothers. The second sample included adolescents from intact families (i.e., 2-parent families) and both of their biological parents.

METHOD

Participants

Participants included adolescents and parents who sought family-based behavioral weight management treatment between 1987 and 1996 at SHAPEDOWN locations within the United States and its territories. The present study included both intact and single-parent biological families within this archival dataset in order to obtain a clearer understanding of family functioning through the contribution of multiple informants' perceptions from different types of family structure. Thus, the present sample was derived from 1378 adolescents (1031 females, 347 males) ages 12 through 17 (mean age = 13.61; SD = 1.77) and their biological parents (N = 2071; 1270 mothers, 801 fathers).

Three-hundred thirteen (22.7%) adolescents who were younger than 12 or older than 17 years of age were excluded from the sample. Children younger than 12 years of age were excluded because they are younger than the recommended age range of the survey instrument. Children older than 17 years of age were considered to be young adults and were therefore outside the scope of the current study, which aimed to examine adolescent psychological difficulties and family functioning.

Of the remaining 1065 adolescents who met age criteria, 21 (1.97%) adolescents were excluded because their health care provider identified their primary problem to be something other than overweight or obesity (e.g., eating disorder, etc). One-hundred forty-three (13.7%) adolescents were excluded because individuals other than their biological parents (e.g., step-parents, guardians, grand-parents, other) had completed one of the surveys. Despite having one or both of their biological parents complete surveys, sixty-six (7.3%) adolescents were excluded because they were from non-intact homes

(i.e., not living with both of their parents). Consequently, it was considered impossible to decipher which constellation of family members informants used to describe family functioning. Additionally, 13 (1.6%) adolescents were excluded from the present sample because it was unclear with whom they lived.

Exclusions were also made due to inadequate parental data for family status group comparisons (i.e., single and intact families). Within the single parent subgroup, approximately two percent (1.8%; n = 15) of adolescents who were living with their fathers were excluded due to the very small size of this subgroup. An additional fifteen (1.9%) adolescents from intact families were excluded due to inadequate maternal data (i.e., only their fathers had participated).

Of the remaining 792 adolescents, 28 (3.5%) adolescents were excluded because they did not meet criteria for being "at risk for overweight" based on gender- and age-specific body mass percentiles. Body mass index (BMI) and reference data from the Centers for Disease Control were used to categorize participants (Cole, 1990; Kuczmarski et al., 2000). An additional 89 (11.6%) participants, with BMI values greater than 40, were excluded because they were considered to be outliers (Jacobson & Rowe, 1998).

Finally, forty-nine (7.2%) adolescents were excluded because their responses on the Lie subscale of the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) were found to be indicative of possible inaccurate self-reporting (i.e., > standard score of 13). The Lie subscale is designed to detect the deliberate faking of responses, influences of social desirability, and acquiescence (e.g., inability to understand the questions).

The final sample included 626 adolescents (45.4% (626/1378) (480 females (76.7%), 146 males (23.3%) ages 12 through 16.99 (mean age = 13.92; *SD* = 1.31). The total number of biological parents who participated was 1022 (49.3%) (626 mothers, 396 fathers). In terms of family composition, 396 (63.3%) adolescents were from intact families where both parents participated in the study, 104 (16.6%) adolescents were from intact families but just their mothers participated, and 126 (20.1%) adolescents were living with their mother in single-parent households and their mothers participated.

The sample was predominantly White and representative of the middle to upper socioeconomic (SES) groups. The ethnic breakdown of the sample was 83.9% White, 4.0% Black, 4.0% Hispanic, 4.3% Mixed, 2.2% Other, and 1.6% Asian. Approximately 8% (i.e., 50/626) of all families did not provide enough information to calculate their family SES scores based on Hollingshead's four-factor index of social position (Hollingshead, 1975). The mean family SES score for both samples fell in the middle to upper SES groups (i.e., Sample 1: *M* = 47.66, *SD* = 10.82; Sample 2: *M* = 49.89, *SD* = 9.89).

Based on parental report, mean age of onset of adolescent weight problems was found to be 8.39 years (*SD* = 3.22). Mean BMI was found to be 30.85 (*SD* = 4.22; Range 22.68 to 39.94) for all adolescents. That is, approximately 81% (507/626) of adolescents were found to be overweight, and 19.0% (119/626) were at risk for overweight.

Description of SHAPEDOWN and Procedure

The SHAPEDOWN© program (Mellin, 1987) provides overweight children and adolescents (ages 6 to 17) and their parents/guardians an interdisciplinary, family-based

behavioral weight management treatment program that uses both group and individual formats to help families build their emotional and physical health through structured age-appropriate interactive learning activities (i.e., workbooks, discussion, disclosure, role playing, etc.). Behavioral monitoring components such as contracts, goals, rewards, and daily monitoring are used throughout the program. The SHAPEDOWN© program also uses a family systems perspective to assess each family's functioning based on Olson's Circumplex Model of Family Cohesion and Adaptability (Olson, Portner, & Lavee, 1985).

Either prior to or shortly after beginning the SHAPEDOWN© program, adolescents and their family members participated in an initial assessment session at their participating provider's location. Questionnaire and physical health data (i.e., height & weight) were collected by SHAPEDOWN© certified providers. All participants completed one of three (i.e., adolescent, primary parental figure, secondary parental figure) standardized assessment instruments known as the Youth Evaluation Scale (Y.E.S.; Mellin, 1987), which evaluates biological, psychological, and social factors involved in adolescent obesity and eating disorders. All instruments discussed in the Measures section below are included in the Y.E.S.

The current sample was obtained from Bob Mellin, the president of Balboa Publishing Inc., who manages the national SHAPEDOWN© program and its computerized Y.E.S. databases.

Measures

Demographics

The Y.E.S. questionnaires included demographic information such as participants' relation to their adolescent (i.e., biological mother, biological father, step-mother, etc.), the adolescent's ethnicity and date of birth, the family's area of residence, as well as the education levels and occupations for each biological parent. Parental education levels and occupations were used to calculate each family's socioeconomic status (SES) based on Hollingshead's four-factor index of social position (Hollingshead, 1975; Hollingshead & Redlich, 1958).

Family Functioning

Family functioning was assessed with the Family Adaptability and Cohesion Evaluation Scale, 3rd edition (FACES-III; Olson et al., 1985). The FACES-III is a 20-item self-report questionnaire that assesses the Circumplex Model developed by Olson and his colleagues (Olson, 1986; Olson, Russell, & Sprenkle, 1983). The two dimensions of family functioning that comprise the three-dimensional Circumplex Model and that are measured linearly by the FACES-III (see Olson, 1991) include family cohesion (i.e., family closeness) and adaptability (i.e., family's ability to change when faced with developmental or situational stressors). Each dimension is measured by its own subscale that consists of 10 items scored on a 5-point Likert scale (Almost Never to Almost Always). Scores from each subscale can range from 10 to 50 with higher scores indicative of balanced, more functional family systems as conceptualized within the three-dimensional Circumplex model. Both parents and adolescents completed the FACES-III.

Raw FACES-III scores were used to assess each participant's perceptions of their family functioning. In addition, discrepancies in perceptions of family functioning between adolescents and each of their parents were examined using difference scores between the adolescent's and their parents' respective subscale scores. Both the absolute and directional values (i.e., positive or negative sign) of family functioning difference scores were used. Positive difference scores would indicate that parents perceived their family's cohesion or adaptability to be higher than their adolescent's ratings, while negative scores would indicate that the adolescent perceived his or her family's functioning to be better than his/her parents' perceptions. Discrepancies between adolescents' and their parents' perceptions of family functioning have been used previously in research on adolescent psychological functioning (Ohannessian, Lerner, Lerner, & von Eye, 1994, 1995).

The FACES-III has been used frequently in psychiatric and health research (Johnson, Brownell, St. Jeor, Brunner, & Worby, 1997; Kouneski, 2000; Leung, Schwartzman, & Steiger, 1996) and exhibits excellent psychometric properties. Acceptable internal consistency reliabilities have been reported for both cohesion (alpha = .77 to .89) and adaptability (alpha= .62 to .87) (Ohannessian et al., 2000; Olson, 1986). Discriminant validity also appears to be adequate (Olson, 1986), as the intercorrelations between the two subscales, and between the adaptability scale and a separate measure of social desirability, were found to be close to zero (r = .03 and r = .00, respectively; Olson, 1986). The correlation between cohesion and social desirability, however, has been shown to be moderate (r = .39; Olson, 1986) yet similar to the correlation between cohesion and social desirability in the FACES II (r = .35; Olson, Portner, & Bell, 1982).

Good test-retest reliability estimates were found for both subscales over a four to five week period (r = .80 - .83 and r = .80; Olson, 1986). In the current sample, acceptable internal consistency reliabilities were found for family cohesion (alpha = .87) and family adaptability (alpha = .63) across all participants. Internal consistency reliabilities for adolescents, mothers, and fathers in the current study are presented in Table 1.

Adolescent Internalizing Symptoms

Worthlessness

Worthlessness was assessed with the general self-worth subscale of the Self-Perception Profile for Adolescents (SPPA; Harter, 1988). The SPPA consists of 45 items measured on a 4-point scale (i.e., low to high perceived adequacy or competence) that are designed to assess teenagers' perceptions of their global self-worth as well as their self-competence in a number of different areas (i.e., scholastic competence, social acceptance, athletic competence, physical appearance, and behavioral conduct). Although the original SPPA includes nine subscales, only items from the global self-worth (GSW; 5 items) subscale were administered to this sample. The GSW subscale assessed adolescents' general opinion of themselves as a person. In the current study, adolescents' GSW total scores were reverse scored to measure feelings of worthlessness. Total scores can range from 5 to 20 with higher scores indicative of greater feelings of worthlessness.

The format of each GSW item consisted of a structured alternative whereby adolescents decide between two antithetical statements regarding which type of teenager was most like him or her (e.g., "Some teenagers like the kind of person they are BUT other teenagers often wish they were someone else."). Participants then rated the extent

of their similarity for the chosen statement (i.e., "really true" or "sort of true" for them). Items were counter-balanced so that half of the statements representing feelings of adequacy (i.e., positively written) were located on the left side while they were on the right for the remaining items. This format was intended to offset socially desirable responding (Harter, 1988).

The GSW subscale has demonstrated adequate internal consistency ranging from .76 to .89 in 8th through 12th grade students (Harter, 1988; Hagborg, 1993a). The GSW subscale has also been found to distinguish between clinically depressed adolescent inpatients and a nonclinical group of comparison adolescents (King, Naylor, Segal, Evans, & Shain, 1993). A negative relationship between GSW subscale scores and the severity of depressive symptomatology in a sample of psychiatric inpatients (King et al., 1993) was also demonstrated. Lastly, decreases in depression severity across hospitalization were found to be associated with increases in global self-worth (King et al., 1993) in a psychiatric inpatient population of adolescents.

Satisfactory convergent validity of the GSW subscale was found using a 12-item version of the Hopkins Symptom Checklist that measured psychological problems ($r = -.31$; Wichstrøm, 1995) in a sample of Norwegian adolescents. Adequate divergent validity was also found (Reynolds & Gould, 1981) between the GSW subscale and a measure of social desirability ($r = .26$; Marlowe-Crowne Social Desirability Scale; Crowne & Marlowe, 1960). In addition, satisfactory concurrent validity ($r = .76$; Hagborg, 1993b) was demonstrated between the GSW subscale and the Rosenberg Self-Esteem Scale (Rosenberg, 1965). Finally, while no test-retest reliability is currently available, the SPPA is one of the most widely used measures of adolescent self-esteem

across clinical and non-clinical populations (i.e., academically gifted, learning disabled, chronic physical disorders, etc.). In the current study, the worthlessness subscale demonstrated adequate internal consistency (alpha = .82).

Manifest Anxiety

Anxiety symptoms were assessed with the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978). The RCMAS is a 37-item, yes/no self-report inventory used to assess the level and nature of anxiety in 6- to 19-year olds. The RCMAS provided four subscale scores along with a total anxiety score. The subscales included: (a) Physiological Anxiety (10 items), (b) Worry/Oversensitivity (11 items), (c) Social Concerns/Concentration (7 items), and a (d) Lie subscale (9 items). The Physiological Anxiety subscale measured somatic manifestations of anxiety such as fatigue, nausea, and difficulties with sleeping. The second subscale, the Worry/Oversensitivity subscale, was associated with fears of being hurt or emotionally isolated as well as a tendency to internalize anxiety. The Social Concerns/Concentration subscale measured interpersonal as well as social thoughts and fears that can affect concentration and attention levels (e.g., fear of not living up to the expectations of significant individuals in their lives). As mentioned earlier, 49 adolescents with high Lie subscale scores (i.e., possibly indicative of inaccurate reporting) were excluded from the current sample.

For the purposes of this dissertation, only the total anxiety score was used in analyses. Psychometric properties of the RCMAS (Reynolds, 1985; Reynolds & Richmond, 1997) include adequate internal consistency of this scale (KR_{20} = .82 - .85).

Moderate 9-month test-retest reliability has also been found (r = .68; Reynolds, 1981) as well as strong convergent validity (r = .88; Muris, Merckelbach, Ollendick, King, & Bogie, 2002) between the total scores of the RCMAS and the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973). In the current sample, the RCMAS total anxiety score demonstrated adequate internal consistency (KR_{20} = .88).

Depression

Depressive symptoms were assessed with the Beck Depression Inventory - Short Form (BDI-SF; Beck & Beck, 1972). The BDI-SF is a self-report measure of depression consisting of 13 items that were rated from 0 (least severe) to 3 (most severe). The BDI-SF total score was obtained by adding the values for all 13 items. Higher scores were indicative of more depressive symptoms.

Research has found the BDI-SF to be an acceptable substitute for the BDI long form (r = .89 - .96; Beck & Beck, 1972; Beck, Rial, & Rickels, 1974) with adequate internal consistency (alpha= .78 - .83; Gould, 1982; Reynolds & Gould, 1981) similar to ranges of reliability for the long form (Beck, Steer, & Garbin, 1988). Satisfactory convergent validity of the BDI-SF was found using the Zung Self-Rating Depression Scale (r = .68; Reynolds & Gould, 1981). Divergent validity also appeared to be adequate (Reynolds & Gould, 1981) as the intercorrelation between the BDI-SF and a measure of social desirability (Crowne & Marlowe, 1960) was relatively low and non-significant.

Research examining the sensitivity, specificity, and predictive values of both the BDI short and long forms in a sample of adolescents referred to a depression clinic found

virtually identical efficiency statistics (Bennett et al., 1997). Test-retest reliability estimates for the BDI-SF are unavailable, partly due to the nature of depressive symptoms. Their fluctuating course and severity make it difficult to estimate robust test-retest reliabilities (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). In the current sample, the BDI-SF total score was found to have adequate internal consistency (alpha = .86).

Age of Onset of Weight Problems

Adolescent and primary parental figures' reports of age of onset of the adolescents' weight difficulties was assessed by a single Y.E.S. item that asked respondents to report the age at which they first remembered the adolescent had a weight or eating problem. Research examining the accuracy of parental and adolescent reports of adolescents' current obesity status found parental reports to be better indicators of adolescents' objective weight status (Goodman, Hinden, & Khandelwal, 2000). This suggests that parental recall of *age of onset* of obesity may be more accurate than adolescents' reports. The observed variable of age of onset of adolescents' weight problem was therefore defined by parental report only.

Internal Review Board Approval

Written approval to use this clinical data for research purposes was received from both Balboa Publishing and the University Committee on Research Involving Human Subjects (UCRIHS) at Michigan State University. IRB approval (IRB # X02-235) was obtained and has been maintained.

Analytic Procedures

All missing data were estimated using the computer software program SYSTAT 10 (Systat Software Inc., 2002; based on the expectation-maximization algorithm). Statistical analyses excluding structural equation modeling were performed using Version 10.0 of the SPSS statistical software package (SPSS Inc., 1999). Structural equation modeling (SEM) was conducted on raw data using AMOS 5.0 (Arbuckle, 2003). Statistical significance was set at $p < .01$ to control the family-wise error rate for all analyses prior to structural equation modeling (i.e., statistical significance was set at $p < .05$ for the SEM models). Because a nonsignificant chi-square value is used to indicate good model fit in SEM (see below), applying a larger probability value decreases the likelihood of committing a Type I error (i.e., erroneously rejecting the null hypothesis) in SEM.

Preliminary Data Analyses

Several initial analyses were conducted to determine the composition of groups for the SEM models. First, differences in "intact" (i.e., living with both parents; n = 500) and non-intact (i.e., living with their mothers in single-parent households; n = 126) families were examined within Sample 1 described above (i.e., the sample that included maternal data only). These analyses were conducted to ensure that these intact and non-intact families could be examined together within the models. Second, potential differences in predictor, outcome, and covariate (e.g., BMI, age of onset of weight problems) variables were examined across gender to determine whether males and females needed to be examined separately in the model fitting analyses. All of these

comparisons were made using multivariate analyses of variance (MANOVA), analysis of variance (ANOVA), and Box's Test of Equality of Covariance Matrices (i.e., Box's M test). Games-Howell post hoc tests were used to account for unequal group sizes in the ANOVA analyses.

Correlations between adolescent BMI and other variables in the model were also examined to determine whether BMI should be controlled for in the proposed analyses. In addition, a series of linear regression analyses was conducted to determine whether the interaction between family functioning variables and age of onset of weight problems should be included in the SEM model as a potential moderator between age of onset and adolescent internalizing symptoms. Finally, zero order correlations were conducted between all dependent and outcome variables prior to structural equation modeling for each sample.

Notably, a total of 32 cases (n = 8 for males and n = 24 for females) were identified as univariate outliers for dependent and/or outcome variables. Analyses were conducted with and without these outliers; results were essentially identical across samples. Thus, only those results with the outliers included are presented below (see Appendix Table F1-F2 for results of multiple group analyses without outliers).

SEM Analyses

Latent and Observed Variables

In each of the structural equation models, the underlying construct of adolescent internalizing symptoms was defined by three raw summary scores: adolescent self-reports of anxiety (i.e., RCMAS), depression (i.e., BDI-SF), and worthlessness (i.e., global self-

worth subscale reverse-scored). The observed variable of age of onset of adolescent's weight problem was defined by parental report. Family functioning (FF) was assessed separately for each participant via raw summary scores for both of the FACES-III subscales (i.e., family cohesion and family adaptability). In addition, discrepancies in perceptions of FF were investigated and defined by two indicators (i.e., discrepancies in perceptions of family cohesion and family adaptability) for each parent-adolescent dyad.

Confirmatory factor analyses were conducted on the observable variables in Sample 2 (i.e., the sample with both maternal and paternal data) only in order to determine whether multiple parent reports should be examined as separate correlated factors or as a single parental factor in the SEM models.

Discrepancies in Perceptions of Family Functioning

Initially, each of the models testing the relationship between parental-adolescent (P-A) discrepancies in perceptions and internalizing symptoms was going to be tested twice to assess: a) the magnitude (i.e., absolute value), and b) the direction (i.e., relative value) of the discrepancies. The second set of analyses was intended to be exploratory in nature. However, contrary to expectations, the truncated variance of absolute P-A discrepancies were found to be untenable to SEM in both samples (see scatterplots for relative and absolute P-A discrepancies by gender in Appendix Figures A1-A12). Examination of these scatterplots illustrated significant differences in the shape, distribution, and overall magnitude of absolute versus relative P-A discrepancies, which favored the use of relative discrepancies. In addition, correlations between cohesion and

adaptability for relative discrepancy scores were greater in magnitude than for absolute discrepancies (see Appendix Table A1 for correlations).

Model Fit

Generalized-Least-Squares estimation (GLS) was used for model fitting because it is less sensitive to small sample sizes (Hu & Bentler, 1995) than other fit indices and does not rely on the normality assumption. GLS has also been found to perform better when correlated errors are also examined (Rubio & Gillespie, 1995). Nonetheless, to ensure that the results are robust, models were also examined using maximum-likelihood (ML) estimation. Results across the two procedures were essentially identical and thus, model fit results for ML estimation are presented in the Appendix only (see Appendix Table E1-E4).

The following fit indices were examined for each of the models to evaluate model fit: the Chi-Square test, Goodness-of-fit Index (GFI), and the Root-mean-square error of approximation (RMSEA). A good model fit was identified if the following results were found: a) a non-significant chi-square, a GFI equal to or greater than .90, and a RMSEA less than or equal .05 (Arbuckle & Wothke, 1995; Bollen, 1989; Schumacker & Lomax, 1992). Adequate fit was described as a RMSEA less than or equal to .08. Substantive changes were made to each model to improve model fit using both theoretical justifications and modification indexes. Lastly, chi-square difference tests were used to compare nested models (i.e., where one model is a subset of the other) in order to determine if the elimination or addition of paths in a modified model improves the model fit of the original model (Kline, 2005). In single-group analyses, significant

chi-square difference values result in the equal-fit hypothesis (i.e., that the two nested models are identical in the population) being rejected (Kline, 2005). Thus, the modified model would be considered to better fit the data.

Power Analyses

The final cohort of 626 adolescents and 1022 parents (626 mothers, 396 fathers) provided sufficient power (i.e., power = .80) to test the proposed models with an alpha less than 0.05. In fact, sample size guidelines identified by MacCullum, Browne, and Sugawara (1996) listed a minimum sample size of 177 and 229 for the test of close fit and not-close fit, respectively.

RESULTS

Preliminary Data Analyses

Family Group Status Comparisons

Within Sample 1, MANOVAs, ANOVAs, and Box's M tests all indicated no significant family status (i.e., intact families versus single-parent families) group differences (i.e., all p's > .01) on any of the independent or dependent variables (see Appendix Table B1 for means and standard deviations, and Table B2 for test stats. Consequently, data from all participants were collapsed into one group for the remaining analyses.

Gender Comparisons

Although there were no gender differences in the predictors of internalizing symptoms, statistically significant gender main effects were found for internalizing symptoms in both samples (i.e., specifically for anxiety and worthlessness). Post hoc analyses indicated that the average anxiety and worthlessness scores were significantly higher for female than male adolescents (see Appendix Table C1-C2 for means and standard deviations and Table C3-C4 for test stats for each sample separately). Thus, males and females were examined separately in all subsequent analyses for each sample.

Effect of Body Mass Index (BMI)

In order to determine whether BMI should be controlled for in the proposed analyses, the relationship between BMI and all of the independent and dependent variables were examined using Pearson product moment correlations (see Table 2). BMI

was not found to be significantly correlated with adolescent internalizing symptoms, adolescent and maternal perceptions of family functioning, or discrepancies in perceptions of family functioning. BMI was found to be correlated with age of onset of weight problems. However, given the predominantly nonsignificant and low (i.e., most correlations < .25) correlations, BMI was not included as a covariate in the SEM analyses.

Age of Onset of Weight Problems

A series of linear regression analyses was conducted to determine whether the interaction between family functioning (FF) and age of onset of weight problems should be included in the initial model as a potential moderator between age of onset and internalizing symptoms. Age of onset, adolescent and maternal perceptions of FF (i.e., total family functioning, family cohesion, and family adaptability), and the interaction between age of onset and FF variables were entered as independent variables in separate regression analyses. All internalizing symptoms were entered as dependent variables. Results indicated that internalizing symptoms were not significantly predicted by the interaction between age of onset *and* a) adolescent perceptions, or b) maternal perceptions of FF for either gender (see Appendix Tables D1-D9). Thus, the interaction between family functioning and age of onset was not included in the SEM models.

Sample #1: Families with Maternal Data Only

Pearson Correlations between Internalizing Symptoms and Dependent Variables

Results of zero-order correlations indicated that adolescent and maternal perceptions of cohesion and adaptability were found to be significantly correlated for females but not for males (see tables 3 and 4). In fact, maternal cohesion and adaptability were not found to be correlated within the male subgroup. Adolescent perceptions of cohesion and adaptability, on the other hand, were found to be significantly correlated for both gender groups. Contrary to expectations, age of onset of weight problems was not significantly associated with any of the independent or dependent variables for males or females.

Overall, internalizing symptoms were found to be associated with a large number of the individual perceptions of family cohesion and adaptability (i.e., adolescent *and* maternal), especially for the female subgroup. Significant correlations of larger magnitude were found between internalizing symptoms and individual perceptions of FF than *relative* maternal-adolescent discrepancies in perceptions for both genders.

SEM Analyses

Primary Aims I and II

Examining the Relationship between Internalizing Symptoms, Family Functioning, and Age of Onset (see Figures 1 - 2)

For study Aims 1 and 2, SEM analyses were conducted to examine reciprocal relationships between adolescent internalizing symptoms, individual perceptions of family functioning (i.e., both adolescent & maternal) and maternal-adolescent discrepancies in perceptions (see Figures 1 - 2). However, because of model identification issues related to limited power, small sample sizes (i.e., $n < 200$ for males),

and empirical underidentification (i.e.. the number of observed measures < number of parameters to estimate), individual perceptions and discrepancies in perceptions could not be examined within the same model. Instead, the model had to be divided in half, with the first model examining reciprocal relationships between internalizing symptoms and individual perceptions, and the second examining reciprocal relationships between internalizing symptoms and discrepancies in perceptions. In each of these models, age of onset of weight problems was examined as a predictor of internalizing symptoms (i.e., Primary Aim II). In addition, two measurement errors (i.e., between maternal & adolescent cohesion and maternal & adolescent adaptability) were correlated due to overlap in content/method variance (i.e., identical surveys were completed by each participant). It is important to note that Hypotheses 3 (i.e., which expected parental-adolescent discrepancies to be stronger predictors than maternal, paternal, and adolescent individual perceptions of FF) could not be tested given these overall model changes. Future research should therefore aim to simultaneously examine individual perceptions and discrepancies in perceptions of FF with a larger sample size and additional indicators (i.e., to define each construct).

As noted above, boys and girls differed significantly in their levels of internalizing symptoms. Consequently, single-group SEM models were first conducted within each gender in order to ensure proper model identification. Follow-up multiple-group analyses were then conducted after a basic structural model was found to be shared across gender (Byrne, 2001). Multiple group analyses test data from both genders simultaneously and compare the fit of the unconstrained model (i.e., where all parameters are allowed to vary freely across gender) to the fit of the most restrictive model (i.e.,

where all parameters, covariances, variances, and errors are constrained to be equal across gender). Goodness of fit indices of the unconstrained and most restrictive models were then compared using the chi-square difference test. Significant group differences were evident if the value of the chi-square different test is significant due to a worsening in model fit when all factor loadings, factor variances and covariances, and error variances and covariances are constrained to be equal across groups (Deshon, 2004).

Hypothesis 1

Examining Individual Perceptions of Family Functioning and Internalizing Symptoms

Single-group analyses. Among adolescent males and females, results of fitting the first model of individual perceptions with reciprocal relationships (see Figure 1) demonstrated model identification problems (i.e., negative squared multiple correlations, negative residual variances, and non-significant factor loadings and paths) (see Table 5 for model fit indices). Thus, changes in model structure were necessary in order to run empirically identified models. For both gender groups, the positive path from adolescent perceptions of family functioning (FF) to internalizing symptoms was eliminated first because of model identification problems. Results of this model continued to be problematic as evidenced by negative squared multiple correlations for each group. Additional problems included an ill-defined construct for maternal perceptions (i.e., non-significant factor loading for adaptability) for males, and non-significant paths in the model for females.

Elimination of a second positive path due to identification problems (i.e., between internalizing symptoms and maternal perceptions) yielded identical baseline models for

each group (see Figure 3) with acceptable goodness of fit indices. Three paths were included in this model: a) a path from maternal perceptions to internalizing problems, b) a path from internalizing symptoms to adolescent perceptions, and c) a path from age of onset to internalizing symptoms. All factor loadings and paths in this model were significant in both genders, with the exception of the path from age of onset to internalizing symptoms.

However, notably, the construct of maternal perceptions continued to be ill-defined for males in this model. The small sample size of males ($n < 200$) was hypothesized to be related to these estimation problems. Given the impossibility of collecting additional cases or indicators for family functioning in males to improve this estimation, the decision was made to retain this model as the baseline model for multiple group comparisons across gender.

Multiple-group comparisons. Results of multiple group analyses indicated that the most restrictive model fit the data better than the unconstrained model, as evidenced by a nonsignificant chi-square difference value, significant factor loadings and all but one significant path (i.e., between age of onset and internalizing symptom) in the most restrictive model. The non-significant chi-square difference value also indicated that no statistically significant gender differences existed in the definition of the constructs or in the magnitude of any relationships between internalizing symptoms and individual perceptions of family functioning (i.e., both maternal and adolescent; see Table 5 for results). In addition, all measures (i.e., including age of onset) were found to be comparable across groups due to equivalent factor loadings, error variances and covariances in the fully constrained model (Deshon, 2004). Finally, the hypothesis for

exact fit (i.e., the null hypothesis which posits that the specified model is identical to the population) could not be rejected for the most restrictive model given that the lower bound of the RMSEA confidence interval was zero (MacCullum, Browne, & Sugawara, 1996). Thus, the most constrained multi-group model (i.e., no gender differences in relationships) demonstrated excellent fit.

The final multi-group model explained 26% of the variance in adolescent perceptions of family functioning and 21% of the variance in adolescent internalizing symptoms. All pathways were significant at $p < .05$. Table 6 presents unstandardized regression weights, standard errors, and covariances for the final model (see Figure 3 for the standardized parameter estimates).

While reciprocal relationships could not be tested in the final model due to model identification problems described earlier, two hypotheses regarding the relationships between internalizing symptoms and individual perceptions of family functioning for adolescent males and females were examined. Results supported the hypotheses that a) maternal perceptions of lower levels of family functioning (i.e., less cohesion and adaptability) significantly predicted increases in adolescent internalizing symptoms, and that b) increases in internalizing symptoms significantly predicted adolescent perceptions of less family cohesion and adaptability. In contrast, the hypothesis that earlier age of onset would predict increased internalizing symptoms was not supported. Despite a statistically significant path, the percent of variance explained by age of onset was found to be essentially zero (i.e., 0.81%) suggesting that the study's large sample size contributed to the identification of such small effects. It is therefore unlikely that these effects would be clinically significant.

Hypothesis 2

Internalizing Symptoms and Parent-Adolescent Discrepancies in Perceptions of Family Functioning

Single-group analyses. Similar to findings for individual perceptions, reciprocal relationships (see Figure 2) could not be tested for discrepancies in perceptions for either adolescent males or females. The initial model generated negative squared multiple correlations and non-significant paths (i.e., both factor loadings and paths) indicative of model identification problems (see Table 7 for goodness of fit indices). Thus, changes in model structure were again necessary.

For both gender groups, the positive path from discrepancies in perceptions to internalizing symptoms was eliminated due to technical identification problems. Results of this model change demonstrated an essentially identical baseline model (see Figure 4) for males and females with acceptable model fit indices. Almost all factor loadings and paths were significant for each gender with two notable exceptions. First, the path from age of onset to internalizing symptoms was nonsignificant for males and females. Secondly, a non-significant factor loading for discrepancies in family adaptability continued to be problematic in this model for males only. As indicated earlier, it is possible that the difference in sample size between genders (i.e., greater than a 3:1 ratio) may have contributed to this measurement model variation. Nonetheless, this second model was chosen as the baseline model for the multiple-group analyses. Two paths were included in this model: a) a path from internalizing symptoms to maternal-adolescent discrepancies, and b) a path from age of onset to internalizing symptoms. All but one factor loading (i.e., maternal-adolescent discrepancy in adaptability for males

only) and path (i.e., from age of onset to internalizing symptoms) was significant in both genders. Multiple-group analysis was performed next to determine whether the magnitude of these relationships were identical when the baseline model was tested across males and females simultaneously.

Multiple-group comparisons. Similar to the model for individual perceptions, results demonstrated that the most restrictive model fit the data better than the unconstrained model which allowed all parameters to differ across groups. Thus, no substantive gender differences were found in the relationship between internalizing symptoms and maternal-adolescent relative discrepancies in perceptions (see Table 7 for results).

Specifically, results of the most restrictive model illustrated a nonsignificant chi-square value and evidence of both measurement (i.e., identically defined constructs via equal factor loadings) and factor invariance (i.e., no differences in the magnitude of relationships between constructs/factors) across gender groups. Also similar to the model for individual perceptions, both measurement and factor invariance was found in multiple-group analyses (Deshon, 2004) despite initial problems with model-fitting that were encountered in single-group analyses for males (i.e., non-significant factor loading for discrepancies in adaptability). Lastly, the RMSEA confidence interval for the most restrictive model met criteria for the hypothesis of exact fit (i.e., included zero as a lower bound) and was thus not rejected.

Approximately 10% of the variance in relative discrepancies in perceptions of family functioning and 1% of the variance in internalizing symptoms were explained in the final multi-group model. All pathways were statistically significant at $p < .0001$

except for the path from age of onset to adolescent internalizing symptoms ($p > .05$). Table 8 presents unstandardized regression weights, standard errors, and covariances for the final multi-group model (see Figure 4 for standardized parameter estimates).

Empirical underidentification once again did not allow the final model to test the reciprocal relationships between discrepancies in perceptions and internalizing symptoms. Consequently, it was impossible to test the hypothesis that expected the path from discrepancies to internalizing symptoms to be stronger than the reverse. However, the final multi-group model examined the reverse path from internalizing symptoms to discrepancies in addition to the path from age of onset to internalizing symptoms.

Results supported the hypothesis that increases in internalizing symptoms significantly predicted larger relative discrepancies in maternal-adolescent perceptions of family functioning. Larger relative discrepancies (i.e., positive in value) signified more positive ratings by mothers; thus, our findings suggest that increases in internalizing symptoms were related to mothers perceiving their family to be functioning better (i.e., more cohesive and flexible) than their sons/daughters' perceptions. As expected, earlier age of onset was not found to be predictive of increased internalizing symptoms.

Sample #2: Families of Adolescents with Maternal and Paternal Data

Pearson Correlations between Internalizing Symptoms and Dependent Variables

Results of zero-order correlations between internalizing symptoms and dependent variables are presented in Tables 9 and 10. As expected, adolescent perceptions were significantly correlated with all internalizing symptoms for both groups. In addition, the relationships between internalizing symptoms and both parental perceptions (i.e.,

maternal and paternal) and discrepancies in perceptions differed between males and females. While maternal and paternal perceptions were found to be significantly correlated for both genders, a larger number of significant correlations were found between individual adolescent and parental perceptions in the female subsample. Finally, age of onset was not found to be statistically associated with any of the independent or dependent variables for either gender.

SEM Analyses

Primary Aims I and II

Internalizing Symptoms, Family Functioning, and Age of Onset (See Figures 5-6)

For study Aims 1 and 2, reciprocal relationships between all latent constructs could not be examined simultaneously due to the limited power and even smaller sample size of Sample #2 (i.e., n = 396; 100 males/296 females). Consequently, the initial model was split into two models, which were very similar to the models tested for Sample #1 (see Figures 5 - 6) with two notable exceptions. First, correlated measurement errors were not included between parental and adolescent individual perceptions of FF in the first model. Second, two correlated measurement errors were specified in the second model due to the overlap of content/method variance in maternal-adolescent and paternal-adolescent discrepancies in perceptions of cohesion and adaptability. Finally, and as noted above, confirmatory factor analyses (CFA's) were conducted prior to single group analyses due to the use of multiple reports of parental perceptions in each model.

Hypothesis 1

Examining Individual Perceptions of Family Functioning and Internalizing Symptoms among Adolescent Males and Females

Confirmatory factor analyses. For each gender, two CFA models were tested to determine which measurement model best fit the data for subsequent SEM analyses. The first model was comprised of two correlated factors, which independently assessed maternal and paternal perceptions (i.e., using FACES-III raw scores). Results for each gender indicated that the 2-factor model was untenable to SEM analyses due to model identification problems (i.e., inadmissible solutions resulting from negative error variances for maternal and paternal cohesion). A second CFA was conducted to test the fit of a single latent construct representing parental perceptions (i.e., all parental FF indicators were combined). Once again, model identification problems were found for both genders (i.e., iteration limit was reached). However, model fitting using ML estimation converged successfully for females (but not males) and demonstrated significant factor loadings in females despite very poor fit (χ^2 (2, N = 296) = 55.30, $p <$ .0001; GFI = .93; RMSEA = .30, 90% confidence interval = .24 - .37). Nonetheless, the one-factor model of parental perceptions was chosen as the preferred model for subsequent SEM analyses given its increased number of indicators.

Single-group analyses. Among adolescent males and females, results of fitting reciprocal effects between perceptions of FF and adolescent internalizing symptoms (see Figure 5) were unsuccessful (i.e., negative squared correlations, nonsignificant paths, negative error variance). Contrary to results in Sample #1, different model changes had

to be made in order to make the model identified for each gender (see Table 11 for results).

Males. In an effort to achieve model identification, two measurement errors (i.e., maternal and paternal adaptability) were allowed to correlate. Despite successful convergence, poor fit and continuous model identification problems were found (i.e., negative squared multiple correlations, negative error variance, nonsignificant paths and factor loadings). Next, the positive path from adolescent perceptions to internalizing symptoms was eliminated because of technical identification problems. Results yielded an inadmissible solution due to a negative error variance for paternal cohesion. In order to increase model parsimony, a second path from internalizing symptoms to parental perceptions was eliminated. Similar inadmissible solutions were encountered (i.e., negative error variance for paternal cohesion persisted). Taken together, a baseline model was not found for males.

Females. In contrast to males, a baseline model was found for females after a series of changes in model structure. First, the error variance for adolescent cohesion was set equal to 1/3 of its variance (i.e., set to equal 20) to correct for identification problems. The model converged successfully but demonstrated poor fit along with problematic paths and values (i.e., negative squared multiple correlations and nonsignificant paths). Second, two paths were eliminated consecutively in order to improve model fit and parsimony. The first elimination of the path from adolescent perceptions to internalizing symptoms did not result in improved model fit; however, problematic negative squared multiple correlations were no longer present. In addition, removing a weak path from

internalizing symptoms to parental perceptions (standardized regression weight = -.01) increased model parsimony despite insignificant changes in fit.

To further improve model fit, a path from parental to adolescent perceptions was included. Significant changes in model fit were found with significant paths and factor loadings. A separate model with the opposite path from adolescent to parental perceptions was also analyzed. Statistical comparisons of model fit indices were essentially unchanged. However, the latter model included nonsignificant paths, which suggested that the former model (i.e., with the path from parental to adolescent perceptions) should be used.

Model fit was found to improve considerably with the addition of an error covariance related to shared method variance between maternal and paternal adaptability. All but one path was significant (i.e., between age of onset and internalizing symptoms). Next, another error covariance was added between the errors for maternal adaptability and paternal cohesion (i.e., was suggested by the modification indices). This change improved model fit with all but one nonsignificant path (i.e., between age of onset and internalizing symptoms).

A final covariance between the errors for parental and adolescent adaptability was added (i.e., again, to account for common method variance). Results demonstrated significant improvements in model fit with the same nonsignificant path. This last model was rerun without the path from parental to adolescent perceptions in order to test its role in model fit. Results demonstrated a significant decline in model fit and confirmed the importance of including this structural path. Overall, the baseline model for females included four structural paths and three error covariances. The paths included in this

model were: a) a path from parental perceptions to internalizing symptoms, b) a path from internalizing symptoms to adolescent perceptions, c) a path from age of onset to internalizing symptoms, and d) a path from parental perceptions to adolescent perceptions of FF. The error covariances (i.e., correlated measurement errors) in this model were: a) between maternal and paternal adaptability, b) between paternal and adolescent adaptability, and c) between maternal adaptability and paternal cohesion.

Multiple-group comparisons. As noted above, single group analyses did not identify a baseline model that was appropriate for both genders. A baseline model for males was not found; however, a strong baseline model was identified for females. In order to still allow for the examination of study hypotheses within Sample #2, the baseline single-group model from females was used as the final model in multiple-group analyses. However, results from this model should be considered exploratory and used to generate pilot data for future studies interested in examining the relationships between individual perceptions of FF, age of onset, and internalizing symptoms for adolescent males and females from intact families.

Results of the multiple-group analysis indicated that the unconstrained model (i.e., all parameters, variances, and covariances were free to vary across gender) was not successfully fit to the sample data for males due to empirical problems (i.e., a not positive definite covariance matrix was observed). These problems were likely related to empirical underidentification problems previously encountered in the single group analyses for males (i.e., limited power and small sample size). Consequently, the inadmissible solution found for the unconstrained model did not yield accurate model fit indices or parameter estimates. Thus, comparisons could not be made between the

unconstrained and most restrictive model (i.e., constrained) in order to evaluate changes in model fit that may have occurred based on the imposition of cross-group constraints.

It is important to note that subsequently restrictive and nested models could not be used as base models to compare with the most restricted model due to additional problems that were encountered (i.e., poor model fit, nonsignificant covariances and paths between groups). For example, the measurement weights model (i.e., all factor loadings are constrained to be equal between groups) successfully fit the data but included two nonsignificant covariances for males.

Despite lacking a less constrained model for comparison, results of fitting the most restrictive model could be analyzed for gender differences if stringent criteria for measurement and factor invariance were met (Deshon, 2004). Results demonstrated that all factors were measured comparably across groups (i.e., due to equivalent factor loadings, error variances and covariances; Deshon, 2004) despite the empirical problems noted above during the fitting of male data in the unconstrained model. In addition, no sex differences were found in the magnitude or direction of the relationships between internalizing symptoms, parental and adolescent perceptions of family functioning, and age of onset. All factor loadings and paths in the most restrictive model were also found to be significant in both genders, with the exception of the path from age of onset to internalizing symptoms. Overall, the successful convergence of the most restrictive model with well-defined constructs provided evidence of no gender differences in the relationships between internalizing problems, discrepancies in perceptions, and age of onset of weight problems (Deshon, 2004).

The final multigroup model (i.e., most restrictive model) included three

covariances between measurement errors and explained 15% of the variance in adolescent internalizing symptoms and 47% of the variance in adolescent perceptions of FF. All but one of the predicted pathways (i.e., from age of onset to internalizing symptoms) were significant at $p < .01$. Figure 7 presents the standardized regression weights, squared multiple correlations, and covariances. Table 12 presents the unstandardized regression weights, standard errors, and covariances.

Similar to the final model for maternal data only (i.e., Sample #1), the final model for this subsample could only test two unidirectional hypotheses instead of the hypothesized reciprocal relationships between familial correlates of adolescent internalizing symptoms. The hypothesis that parental perceptions of lower levels of family cohesion and adaptability significantly predict increases in internalizing symptoms was supported. In addition, increases in internalizing symptoms were found to significantly predict negative adolescent perceptions as expected. Evidence for the final hypothesis that earlier age of onset would predict increases in adolescent internalizing symptoms was not found. However, support was found for an initially unmodeled relationship between paternal and adolescent perceptions of FF. Parental perceptions of FF were found to significantly predict their adolescents' perceptions. These findings suggest that adolescent internalizing symptoms mediate the relationship between parental perceptions and adolescent perceptions of family functioning.

Hypothesis 2

Internalizing Symptoms and Parent-Adolescent Discrepancies in Perceptions of Family Functioning

Confirmatory factor analyses. Among males and females, attempts to fit a 2-factor model (i.e., separate yet correlated factors for maternal- and paternal-adolescent discrepancies) were unfavorable. Minimization was unsuccessful for males (i.e., due to negative error variances for maternal- and paternal-adolescent discrepancies in cohesion) and extremely poor fit was found for females (χ^2 (1, N = 296) = 86.59, $p < .0001$; GFI = .85; RMSEA = .54, 90% confidence interval = .45 - .64). Additionally, results of model fitting using ML estimation did not produce acceptable solutions for either gender (i.e., the model failed to converge for males and yielded an inadmissible solution (not-positive-definite matrix) for females).

A second CFA was conducted to examine the fit of a single parental-adolescent discrepancies factor with two sets of correlated measurement errors due to common method variance. Empirical underidentification was found using GLS and ML estimation for both males and females. Thus, similar to the CFA results described above for individual perceptions, the single factor CFA model for discrepancies was hypothesized to hold greater promise given that it included more indicators than each latent construct in the 2-factor model. Thus, the single factor model was chosen as the preferred measurement model to test the relationship between parental-adolescent discrepancies, internalizing symptoms, and age of onset for in SEM analyses.

Single-group analyses. Initially, the full model with reciprocal relationships (see Figure 6) did not converge successfully for males. Once again, a baseline model could not be found for males despite the elimination of a path from parental-adolescent discrepancies to internalizing symptoms (i.e., iteration limit was reached). This path was eliminated due to the absence of an instrumental variable for the discrepancies factor.

For females, the full model converged but demonstrated other model identification problems (i.e., negative squared multiple correlations & nonsignificant paths; see Table 13 for results). The elimination of a negative path from parental-adolescent discrepancies to internalizing symptoms (i.e., due to identification problems) yielded a baseline model with excellent fit and significant factor loadings and residual covariances. In addition, the hypothesis of exact fit could not be rejected for the current model (i.e., given the inclusion of zero within the RMSEA confidence interval). Overall, this model was chosen as the final model for females despite a nonsignificant path from age of onset to internalizing symptoms.

Multiple-group comparisons. Once again, a baseline model could not be achieved for males. Instead, the final model for females, which included two paths a) from internalizing symptoms to parental-adolescent discrepancies and b) from age of onset to internalizing symptoms, was chosen for follow-up multiple group analyses. By imposing the same model simultaneously on males and females, the magnitude of all measurement and structural relationships could be tested for measurement and factor invariance.

Not surprisingly, attempts to fit the unconstrained model to males resulted in an inadmissible solution related to issues of empirical underidentification (see Table 13 for results). However, all constructs were found to be measured identically across groups (i.e., the measurement weights model was successfully fit and all subsequently restrictive and nested models converged successfully). The measurement weights model was chosen as the base model for comparison given its evidence of measurement invariance across groups via good fit indices (i.e., despite a significant chi-square value). Results of the chi-square difference test, between the measurement weights model and the most

restrictive model, indicated that the most restrictive model fit the data well. Moreover, no sex differences were found to exist in any of the relationships modeled in the most restrictive model (although as previously noted, results differed when run separately for each gender) due to the measurement and factor invariance that was demonstrated.

The final multigroup model included two error covariances and explained 14% of the variance in parental-adolescent discrepancies and 1% of the variance in adolescent internalizing symptoms. All but one of the predicted pathways (i.e., from age of onset to internalizing symptoms) were significant at $p < .0001$. In addition, the hypothesis for exact fit could not be rejected. Figure 8 presents the standardized regression weights, squared multiple correlations, and covariances. Table 14 presents the unstandardized regression weights, standard errors, and covariances.

As noted earlier, empirical underidentification hindered the examination of reciprocal relationships between discrepancies in perceptions and internalizing symptoms for either gender. Thus, the hypothesis, which expected the path from discrepancies to internalizing symptoms to be stronger than the reverse, could not be tested. The final model did allow two paths to be tested, one from internalizing symptoms to parental-adolescent discrepancies, and the second from age of onset to internalizing symptoms. Findings from multiple-group analyses supported the hypothesis that increased adolescent internalizing symptoms predicted greater relative parental-adolescent discrepancies suggesting that parents reported perceiving greater levels of cohesion and adaptability than their adolescents. Earlier age of onset, on the other hand, was not found to predict the degree of internalizing symptoms reported by adolescents, despite expectations. In addition, no significant sex differences were found in the magnitude or

direction of these relationships when both groups were tested simultaneously.

DISCUSSION

The primary aim of this dissertation was to examine possible correlates of adolescent psychopathology in an effort to clarify why some overweight adolescents experience psychological distress while others do not. Family functioning (FF) and age of onset of weight problems have been identified as correlates of psychopathology in the adult obesity literature, but had not sufficiently been investigated in overweight adolescents' functioning. This study aimed to be the first to examine the reciprocal relationships between adolescent internalizing symptoms and both perceptions and discrepancies in perceptions of family functioning. A secondary aim included expanding the current literature by examining whether earlier age of onset of weight problems predicted adolescents' experience of internalizing symptoms.

While the current study was unable to test all hypothesized relationships, its findings highlight the importance of assessing family functioning across multiple informants within treatment-seeking families. In particular, parental perceptions of decreased FF were found to predict psychological distress in both overweight male and female adolescents regardless of family composition. Adolescents suffering from internalizing symptoms were also found to be more likely to report negative perceptions of their family's functioning. In addition, greater discrepancies in parental-adolescent perceptions of FF were found to be predicted by adolescents' internalizing symptoms. Finally, age of onset of weight problems was not found to be related to internalizing symptoms suggesting that the experience of adolescent overweight, with acute or chronic onset, does not exert a significant influence on the expression of internalizing symptoms in overweight youth.

The current study improved upon past research by examining the relationship between multiple informants' individual perceptions of family functioning and a range of internalizing symptoms among families with overweight male and female adolescents. Prior to the present dissertation, the relationships between parental-adolescent discrepancies in perceptions of FF and internalizing symptoms were never explored in a sample of overweight adolescents. This study is also unique in its attempts to investigate the reciprocal relationships between family and adolescent mental health in two help-seeking samples: a) adolescents and their mothers, and b) adolescents from intact families with maternal and paternal data. Additionally, the examination of the role of age of onset in adolescent internalizing symptoms contributes to the growing literature on adolescent psychopathology in overweight youth.

Relationship between Internalizing Symptoms and Individual Perceptions of Family Functioning

The results of the present dissertation provide evidence that parental negative perceptions of family functioning predict internalizing symptoms in male and female overweight adolescents. In testing this hypothesis among adolescents and their mothers, results indicated that when mothers of overweight adolescents report lower levels of perceived FF, adolescent males and females tend to report more internalizing symptoms. Similar results were found for our subsample of adolescents from intact families whose parental perceptions of lower levels of FF (i.e., the combination of maternal and paternal perceptions) were found to predict increased internalizing symptoms in both genders. These findings are consistent with evidence in the general family functioning literature

that have found a positive relationship between problems in family functioning and internalizing problems in adolescents (Crawford et al., 2001; Ohannessian et al., 1995, 2000). However, our findings extend this literature by showing that these relationships are also present in families of overweight adolescents.

Little is known about the processes by which negative parental perceptions of FF affect adolescent internalizing symptoms in families of overweight adolescents. However, a possible explanation for the inverse relationship is that overweight adolescents are more likely to have internalizing symptoms if their parents' perceptions of poor FF (i.e., lacking cohesiveness or flexibility) result in negative parent-adolescent interactions. For example, parents who view their families to be functioning poorly may not only interact negatively with their adolescents but also withdraw from interactions in an effort to avoid conflict. The stressful interactions that do take place (i.e., riddled with tension, disengagement, criticism, etc.) may subsequently increase adolescents' internalizing symptoms of loneliness, depressed mood, hopelessness, and low self-worth through their impact on adolescent perceptions of parental rejection.

Indeed, research in the general adolescent literature has found that adolescent perceptions of parental rejection predict adolescent depression and aggression (Akse et al., 2004; Hale et al., 2005). While this relationship has not been examined in overweight adolescents, it is possible that overweight adolescents may perceive their parents' negative interactions, or lack thereof, to be rejecting. Consequently, overweight adolescents' perceptions of parental rejection may result in increased depressive symptomatology. Similarly, overweight adolescents' may also experience increases in anxiety brought about by repeatedly adverse interactions from unsupportive parents.

Future research is necessary to identify mechanisms by which parental perceptions of poor FF predict overweight adolescents' internalizing difficulties. Given findings in the general adolescent literature described above, research should examine the relationship between overweight adolescents' perceptions of parental rejection and adolescent internalizing symptoms. Additional research investigating the relationship between parental perceptions of poor FF and overweight adolescents' internalizing symptoms should also investigate the potential moderating effect of perceived interpersonal support (e.g., peer, external family members and friends, community, church). Finally, the relationship between parental perceptions of poor FF, adolescent internalizing symptoms, and the adoption and/or maintenance of health compromising behaviors (e.g., poor nutrition, sedentary behavior, substance use) in overweight adolescents is especially necessary to inform prevention and intervention programs alike.

Results of the present dissertation also indicated that increased internalizing symptoms, in turn, predicted negative adolescent perceptions of FF in males and females from samples. These findings are also consistent with prior research which has demonstrated an inverse relationship between overweight adolescents' level of emotional distress and perceived family connectedness and flexibility of parental perceptions (Mellin et al., 2002). While prior research has demonstrated that adolescents generally tend to view their family as functioning less favorably than their parents (Ohannessian et al., 1995, 2000; Noller, Seth-Smith, Bouma, & Schweitzer, 1992), it is likely that adolescents' with internalizing symptoms may perceive their family's functioning to be even more negative than adolescents without these symptoms. For example, internalizing symptoms (e.g., depressed mood, anxiety, irritability, feelings of loneliness, low self-

worth, etc.) may color overweight adolescents' experiences of family interactions by increasing their vulnerability to feeling rejected and decreasing their ability to regulate affect. Adolescents' perceptions of FF may also be compromised by feelings of hopelessness regarding the future state of their family's relations, let alone their ability to achieve weight loss success. It is also possible that adolescents' withdrawal from family interactions (i.e., due to family conflict and/or internalizing symptoms) may reinforce their unfavorable perceptions of FF and potentially arrest their development of important conflict resolution skills.

In the sample of adolescents with maternal and paternal data only, adolescent internalizing symptoms were found to mediate relationships between parental and adolescent perceptions of FF. This relationship was unexpected given the absence of a priori hypotheses regarding the influence of parental perceptions on adolescents' appraisals. This unexpected finding underscores the importance of obtaining multiple parental reports of FF in intact families. Similar to the interpretation described above for adolescents and their mothers, this finding suggests that *both* mothers and fathers who perceive their families to be lacking cohesiveness and/or flexibility may interact negatively with their adolescents (i.e., be intimidating, cold, critical, rejecting, etc.). Consequently, the emotional costs of stressful interactions is expressed in subsequent increases in adolescents' internalizing symptoms which in turn, increases adolescents' unfavorable perceptions of their family's functioning..

It is interesting to note that the current finding was only found after paternal perceptions of FF were included for examination with maternal and adolescent perceptions. This finding suggests that fathers of overweight adolescents play a

significant role in shaping their adolescents' internalizing symptoms *and* appraisals of family functioning. Indeed, the importance of including fathers in research on family functioning and eating disturbances (including obesity) has been emphasized (Steinberg & Phares, 2001). Future research should investigate whether certain components of parent-adolescent interactions (e.g., quality or quantity of contact) impact overweight adolescents' internalizing symptoms and perceptions of FF more than others.

As noted earlier, methodological problems prevented a number of hypotheses from being tested. For example, the hypothesis that posited that internalizing symptoms would predict maternal perceptions of FF could not be examined. In addition, the hypothesis that proposed perceptions of family functioning would be stronger predictors of internalizing symptoms than their reverse paths of causation, could not be investigated due to the impossibility of testing reciprocal relationships. Consequently, it was impossible to investigate the effect of adolescent appraisals of FF on internalizing problems.

Additional research is necessary in order to determine how overweight adolescents' internalizing symptomatology may adversely impact parental and adolescent perceptions of poor family functioning. It is probable that individual perceptions of FF may demonstrate stronger effects on overweight adolescents' internalizing symptoms as compared with the opposite direction of causation. Indeed, previous twin research has demonstrated the role of recalled parenting in predicting psychological distress in adult female twins (Gillespie et al., 2003). For overweight adolescents, this potential effect is likely due to the important role familial relationships play in the development of their self-competence, individuality, and overall identity. Finally, cross-sectional and

longitudinal research of these bidirectional relationships is sorely needed in order to clarify the mechanisms that cause maladaptive individual and family functioning in families of overweight youth.

Relationship between Internalizing Symptoms and Discrepancies in Perceptions of Family Functioning

It was also hypothesized that discrepancies in parental-adolescent perceptions of FF would contribute to internalizing symptoms of overweight adolescents. In addition, discrepancies in perceptions were hypothesized to be stronger predictors of internalizing symptoms than individual perceptions. Unfortunately, empirical underidentification prevented these hypotheses and the reciprocal relationships between these constructs from being tested in both samples. However, the path from internalizing symptoms to parental-adolescent discrepancies was examined. In fact, the present investigation is the first study to examine the relationship between discrepancies in perceptions of FF and overweight adolescents' internalizing symptoms.

Overweight adolescents' psychological functioning was found to play an influential role in the functioning of their families. Results indicated that internalizing symptoms predict greater relative discrepancies in perceptions of FF in males and females from both samples. Specifically, adolescents with more internalizing symptoms were found to have less favorable perceptions of FF than their parents. By the same token, adolescents with less internalizing symptoms were found to have more favorable perceptions of FF than their parents. These findings are in agreement with longitudinal research in the general adolescent and family functioning literature which has

demonstrated that adolescent females who expressed more depressive and anxious symptomatology perceived their family's functioning to be less favorable than both their mothers' and fathers' individual appraisals (Ohannessian et al., 1995, 2000).

It is probable that larger relative discrepancies are a consequence of the effect of adolescents' internalizing difficulties on their perceptions of FF (see above). For example, adolescents with internalizing symptoms (e.g., sensitivity to perceived rejection, interpersonal conflict, etc.) may view their relationships with their parents even more negatively than adolescents who are not depressed. It is also plausible that depressed adolescents' perspectives of their family's functioning may be veridical, albeit less favorable than their parents' perceptions. Given the general tendency for parents to view their family relationships as more favorable than their children (Lerner & Knapp, 1975; Lerner & Spanier, 1980), the discrepancy between perceptions is likely to be even greater in kids with internalizing symptoms.

Despite the presence of significant effects, it should be noted that the percentage of variance in relative discrepancies that was explained by adolescents' internalizing symptoms was rather small in both samples (i.e., 10 - 14%). Our small yet significant findings suggest that discrepancies in perceptions of FF may comprise only one influential piece in the overall picture of familial factors that are affected by internalizing symptoms in overweight youth. As noted previously, our research also demonstrated that adolescent perceptions of FF were predicted by internalizing symptoms (i.e., 26% - 47% of variance explained in both samples). Given the percentages of variance of FF that were found to be explained in the current study, future research should investigate additional factors that may mediate or moderate the relationship between overweight

adolescents' internalizing symptoms and multiple informants' perceptions of FF. Similarly, the inclusion of additional indicators of family functioning (e.g., family communication, interaction, conflict, etc.) in future studies would allow for the examination of bidirectional hypotheses (i.e., between FF and overweight adolescents' internalizing symptoms), which could not be tested, in the current study.

Relationship between Internalizing Symptoms and Age of Onset of Weight Problems

It was hypothesized that age of onset of weight problems, in addition to the effects of individual perceptions of FF and discrepancies in perceptions, would predict adolescent internalizing symptoms in overweight youth. Results did not support this hypothesis in any of the models tested across both samples. The current results are in contrast with findings in the adult obesity literature, which have identified a relationship between childhood age of onset and both psychological distress and psychotic symptoms in obese adults (Mills, 1995; Mills & Andrianopoulos, 1993). However, the findings of the present dissertation are in partial contrast to prior research, which demonstrated evidence of greater risk of psychopathology in chronically obese rural adolescents (i.e., children who were obese before the age of 9 and who continued to be obese throughout the 8 year study) (Mustillo et al., 2003). Indeed, research by Mustillo et al. found a significant relationship between chronic obesity and DSM-IV depressive disorders in boys only, whereas oppositional defiant disorder (ODD) was found to be related to earlier age of onset for chronically obese boys and girls.

A possible explanation of the current findings is that age of onset may be a more effective predictor of symptomatology other than internalizing problems in overweight

youth, especially females. It is interesting to note that Mustillo et al.'s results were based on a longitudinal analysis of a representative sample of rural youth in the United States (i.e., 9 - 16 year olds of Caucasian descent). While the majority of the current sample lived in urban and suburban areas, their average age of onset would classify them as belonging to the "chronically-obese" group suggesting that externalizing problems such as ODD should be examined in future research.

Another interpretation is that age of onset may not have any effect on internalizing symptoms in overweight youth. In fact, results from research in the adult obesity literature may have been biased as a consequence of using retrospective recall of age of onset (Mills, 1995; Mills & Andrianopoulos, 1993). Alternatively, it is possible that the effects of earlier age of onset on internalizing symptomatology may not become apparent until adulthood (Mills, 1995; Mills & Andrianopoulos, 1993). Nonetheless, future research is necessary to increase our understanding of the relationship between obesity trajectories based on age of onset and psychological adjustment in overweight youth's development over time.

Limitations and Future Directions

A few limitations of the current study should be noted. First, the sample was predominantly Caucasian, from middle to upper SES groups, and seeking treatment for adolescent overweight. Given the high cost of the private obesity treatment from which the current dataset was collected, SES membership for these families was expected to be in the middle to high groups. As a whole, the results of this study might not generalize to families from lower SES backgrounds or who have overweight offspring who do not seek

clinical treatment for their adolescents' weight problem. Additional research is necessary to determine if the present results generalize to non-treatment seekers. It is also important to note that the present study did not assess whether family enrollment in the private obesity program was influenced by the presence of any internalizing symptoms in their adolescents. Indeed, the presence of adolescent internalizing symptoms, both alone (Verhulst & Van de Ende, 1997) and in combination with chronic medical problems, has been found to directly influence help-seeking for child psychopathology (Gasquet, Chavance, Ledoux, & Choquet, 1997; John, Offord, Boyle, & Racine, 1995; Zahner & Daskalakis, 1997). Future research should examine how adolescent internalizing symptoms might influence parental help-seeking behavior for adolescent obesity. Finally, the need to replicate these results in more diverse samples is evident given prior research that has found minority youth (Saha, Eckert, Pratt, & Shankar, 2005; Zhang & Wang, 2004), and children and adolescents from lower SES groups (Power, Manor, & Matthews, 2003), to be at the greatest risk for developing obesity.

Future research may also benefit from examining the role of family composition (i.e., single-parent, 2-parent families) in the relationship between FF and adolescent internalizing symptoms. The present study did not find significant family composition differences. However, results of previous research have demonstrated that adolescents from single-parent families were at greater risk for depression and low self-esteem than adolescents in 2-parent families (Swallen et al., 2005). As such, additional research should explore this issue more closely.

Second, methodological problems related to limited power, small sample sizes, and model specification problems (i.e., number of parameters to be estimated exceeded

the number of observed variables) prevented the examination of all hypothesized reciprocal relationships, which resulted in substantive model changes. For example, hypotheses regarding the predictive value of family functioning on internalizing symptoms (i.e., bidirectional hypotheses) could not be tested. These limitations in model testing may have been influenced by the nature of the current dataset (i.e., secondary data), especially in relation to the restricted number of available measures of family functioning. Future research should include larger sample sizes of both genders with additional informants and indicators for each construct, especially for the assessment of family functioning. Given the cross-sectional nature of the current study, longitudinal research is necessary in order to elucidate the causal mechanisms between perceptions and discrepancies in perceptions of FF and adolescent internalizing symptoms.

Third, it is important to note that the models tested are not exhaustive of the relationships between family functioning and internalizing symptoms in families with overweight youth. Alternative models, which include influential variables that may explain larger portions of the variance of family functioning and internalizing symptoms, should be explored. For example, weight cycling and critical events (i.e., history of trauma and abuse) may be related to fluctuations in weight and/or internalizing symptoms. Research has demonstrated a strong relationship between prior histories of sexual and physical abuse and adolescent internalizing symptoms (i.e., especially for females), which support their examination (Diaz, Simantov, & Rickert, 2002). Potential variables to examine in future models may also include the role of pubertal timing, parental psychopathology, and parental obesity on the family functioning and internalizing symptoms of overweight adolescents. Pubertal timing may influence

internalizing symptoms in overweight youth as a consequence of its relationship to increased weight gain and body composition changes. Likewise, parental variables, such as parental psychopathology and obesity, may increase the risk for adolescent psychopathology and overweight through heritability. Evidence already exists in the overweight child literature that supports a positive relationship between maternal and paternal mental health problems and internalizing symptoms in treatment-seeking overweight children (i.e., who completed family-based obesity treatment; Epstein, Wisniewski, & Weng, 1994). Additional research is necessary to increase our understanding of how the psychological functioning and weight status of overweight adolescents is influenced by their caregivers' (i.e., maternal and/or paternal) psychopathology. Given that depression and obesity may both originate during adolescence, future models should also explore their reciprocal relationship (Goodman & Whitaker, 2002). Taken together, the examination of these relationships in families of overweight adolescents has the potential to identify youth who may be at greater risk of developing internalizing problems that complicate the course and outcome of obesity (e.g., depression in adolescents) (Rice, Harold, & Thabar, 2002).

Fourth, the use of self-reports is a possible limitation given the relationship of the participants' assessments to their eligibility for a family-based weight-loss program. Participants were aware that the results of all assessments would be evaluated to determine eligibility for program enrollment and reviewed in a consultation meeting with their family. It is possible that social desirability may have influenced adolescents and/or their parents to report healthier levels of family functioning given the intimate nature of disclosing/exposing family relations to a health care professional who has not yet gained

the family's trust. This may be especially true for families in which the adolescents' weight problem is shame-bound and may vary depending on the adolescents' degree of overweight.

In addition, the independence of participants' responses may have been affected by site-specific procedures. For example, limited resources may have led to some family members completing the assessments at home and/or while sitting next to one another (i.e., if not jointly) at the site. Consistent with this hypothesis, participating adolescents may have underreported their internalizing symptomatology on self-reports if privacy was a concern. Future research would benefit from employing multiple methods of assessment (i.e., observational, qualitative, and quantitative) to measure cross-informant perceptions of family functioning (i.e., overall FF, and parent-adolescent dyadic functioning).

Conclusion & Implications for Treatment

Clinically, our results stress the dynamic relationship between family environment and adolescents' emotional adjustment, and emphasize the importance of obtaining multiple informants' perceptions of FF. This is particularly valuable given the identified effect of parental perceptions of FF on adolescents' symptomatology, and the role adolescents' psychological functioning plays on their appraisals of family functioning. Naturally, identifying youth who may necessitate referrals for individual and/or family therapy prior to or in conjunction with their participation in a pediatric weight management intervention program should be an integral part of any assessment process.

However, many programs fail to examine the familial context within which overweight adolescents' internalizing symptoms are experienced.

The current study suggests that providers should assess the family functioning of their clients prior to the start of any weight management program. Obtaining a clear understanding of a family's functioning, pattern of interactions, and available support systems is critical in determining which treatment format (i.e., individually tailored vs. group) would be the most appropriate and conducive for success. For example, families that make impulsive decisions, avoid familial interactions, and lack the necessary leadership to promote efficient monitoring and success may find it especially difficult to participate in group activities that require skills they do not usually practice (i.e., disclosure, active listening, effective communication). It is also likely that parents may perceive failed attempts to promote change in their adolescents' behaviors (whether in individual or group treatment) as a sign of problems in the cohesiveness and adaptability of their family system. As described earlier in this dissertation, adolescents' internalizing symptoms may consequently increase due to their parents' negative perceptions of FF. Thus, recommendations for weight management treatment formats should incorporate family functioning assessments in order to maximize adolescents' and their family's mental health while promoting weight management.

Baseline assessments of family and adolescent psychological functioning can also be used to help providers conceptualize the familial and individual processes that may impede adolescents' weight management while increasing their psychological maladjustment. For example, the accurate assessment of adolescents' internalizing symptoms may be particularly important for the subgroup of individuals who experience

increased appetite as a consequence of depressed mood (Goodman & Whitaker, 2002). For these adolescents, prompt treatment of their depressive symptoms may decrease their risk for the development and persistence of obesity. Providers that offer time-limited programs may particularly benefit from using their knowledge of adolescent and family functioning to help parent-adolescent teams identify realistic goals which they can achieve together. For instance, it would be unrealistic to expect families who lack effective leadership to succeed at achieving numerous programmatic goals of improving individual and dyadic/triadic dietary and behavioral interventions. In fact, the motivation for achieving any goals would likely decrease as the responsibility for monitoring progress is juggled among family members. Thus, knowledge of a family's level of connectedness and adaptability can be used to tailor teamwork assignments that progressively increase a family's ability to identify a broad range of effective solutions to challenges in weight management. Increasing parental and adolescent cooperative skill sets may in turn, improve adolescents' feelings of self-efficacy and overall psychological adjustment.

It is also noteworthy to indicate that the treatment process of disclosure and communication of parental and adolescent perceptions of family functioning may in and of themselves increase overweight adolescents' internalizing symptoms as their parents' awareness of lower levels of FF are raised. This may be particularly true in families who avoid interactions and have succumbed to obesity treatment as a last resort. Given our present findings, particular emphasis should be placed on assisting parents to identify the strengths of their families while recognizing areas of functioning that would benefit from improvement. Similarly, parents and adolescents may benefit from structured

communication skills training which address active listening, empathy, and problem-solving. Increasing their communication skills has the potential of decreasing constrained relations while promoting adolescent mental health. Obesity treatment can also be used as a springboard for psychoeducation that focuses on increasing parents' understanding of the impact their perceptions of FF have on the mental health of their overweight adolescents. As such, the importance of paying attention to parental-adolescent discrepancies in perceptions of FF can also be discussed in relation to adolescents' developmental tasks (i.e., of individuation and autonomy) and possible internalizing symptoms.

Finally, assessments of adolescents' internalizing symptoms can be used to inform providers of particular issues to address in group and/or individual treatments. For example, discussions regarding affect regulation, health compromising behaviors (e.g., poor nutrition, sedentary behavior, dieting, substance use), and the effects of pubertal timing, social marginalization, and overt bullying victimization have the potential of validating adolescent experiences while increasing their coping skills. Moreover, it is suggested that changes in family functioning and internalizing symptoms be assessed throughout treatment in order to identify "hot spots" (i.e., distressing topics, events, or symptoms that disturb family and individual functioning) which have the potential to decrease the psychological welfare of adolescents if not addressed. In conclusion, results of the current dissertation suggest that intervention programs and therapies should recognize and promote increases in healthy individual and family functioning as important goals in the successful treatment of overweight adolescents and their families.

FIGURES

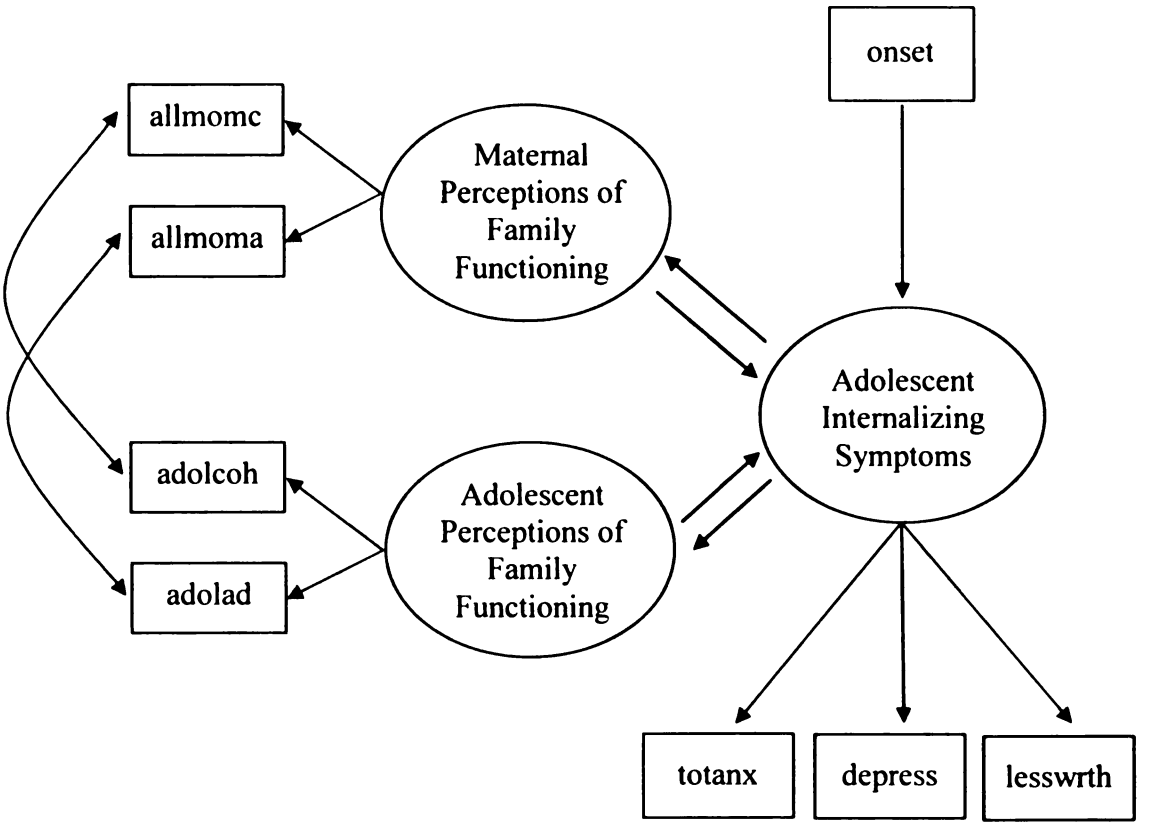

Figure 1. Conceptual and structural model of relationships between perceptions of family functioning, age of onset and adolescent internalizing symptoms for adolescents in Sample 1

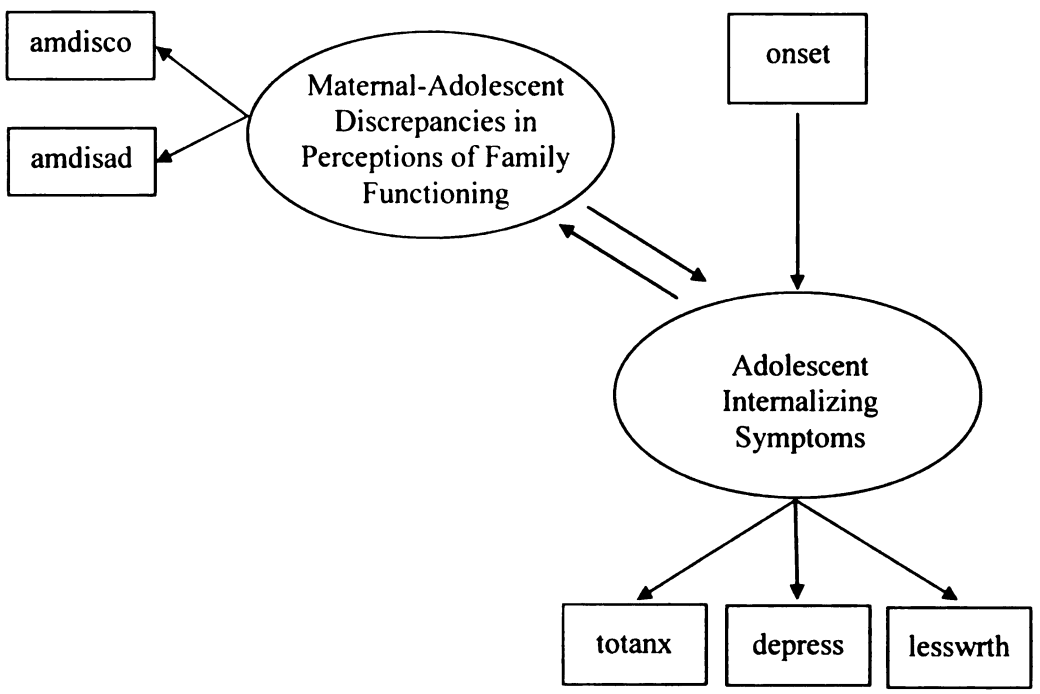

Figure 2. Conceptual and structural model of relationships between discrepancies in maternal-adolescent perceptions of family functioning, age of onset and adolescent internalizing symptoms for adolescents in Sample 1

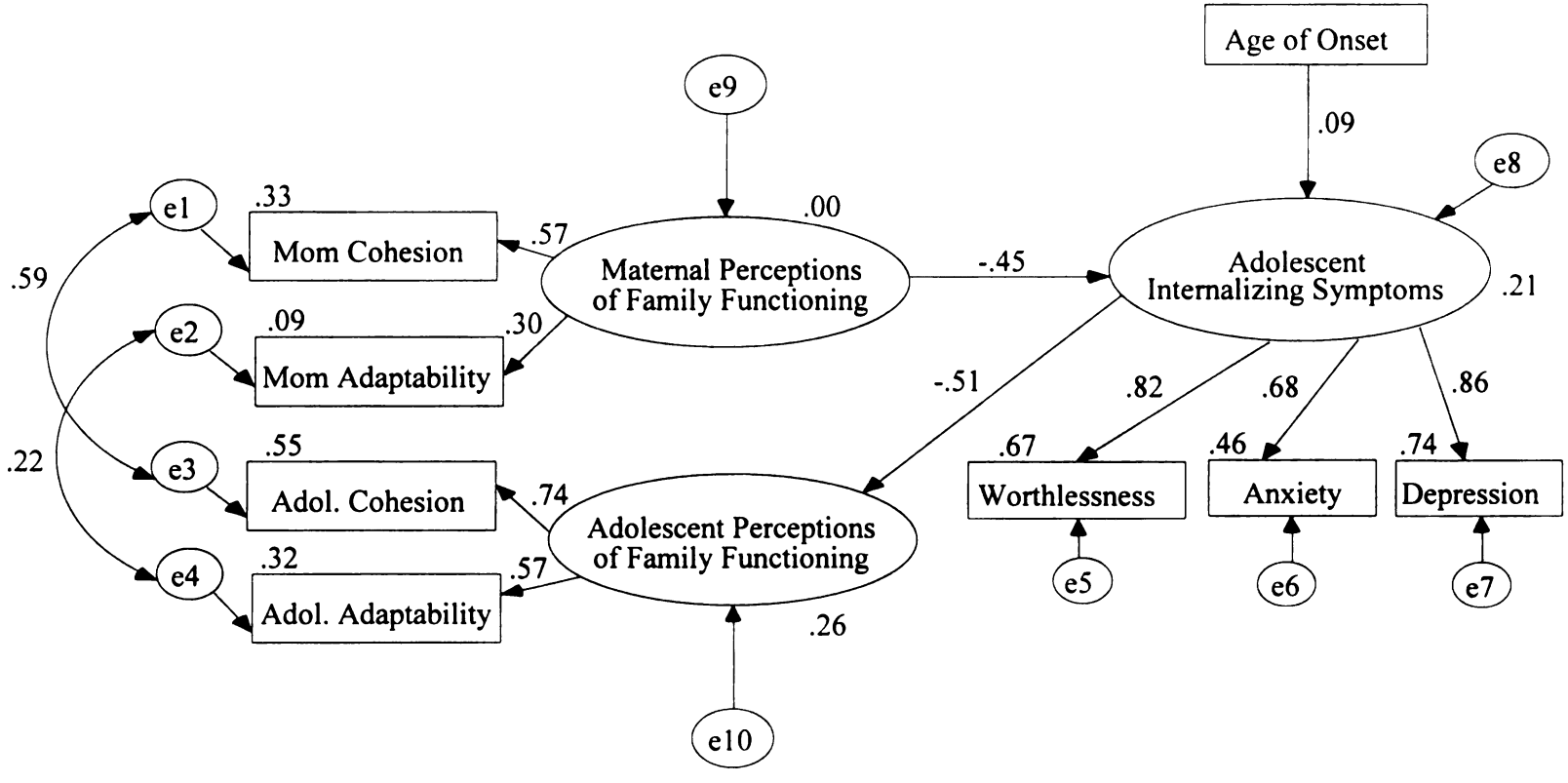

Figure 3. Multiple-group analysis of the final model for maternal and adolescent perceptions of family functioning, adolescent internalizing symptoms, and age of onset for adolescents in Sample 1

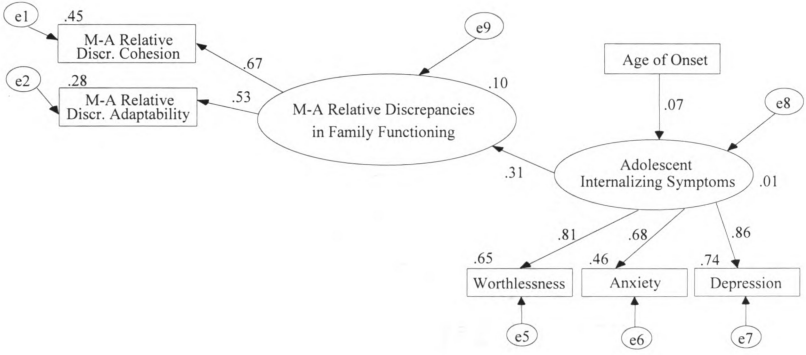

Figure 4. Multiple-group analysis of the final model for maternal-adolescent discrepancies in perceptions of family functioning, adolescent internalizing symptoms, and age of onset for adolescents in Sample 1

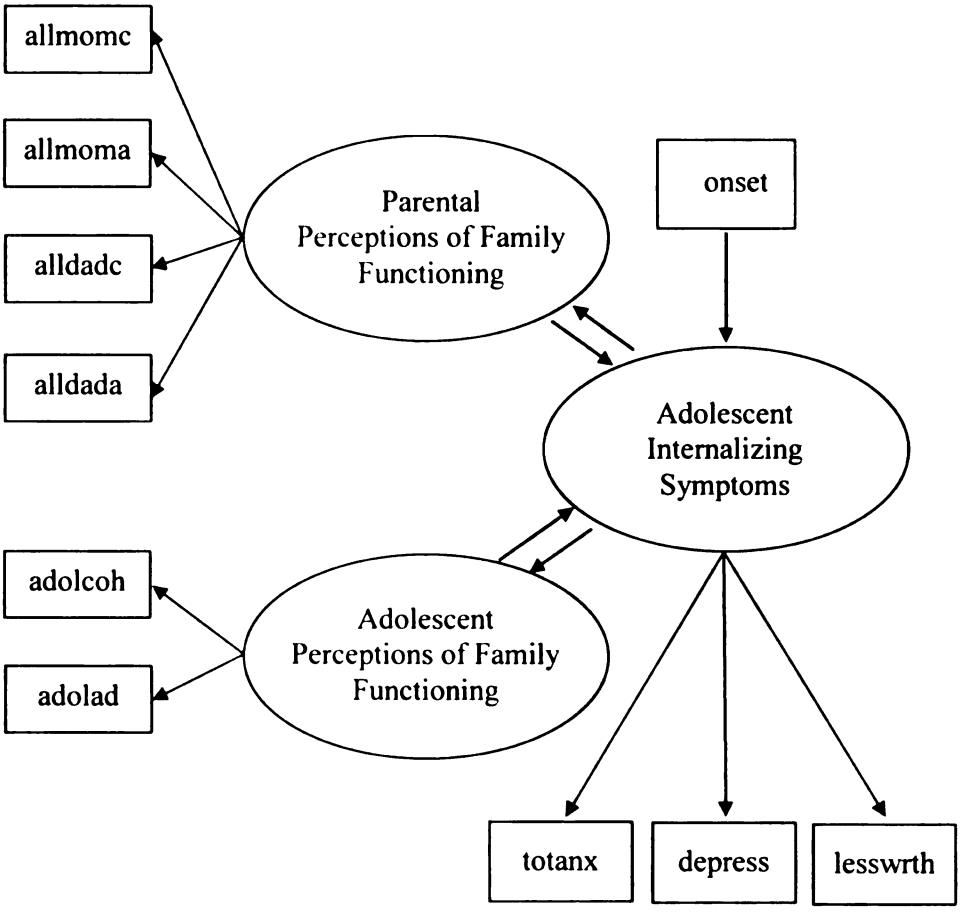

Figure 5. Conceptual and structural model of relationships between perceptions of family functioning, age of onset and adolescent internalizing symptoms for adolescents in Sample 2

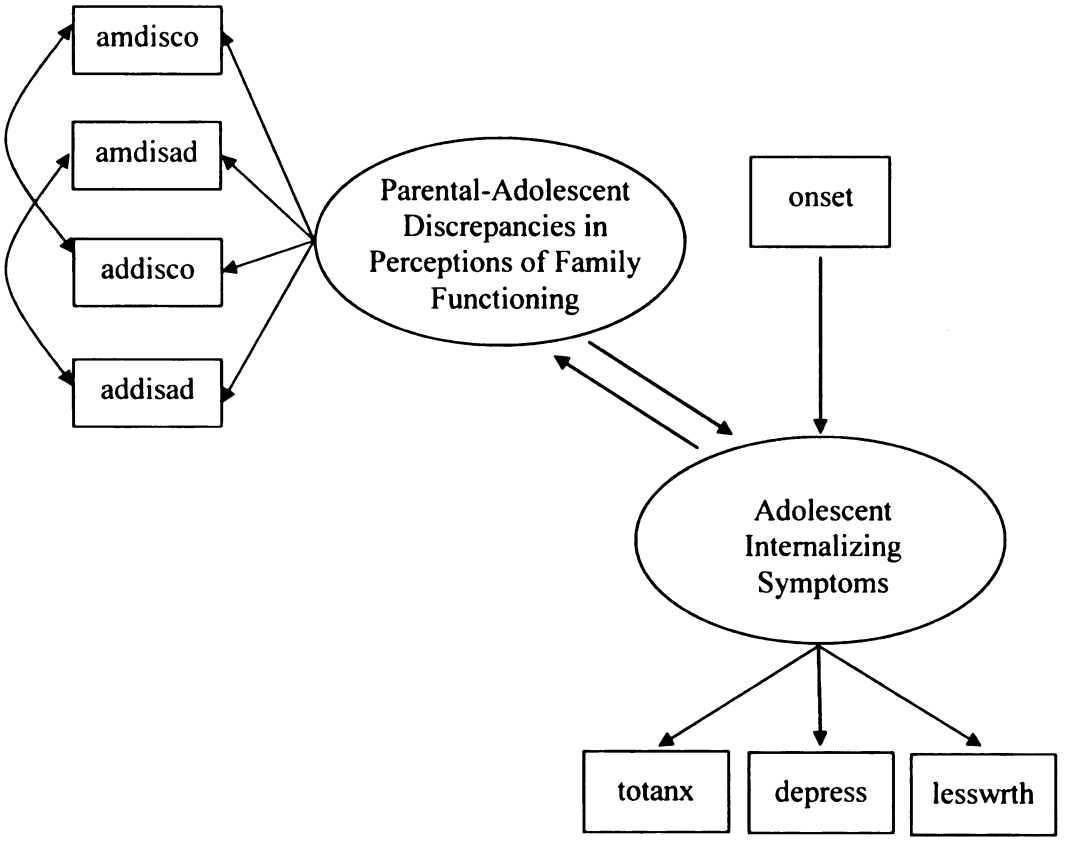

Figure 6. Conceptual and structural model of relationships between discrepancies in parent-adolescent perceptions of family functioning, age of onset and adolescent internalizing symptoms for adolescents in Sample 2

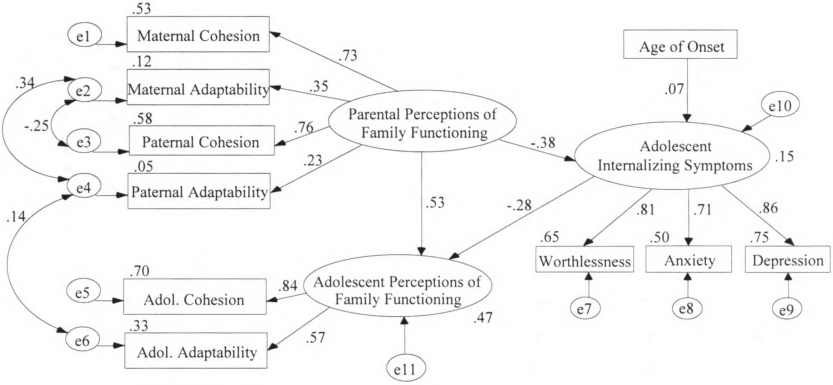

Figure 7. Multiple-group analysis of the final model for parental and adolescent perceptions of family functioning, adolescent internalizing symptoms, and age of onset for adolescents in Sample 2

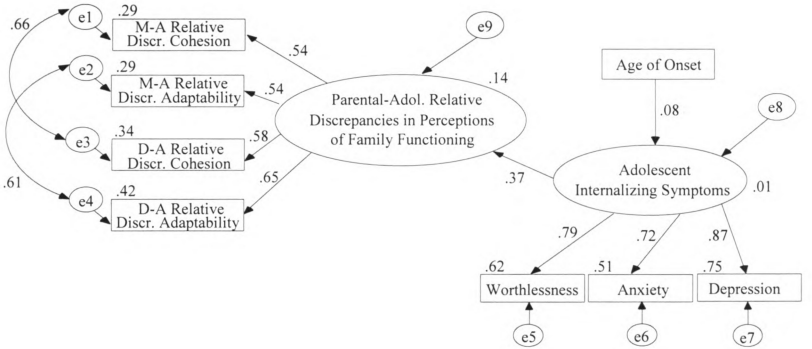

Figure 8. Multiple-group analysis of the final model for parental-adolescent discrepancies in perceptions, adolescent internalizing symptoms, and age of onset for adolescents in Sample 2

TABLES

Table 1.

Internal Consistency for Individual Perceptions of Family Functioning on the FACES-III

	All Participants (*n*=1648)	All Adolescents (*n*=626)	All Mothers (*n*=626)	All Fathers (*n*=396)
Family Cohesion	.87	.87	.83	.85
Family Adaptability	.63	.65	.61	.63

Note. n = total number of valid cases for each group.

Table 2.

Pearson Correlations between Body Mass Index & All Indicators for Girls & Boys in Sample 1

	All Adolescents (N=626)	Males (*N*=146)	Females (*N*=480)
	r	*r*	*r*
Age	.16****	.25**	.16****
Age of Onset of Weight Problems	-.22****	-.12	-.24****
BDI-SF Total Depression Score	.04	-.06	.09
RCMAS Total Anxiety Score	.03	.03	.04
Worthlessness Total Score	.03	.01	.07
Adolescent FACES-III Score			
Family Cohesion	-.02	-.00	-.03
Family Adaptability	.03	.10	.01
Maternal FACES-III Score			
Family Cohesion	-.06	-.12	-.03
Family Adaptability	.02	-.09	.06
Maternal-Adolescent Relative Discrepancy in:			
Family Cohesion	-.02	-.08	.01
Family Adaptability	-.01	-.16	.03

Note. N = total number of valid cases for each group.

* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$.

Table 3.

Pearson Correlations for Girls in Sample 1

Variable	1	2	3	4	5	6	7	8	9	10
1. Age of Onset	--									
2. Adolescent Cohesion	-.04	--								
3. Adolescent Adaptability	-.06	.47***	--							
4. Maternal Cohesion	-.00	.45***	.13**	--						
5. Maternal Adaptability	-.04	.14**	.24***	.23***	--					
6. M-A Relative Cohesion Discrepancies	.04	-.73***	-.41***	.27***	.03	--				
7. M-A Relative Adapt. Discrepancies	.02	-.33***	-.74***	.04	.48***	.39***	--			
8. Depression	.04	-.31***	-.21***	-.24***	-.06	.15**	.15**	--		
9. Anxiety	.01	-.25***	-.19***	-.15***	-.03	.15**	.16**	.58***	--	
10. Worthlessness	.06	-.28***	-.23***	-.20***	-.12*	.15**	.12**	.70***	.55***	--

Note. n=480; M-A = Maternal-Adolescent; Adapt. = Adaptability.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4.

Pearson Correlations for Boys in Sample 1

Variable	1	2	3	4	5	6	7	8	9	10
1. Age of Onset	--									
11. Adolescent Cohesion	-.16	--								
12. Adolescent Adaptability	.07	.39***	--							
13. Maternal Cohesion	-.00	.37***	.09	--						
14. Maternal Adaptability	.03	.10	.30***	.12	--					
15. M-A Relative Cohesion Discrepancies	.16	-.74***	-.32***	.36***	-.02	--				
16. M-A Relative Adapt. Discrepancies	-.04	-.28**	-.69***	.00	.48***	.29***	--			
17. Depression	.07	-.32***	-.20***	-.08	-.12	.26**	.09	--		
18. Anxiety	.15	-.24**	-.15	-.14	-.22**	.14	-.03	.59***	--	
19. Worthlessness	.13	-.39**	-.36***	-.12	-.17*	.31***	.21*	.68***	.49***	--

Note. n=146; M-A = Maternal-Adolescent; Adapt. = Adaptability.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5.

Examining Hypothesis 1: Goodness-of-Fit Indices for Single-Group and Multiple-Group Analyses of Adolescents in Sample 1

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	25.12 (14)*	1.80	--	.96	.07 (.02-.12)
	2nd Model – eliminated path (adolescent perceptions of FF → internalizing symptoms)	25.38 (15)	1.69	0.26 (1)	.96	.07 (.01-.11)
	3rd & Final Model – eliminated path (internalizing symptoms → maternal perceptions)	25.76 (16)	1.61	0.38 (1)	.96	.07 (.00-.11)
Females	1st Model – reciprocal relationships	11.82 (14)	0.85	--	.99	.00 (.00-.04)
	2nd Model – eliminated path (adolescent perceptions of FF → internalizing symptoms)	17.41 (15)	1.16	5.59 (1)*	.99	.02 (.00-.05)
	3rd & Final Model – eliminated path (internalizing symptoms → maternal perceptions)	17.42 (16)	1.09	0.01 (1)	.99	.01 (.00-.05)

Table 5 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	43.25 (32)	1.35	--	.98	.02 (.00-.04)
	Fully Constrained – Final Model	64.37 (52)	1.24	21.12 (20)	.97	.02 (.00-.03)

Note. FF = Family Functioning; *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses. Statistical significance was set at $p < .05$ for SEM analyses.

* $p < .05$.

Table 6.

Investigating Gender Differences for Hypothesis 1: Unstandardized Loadings (Standard Errors) for Multiple Group Analysis of Adolescents in Sample 1

Structural Model	Unstandardized Loadings (*SE*)
Maternal FF→ Internalizing Symptoms	-.683 (.235)**
Internalizing Symptoms → Adolescent FF	-.608 (.069)***
Age of Onset → Internalizing Symptoms	.144 (.069)*
Measurement Model	
Internalizing Symptoms → Depression	1.00 (--)
Internalizing Symptoms → Anxiety	.849 (.051)***
Internalizing Symptoms → Worthlessness	.633 (.034)***
Adol. Perceptions of FF → Adol. *Cohesion*	1.00 (--) .
Adol. Perceptions of FF → Adol. *Adaptability*	.535 (.078)***
Maternal Perceptions of FF → Maternal *Cohesion*	1.00 (--)
Maternal Perceptions of FF → Maternal *Adaptability*	.399 (.136)**
Error Covariances	
Adolescent Cohesion ↔ Maternal Cohesion	15.075 (1.733)***
Adolescent Adaptability ↔ Maternal Adaptability	4.292 (.932)***

Note. FF = Family Functioning; Adol. = Adolescent. Dashes (--) indicate the standard error was not estimated. GFI = .974; RMSEA = .020; $\chi^2(52) = 64.373$, $p = ns$.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 7.

Examining Hypothesis 2: Goodness-of-Fit Indices for Single-Group and Multiple-Group Analyses of Adolescents in Sample 1

Model	*Description of Nested Models*	χ^2 *(df)*	X^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	12.84 (7)	1.84	--	.97	.08 (.00-.14)
	2nd "& Final Model – eliminated path (maternal-adolescent relative discrepancies in perceptions → internalizing symptoms)	14.77 (8)	1.85	1.93 (1)	.97	.08 (.00-.14)
Females	1st Model – reciprocal relationships	3.34 (7)	.48	--	.998	.00 (.00-.03)
	2nd & Final Model – eliminated path (maternal-adolescent relative discrepancies in perceptions → internalizing symptoms)	3.85 (8)	.48	0.51 (1)	.997	.00 (.00-.03)
Multiple-Group Analysis						
	Unconstrained – Final Model	18.67 (16)	1.17	--	.99	.02 (.00-.04)
	Fully Constrained – Final Model	32.37 (29)	1.12	13.70 (13)	.98	.01 (.00-.03)

Table 7 continued.

Note. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses. Statistical significance was set at $p < .05$ for SEM analyses.

* $p < .05$.

Table 8.

Investigating Gender Differences for Hypothesis 2: Unstandardized Loadings (Standard Errors) for Multiple Group Analysis of Adolescents in Sample 1

Structural Model	Unstandardized Loadings (*SE*)
Internalizing Symptoms → Maternal-Adolescent *Relative* Discrepancies in Perceptions of FF	.312 (.066)***
Age of Onset → Internalizing Symptoms	.119 (.071)
Measurement Model	
Internalizing Symptoms → Depression	1.00 (--)
Internalizing Symptoms → Anxiety	.850 (.052)***
Internalizing Symptoms → Worthlessness	.627 (.035)***
Maternal-Adolescent Relative Discr. in FF → M-A Relative Discrepancies in *Cohesion*	1.00 (--)
Maternal-Adolescent Relative Discr. in FF → M-A Relative Discrepancies in *Adaptability*	.654 (.181)***

Note. FF = Family Functioning. Discr. = Discrepancies. M-A = Maternal-Adolescent. Dashes (--) indicate the standard error was not estimated. GFI = .983; RMSEA = .014; $\chi^2(29) = 32.369, p = ns.$

*** $p < .001$.

Table 9.

Pearson Correlations for Boys in Sample 2

Variable	1	2	3	4	5	6	7	8	9	10
1. Age of Onset	--									
20. Adolescent Cohesion	-.15	--								
21. Adolescent Adaptability	.04	.42***	--							
22. Maternal Cohesion	-.05	.37***	.12	--						
23. Maternal Adaptability	.06	.16	.33**	.10	--					
24. M-A Relative Discrepancies Cohesion	.12	-.76***	-.34**	.33**	-.09	--				
25. M-A Relative Discrepancies Adaptability	.01	-.28**	-.70***	-.04	.44***	.26*	--			
26. Depression	.02	-.33**	-.24*	-.11	-.16	.26**	.11	--		
27. Anxiety	.09	-.31**	-.21*	-.22*	-.23*	.16	.03	.63***	--	
28. Worthlessness	.06	-.47***	-.45***	-.16	-.29**	.36***	.21*	.69***	.51***	--
29. Paternal Cohesion	-.11	.39***	.19	.54***	.18	-.02	-.05	-.30**	-.29**	-.28**
30. Paternal Adaptability	.08	.12	.16	-.09	.39***	-.19	.15	-.13	.02	-.12
31. P-A Relative Discrepancies Cohesion	.07	-.72***	-.28**	.03	-.02	.76***	.25*	.11	.09	.26**
32. P-A Relative Discrepancies Adaptability	.02	-.26**	-.72***	-.16	.00	.15	.68***	.11	.19	.29**

Note. n=100; Adapt. = Adaptability; M-A = Maternal-Adolescent; P-A = Paternal-Adolescent.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 10.

Pearson Correlations for Girls in Sample 2

Variable	1	2	3	4	5	6	7	8	9	10
1. Age of Onset	--									
33. Adolescent Cohesion	-.06	--								
34. Adolescent Adaptability	-.09	.48***	--							
35. Maternal Cohesion	-.04	.44***	.14*	--						
36. Maternal Adaptability	-.06	.14*	.22***	.24***	--					
37. M-A Relative Discrepancies Cohesion	.04	-.76***	-.42***	.25***	.03	--				
38. M-A Relative Discrepancies Adaptability	.04	-.35***	-.77***	.03	.46***	.40***	--			
39. Depression	.07	-.29***	-.19**	-.24***	-.03	.14*	.15**	--		
40. Anxiety	.03	-.25***	-.24***	-.18**	-.05	.14*	.18**	.62***	--	
41. Worthlessness	.11	-.25***	-.22***	-.22***	-.11	.11	.12*	.69***	.59***	--
42. Paternal Cohesion	-.02	.41***	.06	.52***	.06	-.07	-.02	-.16**	-.08	-.18**
43. Paternal Adaptability	.04	.08	.22***	.10	.39***	-.01	.05	.02	-.01	-.05
44. P-A Relative Discrepancies Cohesion	.04	-.74***	-.46***	-.07	-.10	.74***	.35***	.18**	.20***	.13*
45. P-A Relative Discrepancies Adaptability	.11	-.39***	-.75***	-.06	.07	.37***	.73***	.19**	.21***	.16**

Note. n=296. M-A = Maternal-Adolescent. P-A = Paternal-Adolescent.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 11.

Examining Hypothesis 1 for Adolescents in Sample 2: Goodness-of-Fit Indices for Single- and Multiple-Group Analyses

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	*Inadmissible Solution* – Failed to Converge/Iteration Limit Reached				
	2nd Model – added 1 error covariance (maternal adaptability error ↔ paternal adaptability error)	*Inadmissible Solution* – Converged but Negative Error Variance for Paternal Cohesion				
		45.14 (30)*	1.51	--	.91	.07 (.02-.11)
	3rd Model – eliminated path (adolescent perceptions → internalizing symptoms)	*Inadmissible Solution* – Failed to Converge/Iteration Limit Reached				
	4th Model – eliminated path (internalizing symptoms → parental perceptions)	*Inadmissible Solution* – Failed to Converge/Iteration Limit Reached †				

Table 11 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Females	1st Model – reciprocal relationships	*Inadmissible Solution* – Negative Error Variance for Adolescent Family Cohesion				
		87.55 (31)****	2.82	--	.94	.08 (.06-.10)
	2nd Model – set error variance for adolescent cohesion to1/3 its variance (i.e., equals 20)	93.95 (32)****	2.94	--	.94	.08 (.06-.10)
	3rd Model – eliminated path (adolescent perceptions → internalizing symptoms)	123.79 (33)****	3.75	29.84 (1)***	.92	.10 (.08-.12)
	4th Model – eliminated path (internalizing symptoms → parental perceptions)	123.79 (34)****		0.00 (1)	.92	.10 (.08-.11)
	5th Model – added path (parental perceptions → adolescent perceptions)	92.98 (33)****	2.82	30.81 (1)***	.94	.08 (.06-.10)

Table 11 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
	6th Model – tested addition of *reverse* path (adolescent → parental perceptions) to the 4th Model	92.69 (33)****	2.81	31.10 (1)*** *Compared to 4th Model*	.94	.08 (.06-.10)
	7th Model – building on the 5th Model, added error covariance (maternal ↔ paternal adaptability)	70.33 (32)****	2.20	22.65 (1)***	.95	.06 (.04-.08)
	8th Model – added error covariance (maternal adaptability ↔ paternal cohesion)	59.77 (31)**	1.93	10.56 (1)***	.96	.06 (.04-.08)
	9th & Final Model – added error covariance (paternal ↔ adolescent adaptability)	50.64 (30)*	1.69	9.13 (1)**	.97	.05 (.02-.07)
	10th Model – eliminated path (parental perceptions → adolescent perceptions)	82.62 (31)****	2.67	31.98 (1)***	.94	.08 (.06-.10)

Table 11 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	*Inadmissible Solution* – Not Positive Definite Covariance Matrix for Males				
		95.50 (60)**	1.59	--	.95	.04 (.02-.05)
	Measurement Weights – Final Model	105.70 (66)** ‡	1.60	--	.95	.04 (.02-.05)
	Fully Constrained – Final Model	133.61 (85)**	1.57	*See text for explanation*	.93	.04 (.03-.05)

Note. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

† Final Model was not found.

‡ While model converged, empirical problems persisted.

Table 12.

Investigating Gender Differences in Hypothesis 1 for Adolescents in Sample 2: Unstandardized Loadings (Standard Errors) for Multiple Group Analysis

Structural Model	Unstandardized Loadings (*SE*)
Parental Perceptions of FF→ Internalizing Symptoms	-1.748 (.565)**
Internalizing Symptoms → Adol. Perceptions of FF	-.182 (.048)***
Parental Perceptions of FF → Adol. Perceptions of FF	1.624 (.477)***
Age of Onset → Internalizing Symptoms	.101 (.083)
Measurement Model	
Internalizing Symptoms → Depression	1.00 (--)
Internalizing Symptoms → Anxiety	.933 (.069)***
Internalizing Symptoms → Worthlessness	.652 (.044)***
Adol. Perceptions of FF → Adol. *Cohesion*	2.237 (.229)***
Adol. Perceptions of FF → Adol. *Adaptability*	1.00 (--)
Parental Perceptions of FF → Maternal *Cohesion*	3.890 (1.097)***
Parental Perceptions of FF → Maternal *Adaptability*	1.438 (.392)***
Parental Perceptions of FF → Paternal *Cohesion*	4.300 (1.170)***
Parental Perceptions of FF → Paternal *Adaptability*	1.00 (--)
Error Covariances	
Maternal Adaptability ↔ Paternal Cohesion	-3.664 (1.130)**
Maternal Adaptability ↔ Paternal Adaptability	5.610 (1.056)***
Paternal Adaptability ↔ Adolescent Adaptability	2.588 (1.083)*

Table 12 continued.

Note. FF = Family Functioning. Adol. = Adolescent. Dashes (--) indicate the standard error was not estimated. GFI = .932; RMSEA = .038; $\chi^2(85) = 133.607, p < .01$.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 13.

Examining Hypothesis 2 for Adolescents in Sample 2: Goodness-of-Fit Indices for Single- and Multiple-Group Analyses

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	*Inadmissible Solution* – Iteration Limit Reached due to Not Positive Definite Covariance Matrix				
	2nd Model – eliminated a path (parental-adolescent discrepancies → internalizing symptoms)	*Inadmissible Solution* – Iteration Limit Reached due to Not Positive Definite Covariance Matrix †				
Females	1st Model – reciprocal relationships	21.91 (16)	1.37	--	.98	.04 (.00-.07)
	2nd & Final Model – eliminated a path (parental-adolescent discrepancies → internalizing symptoms)	23.69 (17)	1.39	1.78 (1)	.98	.04 (.00-.07)

Table 13 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	*Inadmissible Solution* – Iteration Limit was reached due to Empirical Underidentification for Males				
	Measurement Weights – Final Model	59.67 (39)*	1.53	--	.96	.04 (.02-.05)
	Fully Constrained – Final Model	75.46 (53)*	1.42	15.79 (14)	.95	.03 (.01-.05)

Note. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses.

* $p < .05$.

† Final Model was not found.

Table 14.

Investigating Gender Differences in Hypothesis 2 for Adolescents in Sample 2: Unstandardized Loadings (Standard Errors) for Multiple Group Analysis

Structural Model	Unstandardized Loadings (*SE*)
Internalizing Symptoms → Parental-Adolescent *Relative* Discrepancies in Perceptions of FF	.320 (.084)***
Age of Onset → Internalizing Symptoms	.125 (.086)
Measurement Model	
Internalizing Symptoms → Depression	1.00 (--)
Internalizing Symptoms → Anxiety	.946 (.071)***
Internalizing Symptoms → Worthlessness	.636 (.045)***
Parental-Adol. Relative Discr. in FF → Maternal-Adol. Relative Discr. in *Cohesion*	1.00 (--)
Parental-Adol. Relative Discr. in FF → Maternal-Adol. Relative Discr. in *Adaptability*	.836 (.240)***
Parental-Adol. Relative Discr. in FF → Paternal-Adol. Relative Discr. in *Cohesion*	1.151 (.114)***
Parental-Adol. Relative Discr. in FF → Paternal-Adol. Relative Discr. in *Adaptability*	1.046 (.291)***
Error Covariances	
Maternal-Adol. Relative Discr. in Cohesion ↔ Paternal-Adol. Relative Discr. in Cohesion	27.217 (5.643)***

Table 14 continued.

Maternal-Adol. Relative Discr. in Adaptability ↔ Paternal-Adol. Relative Discr. in Adaptability	16.041 (4.215)***

Note. FF = Family Functioning. Adol. = Adolescent. Discr. = Discrepancies. Dashes (--) indicate the standard error was not estimated. GFI = .952; RMSEA = .033; $\chi^2(53) = 75.464, p < .05$.

*** $p < .001$.

APPENDICES

APPENDIX A:

Examining Absolute and Relative Discrepancies of Family Functioning

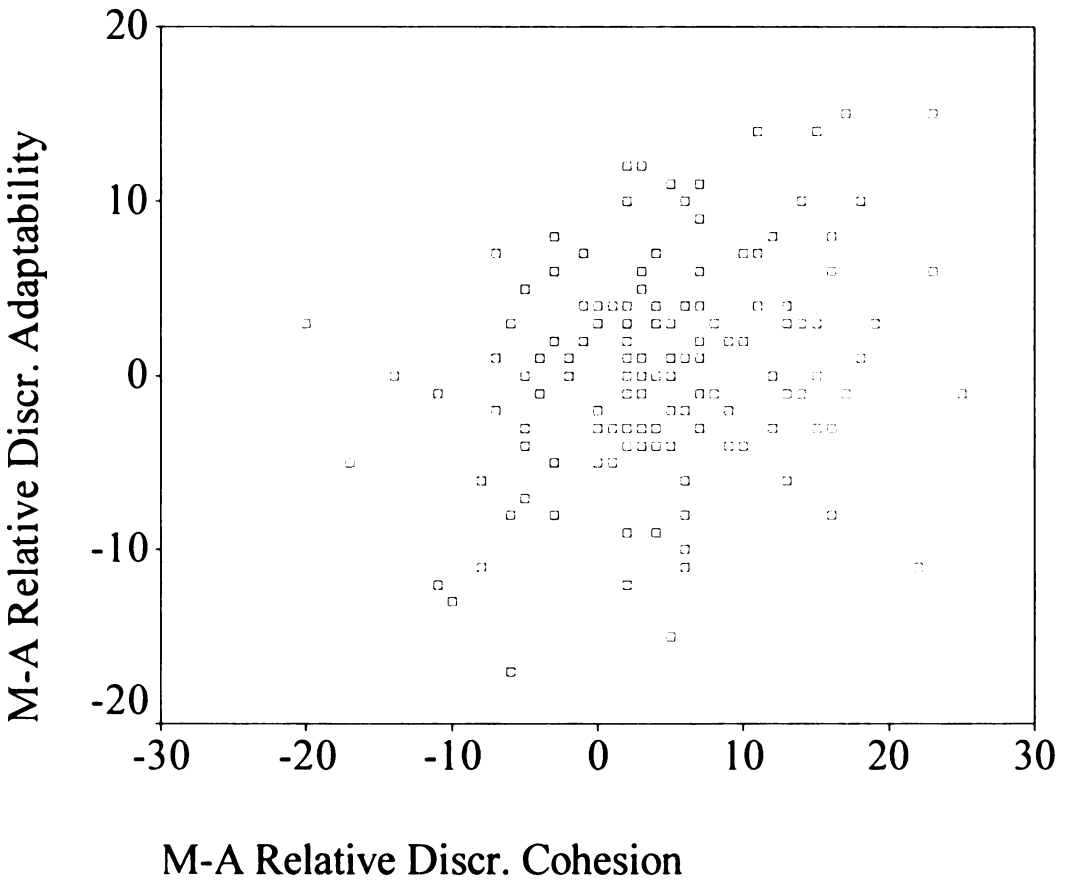

Figure A1. Scatterplot of Relative Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 1 (Boys) (N= 146)

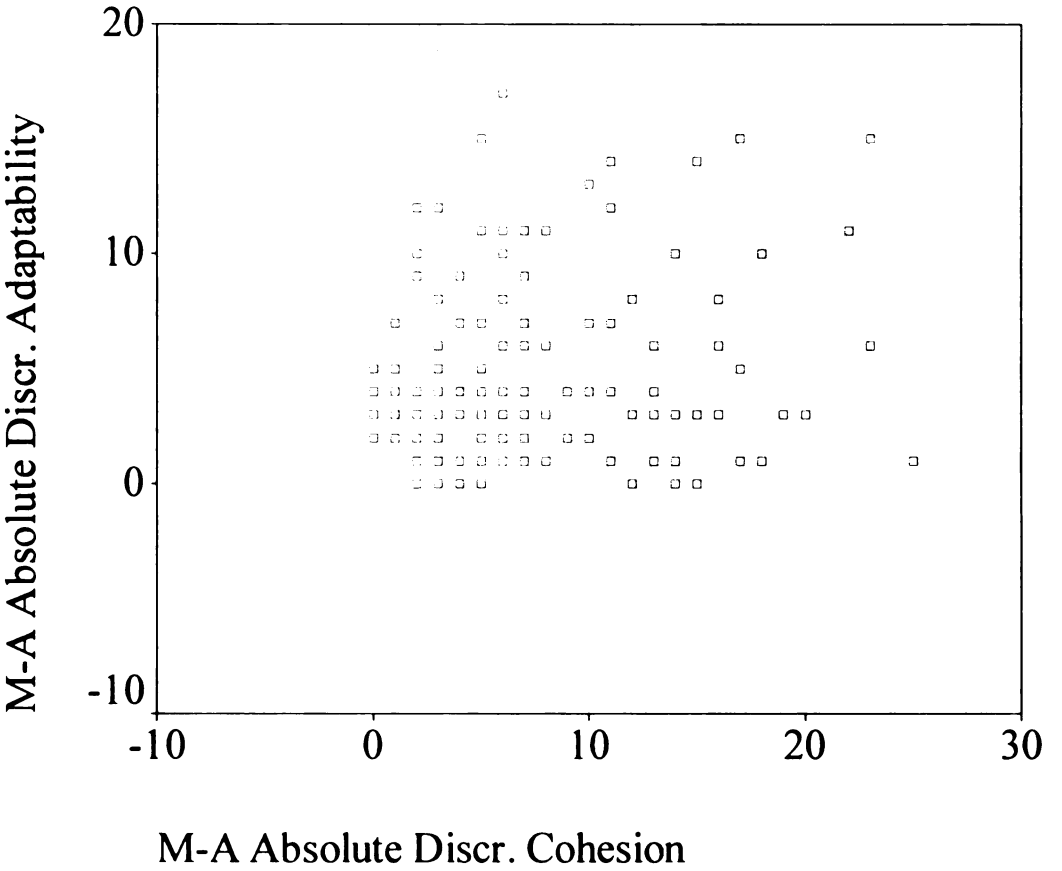

Figure A2. Scatterplot of *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 1 (Boys) (N= 146)

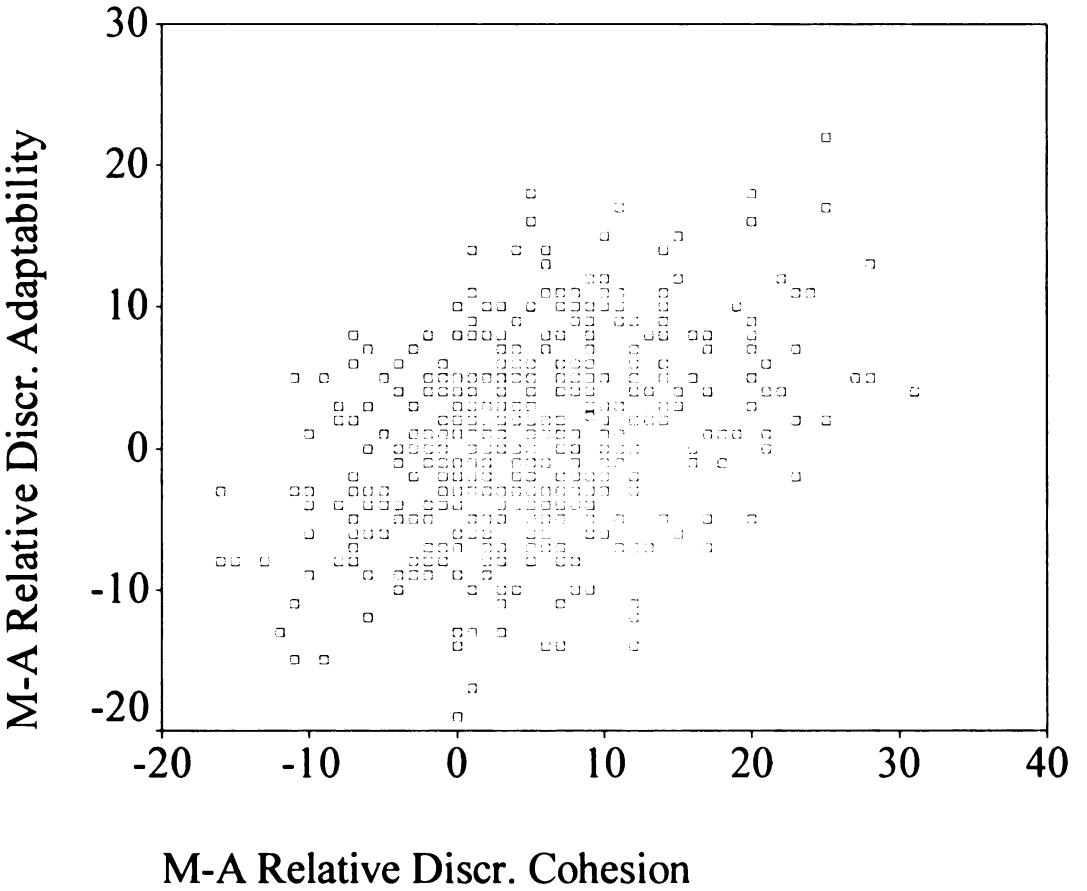

Figure A3. Scatterplot of Relative Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 1 (Girls) (N= 480)

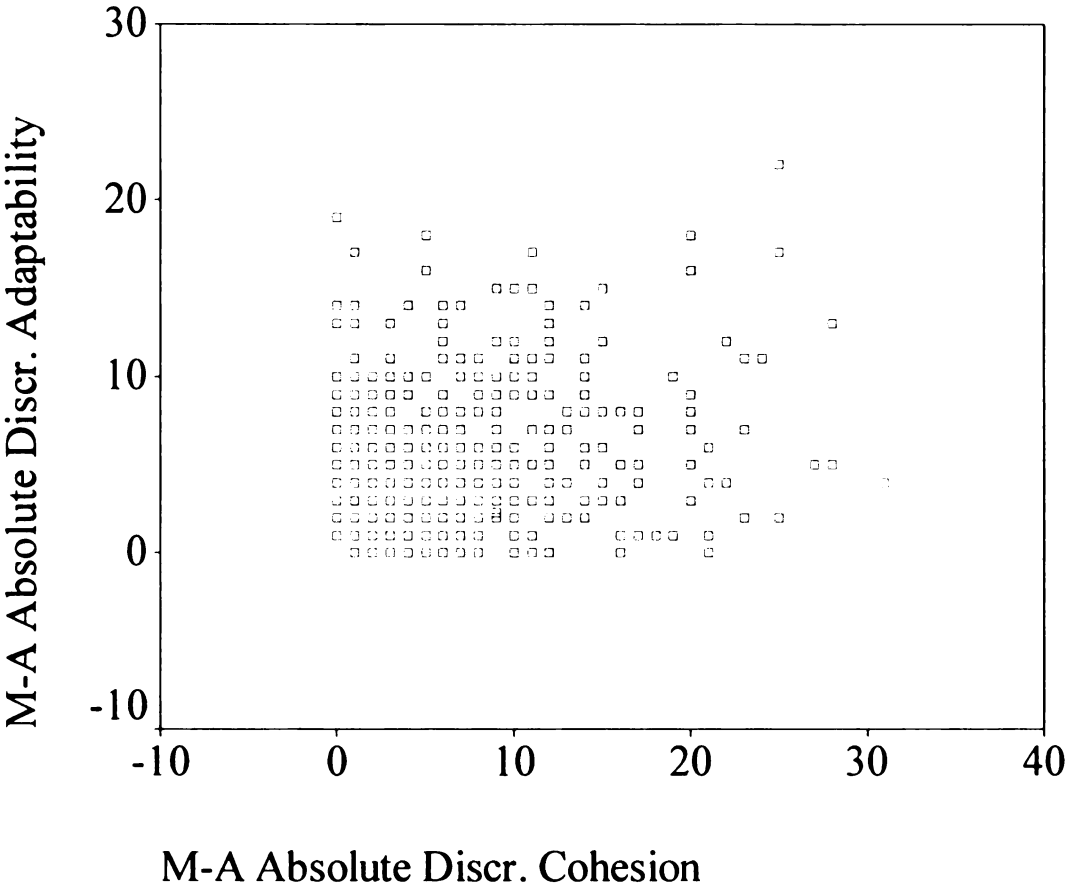

Figure A4. Scatterplot of *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 1 (Girls) (N= 480)

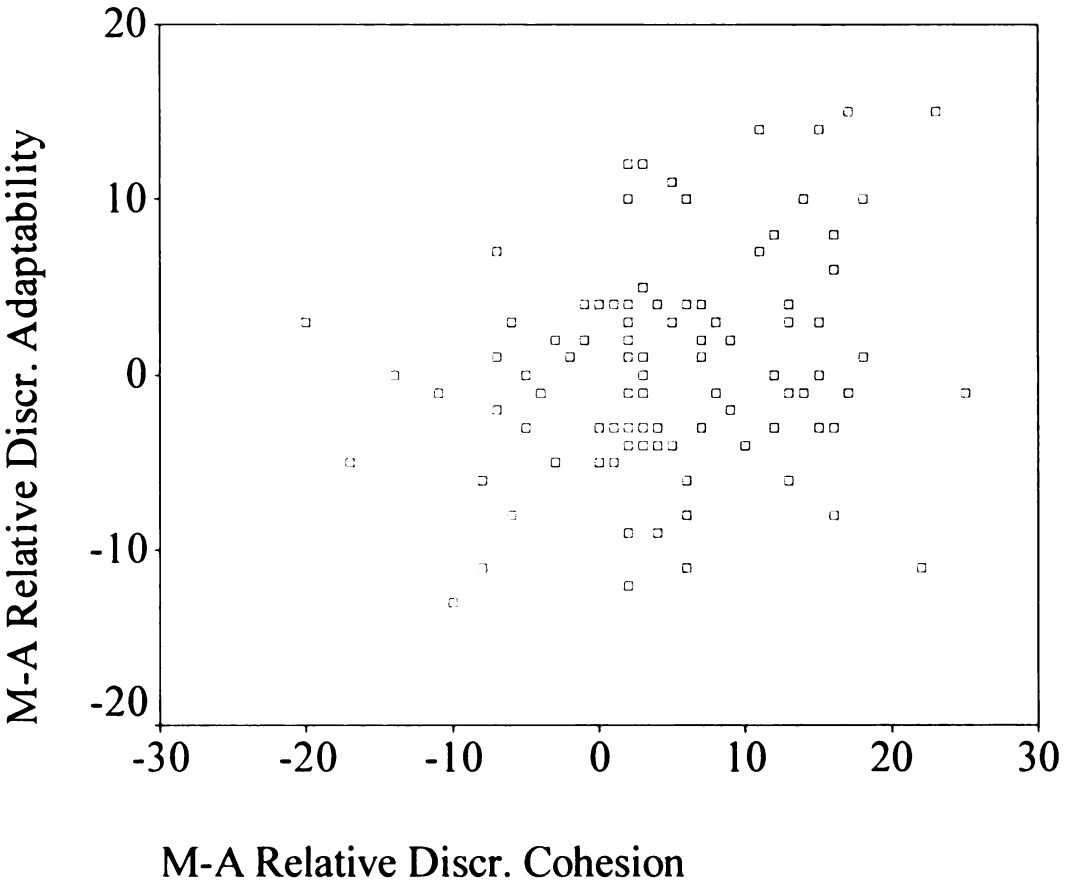

Figure A5. Scatterplot of Relative Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Boys) (N= 100)

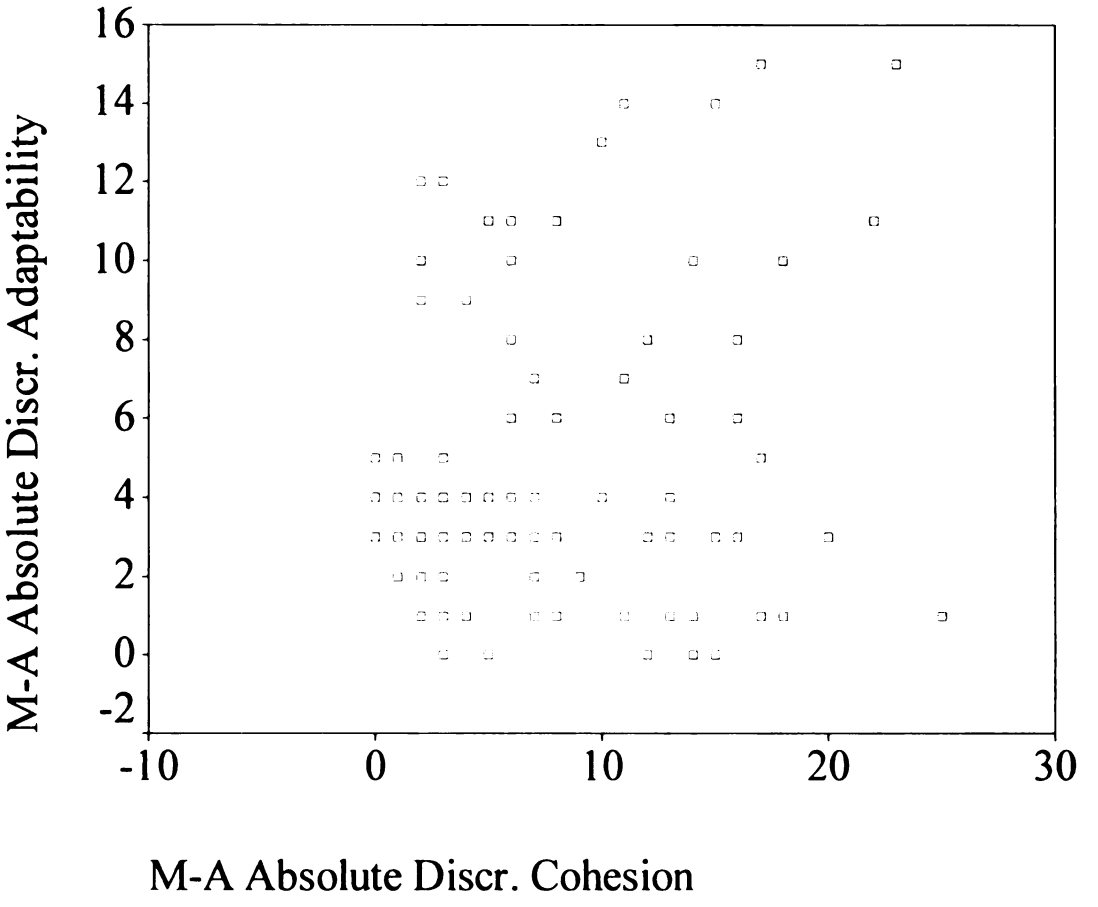

Figure A6. Scatterplot of *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Boys) (N= 100)

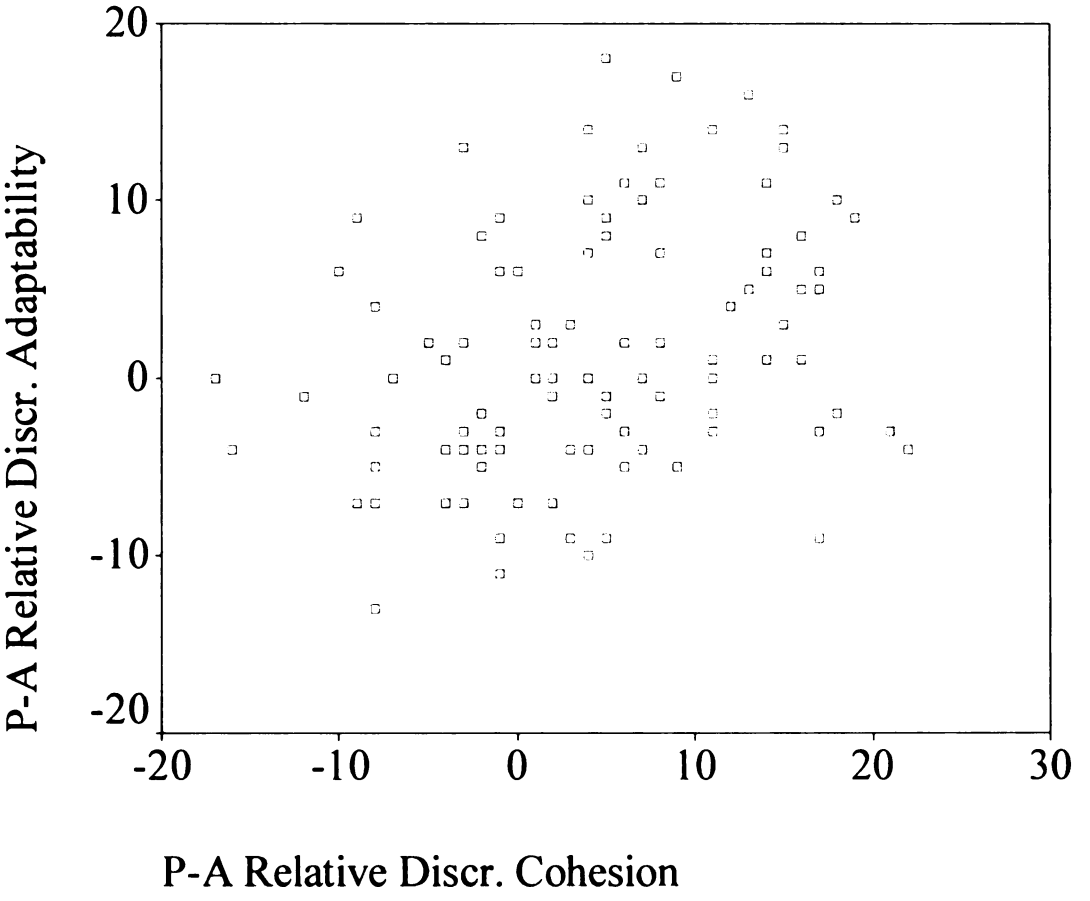

Figure A7. Scatterplot of Relative Paternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Boys) (N= 100)

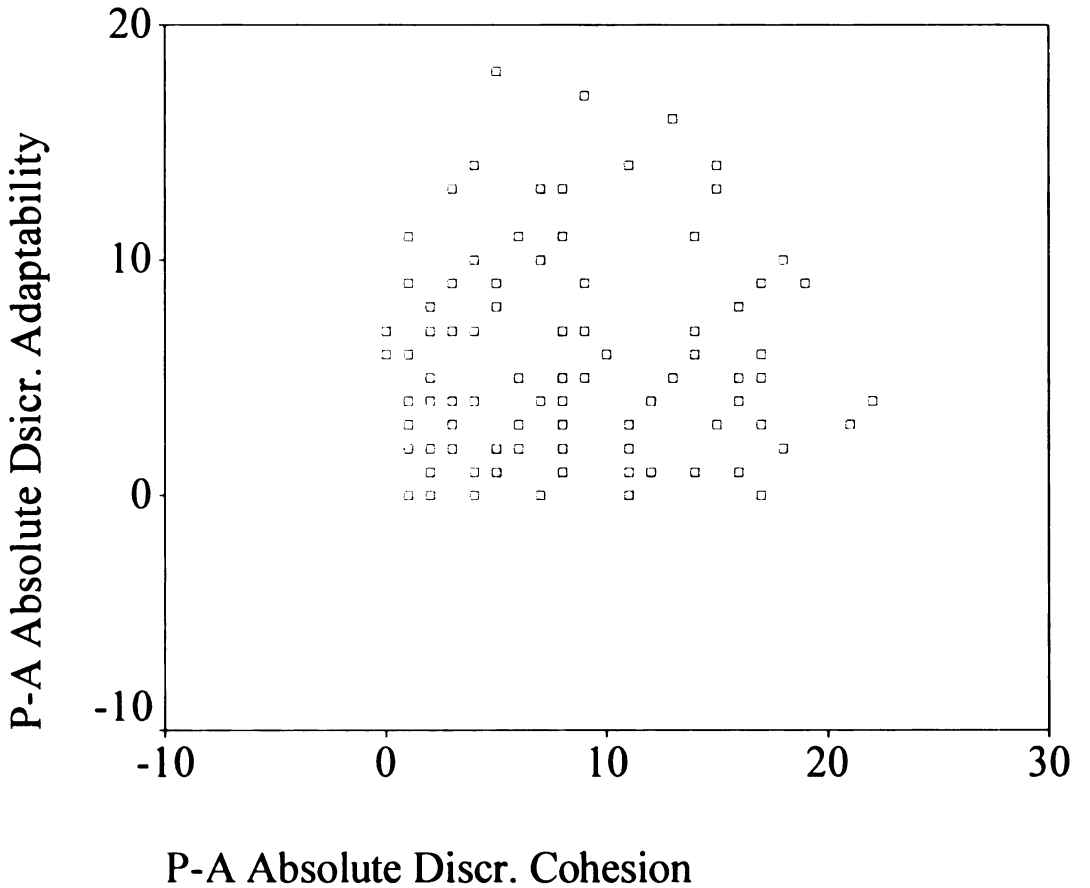

Figure A8. Scatterplot of *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Boys) (N= 100)

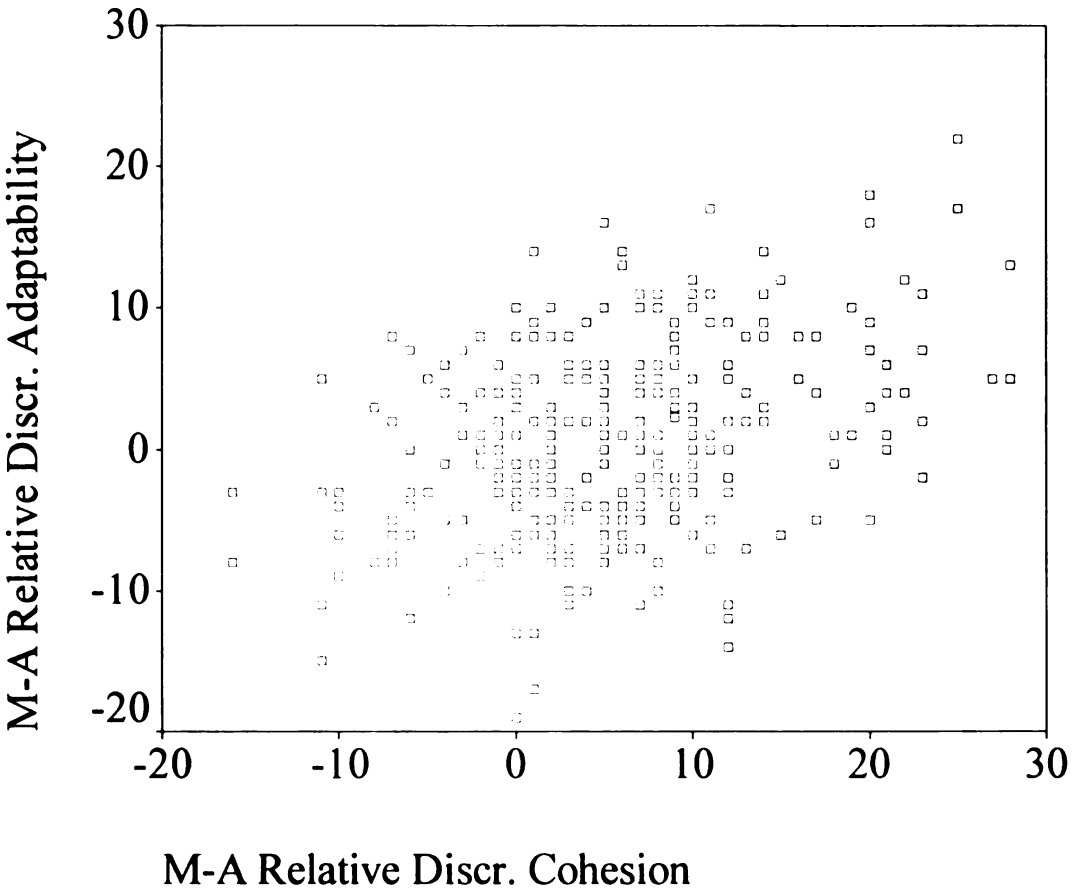

Figure A9. Scatterplot of Relative Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Girls) (N= 296)

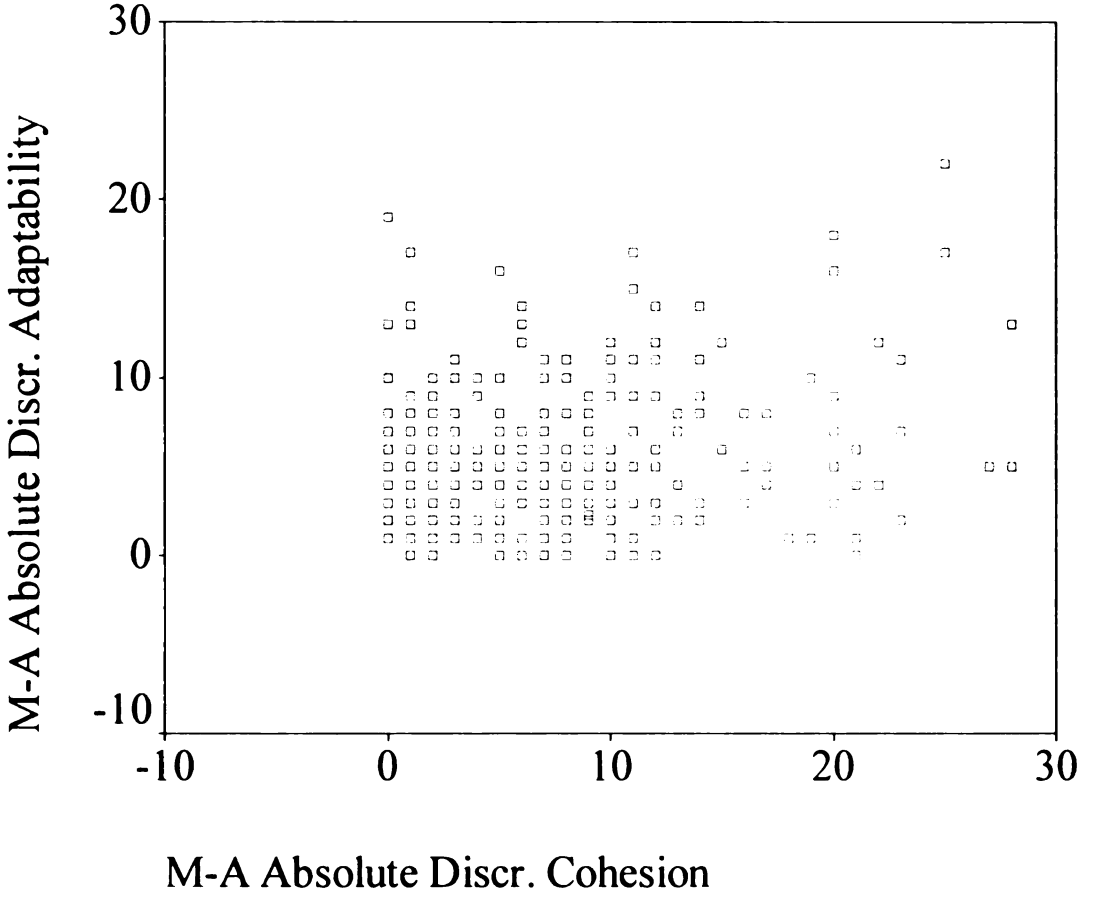

Figure A10. Scatterplot of *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Girls) (N= 296)

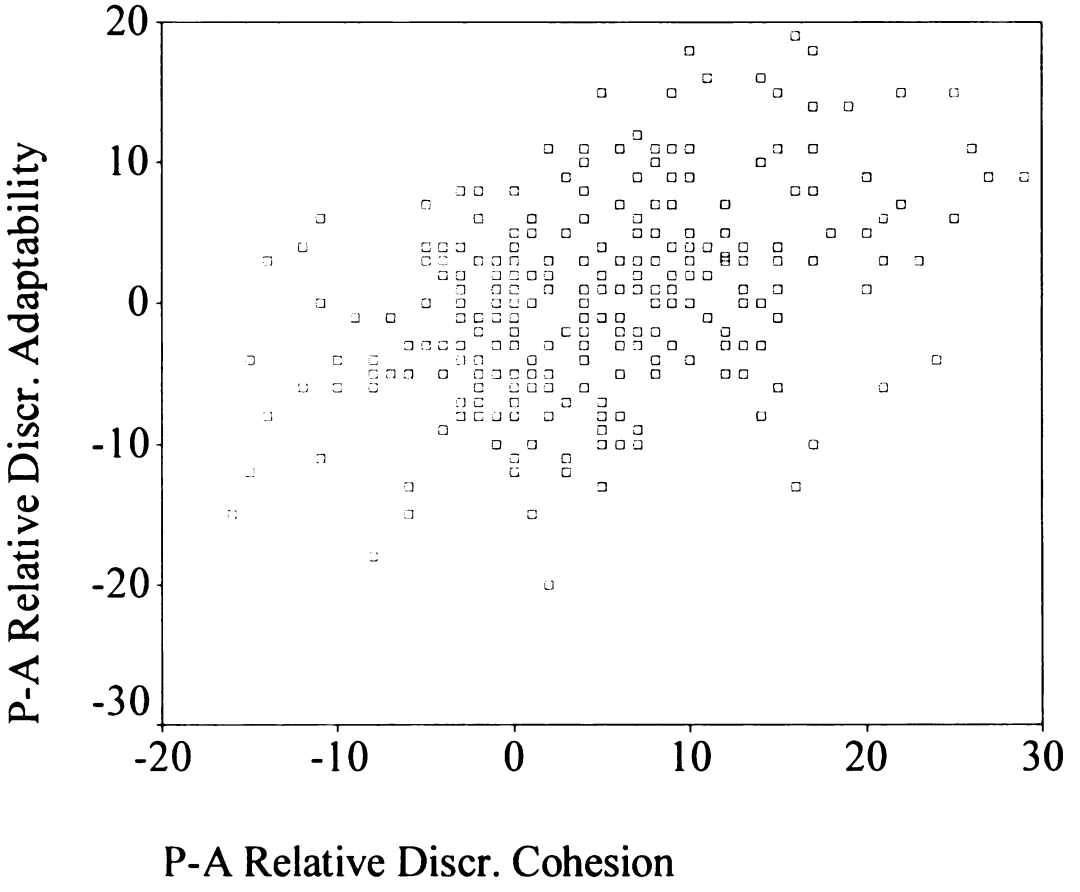

Figure A11. Scatterplot of Relative Paternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Girls) (N= 296)

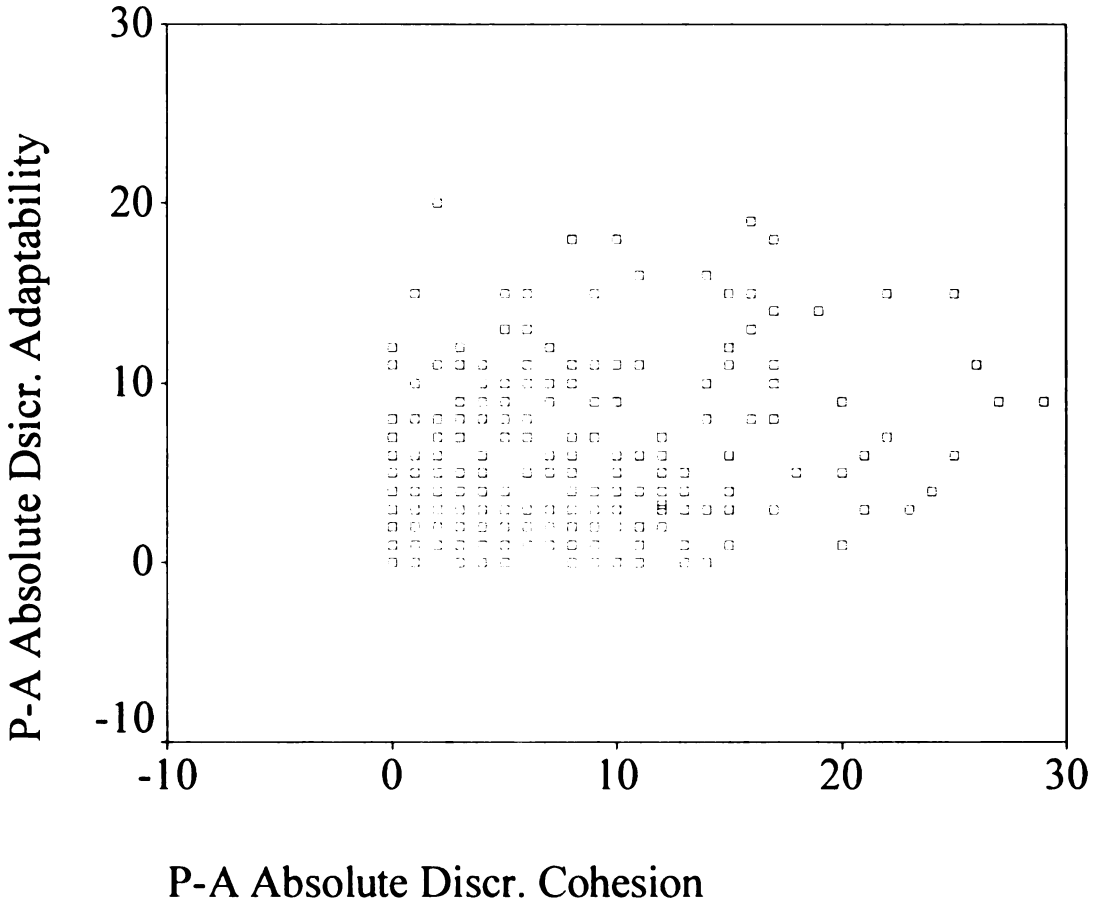

Figure A12. Scatterplot of *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Family Functioning - Sample 2 (Girls) (N= 296)

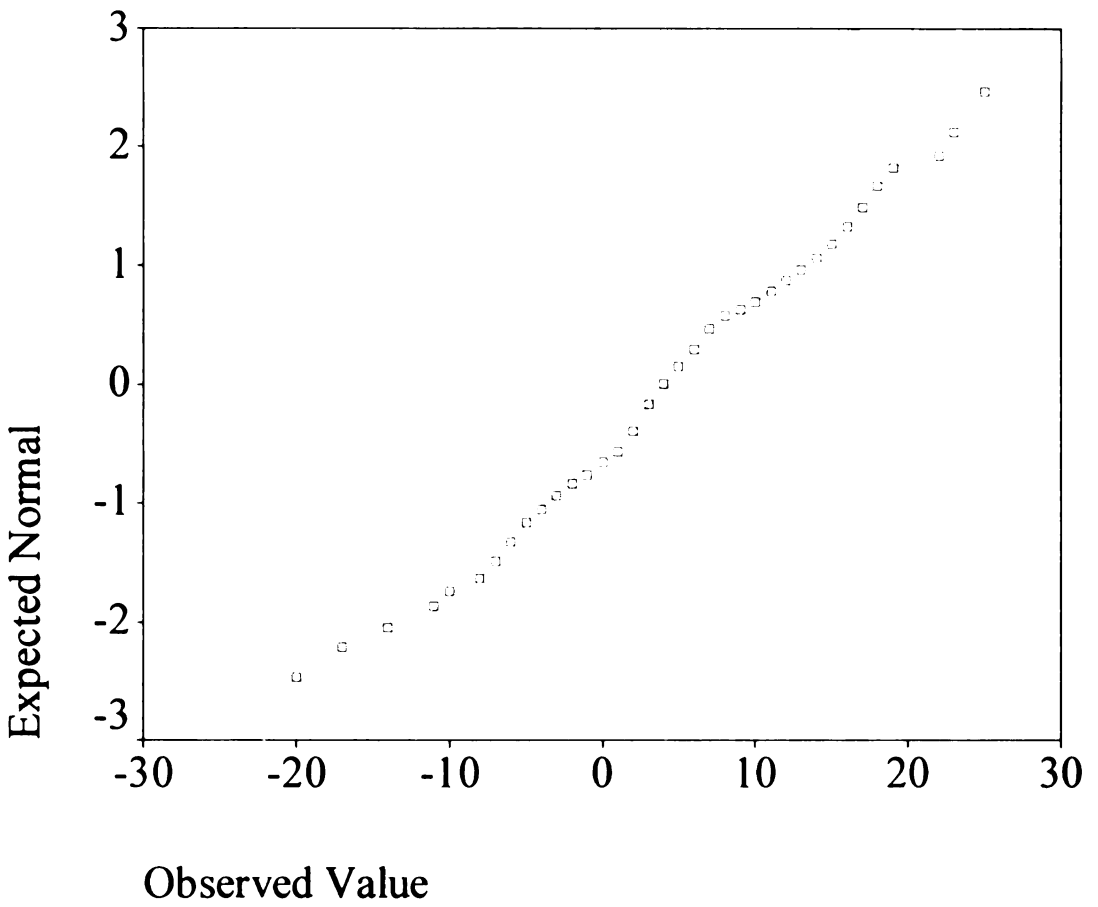

Figure A13. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 1 (Boys) (N= 146)

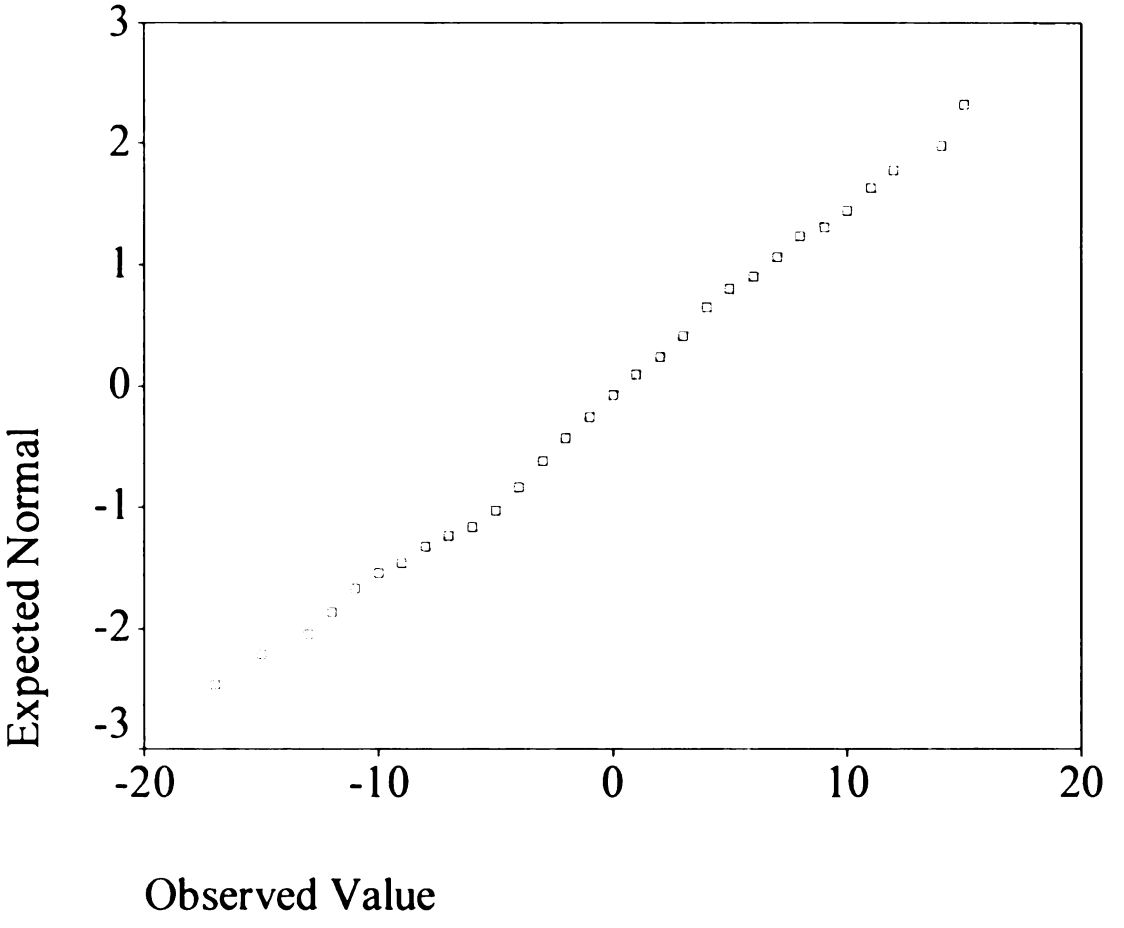

Figure A14. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 1 (Boys) (N= 146)

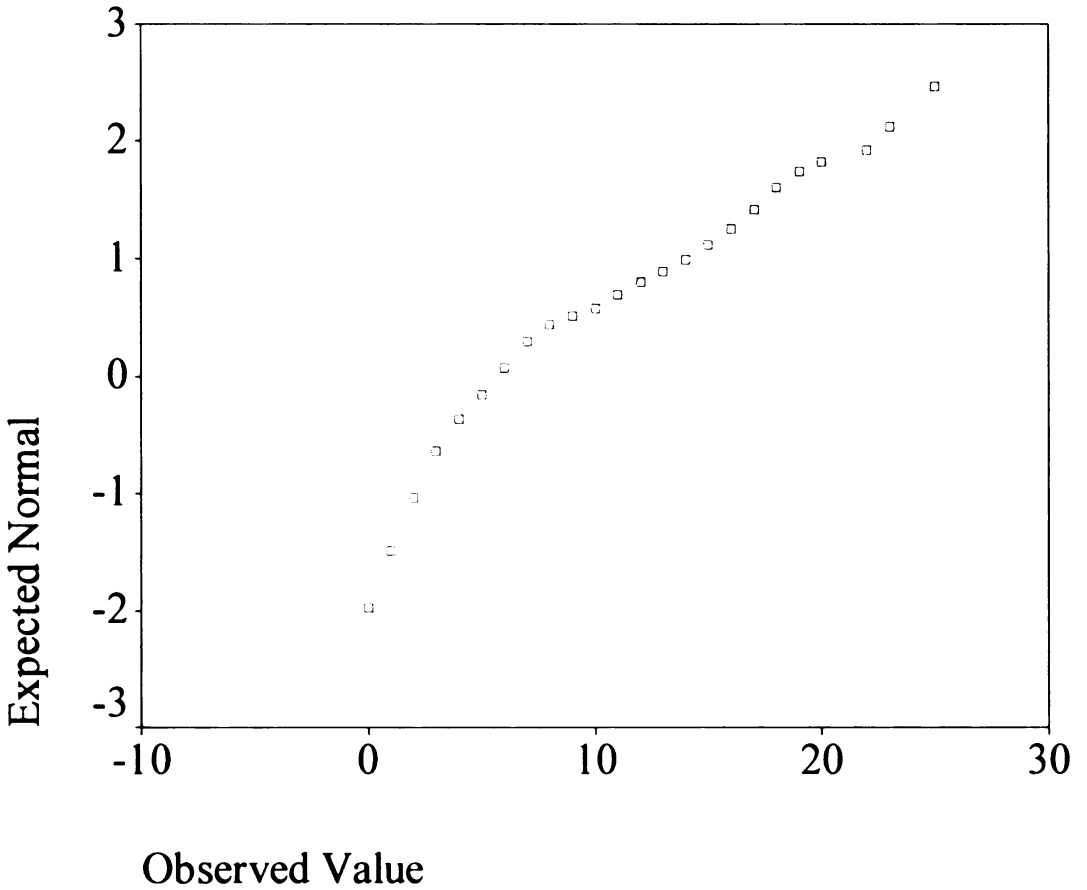

Figure A15. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 1 (Boys) (N= 146)

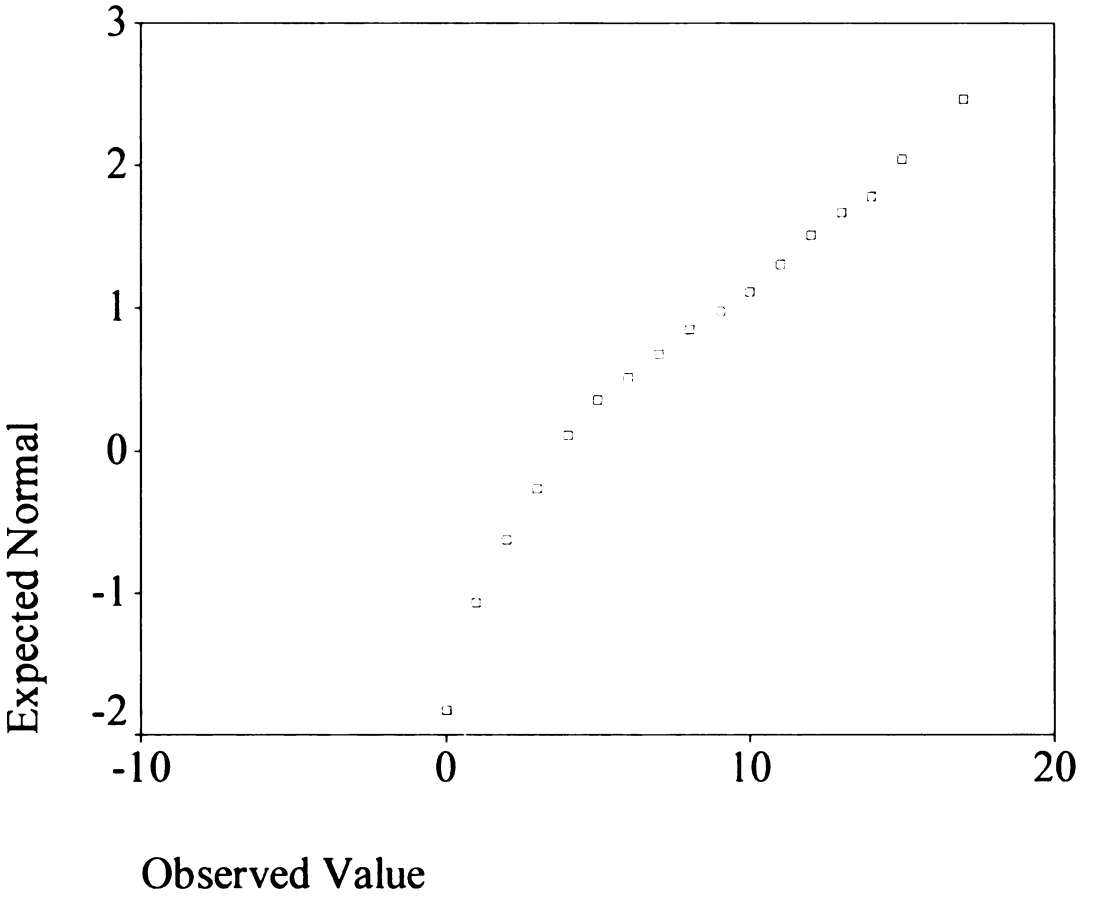

Figure A16. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 1 (Boys) (N= 146)

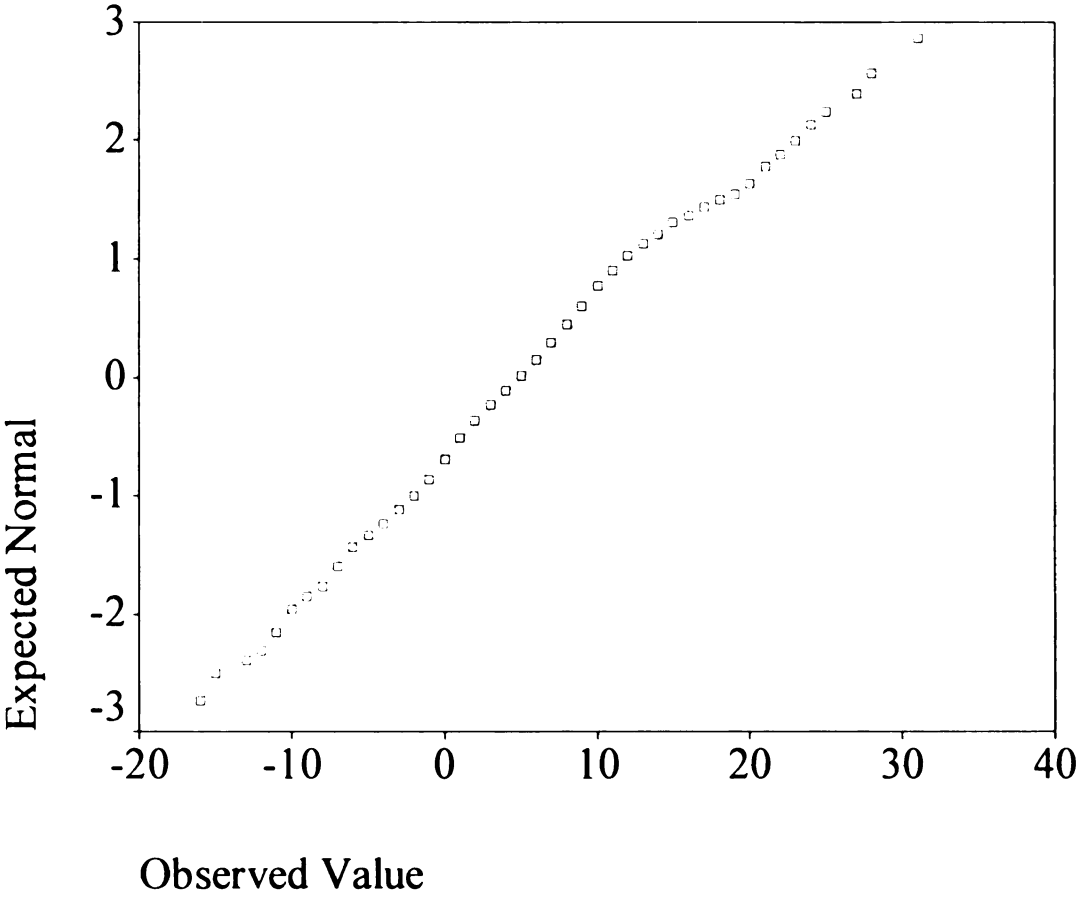

Figure A17. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 1 (Girls) (N= 480)

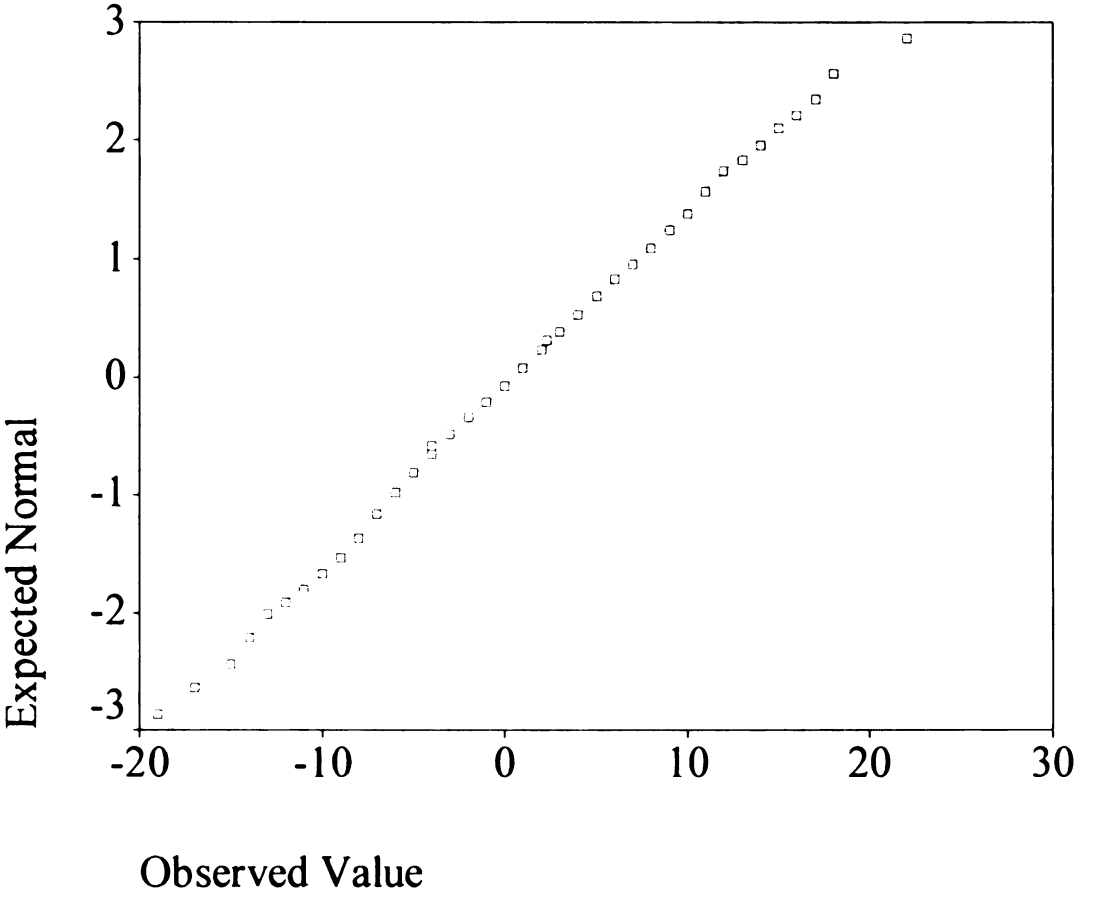

Figure A18. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 1 (Girls) (N= 480)

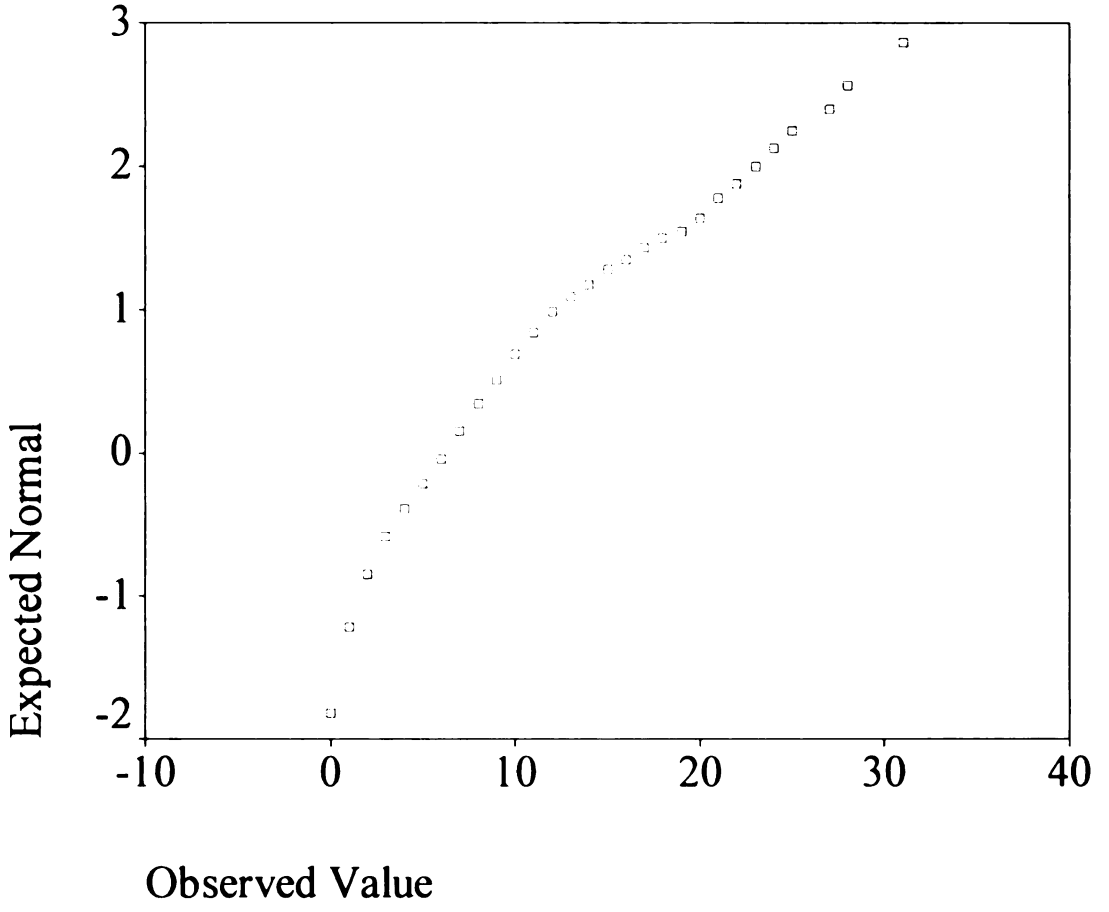

Figure A19. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 1 (Girls) (N= 480)

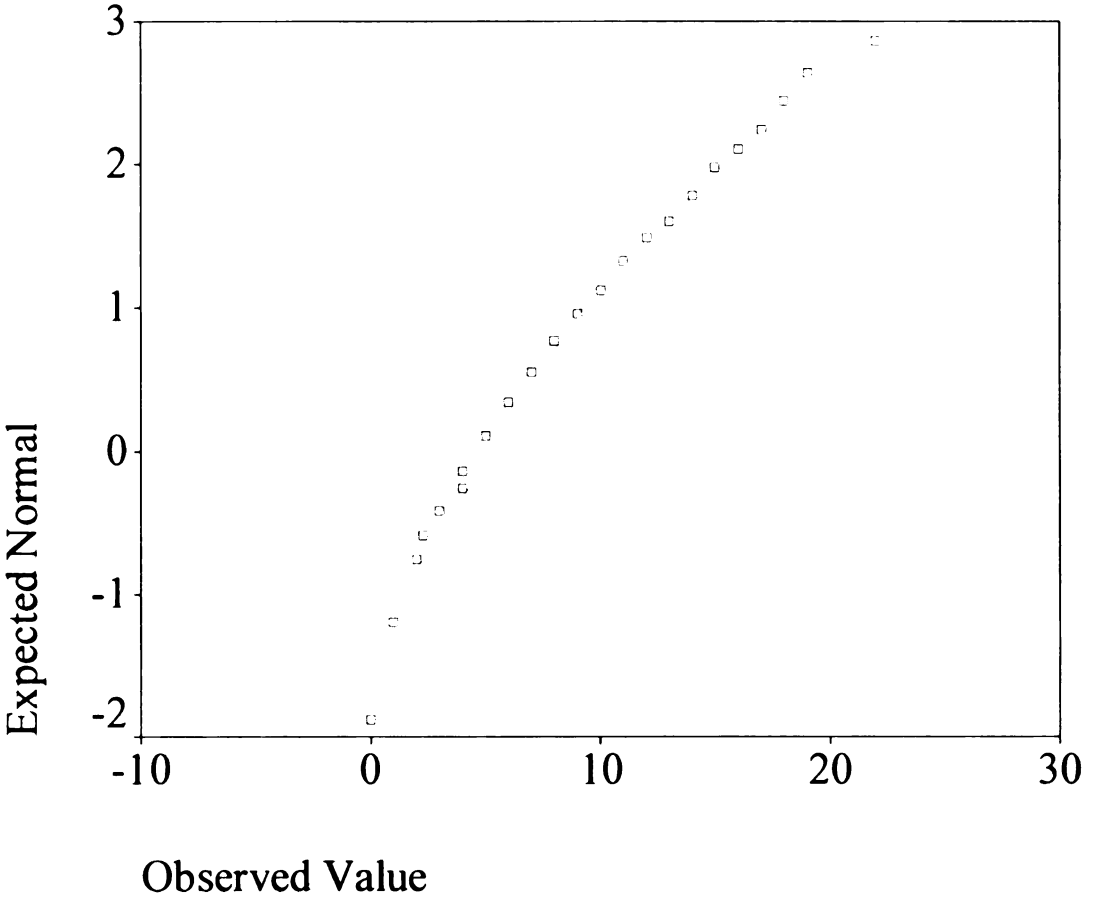

Figure A20. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 1 (Girls) (N= 480)

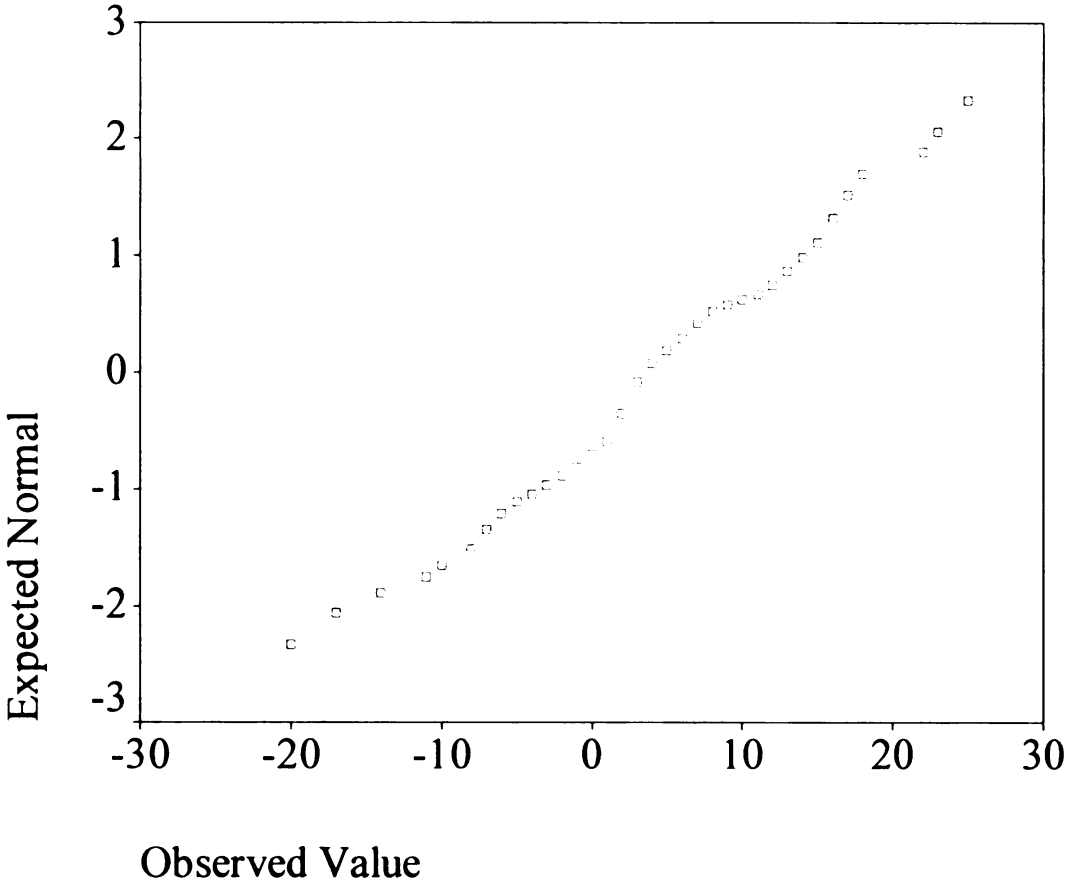

Figure A21. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Boys) (N= 100)

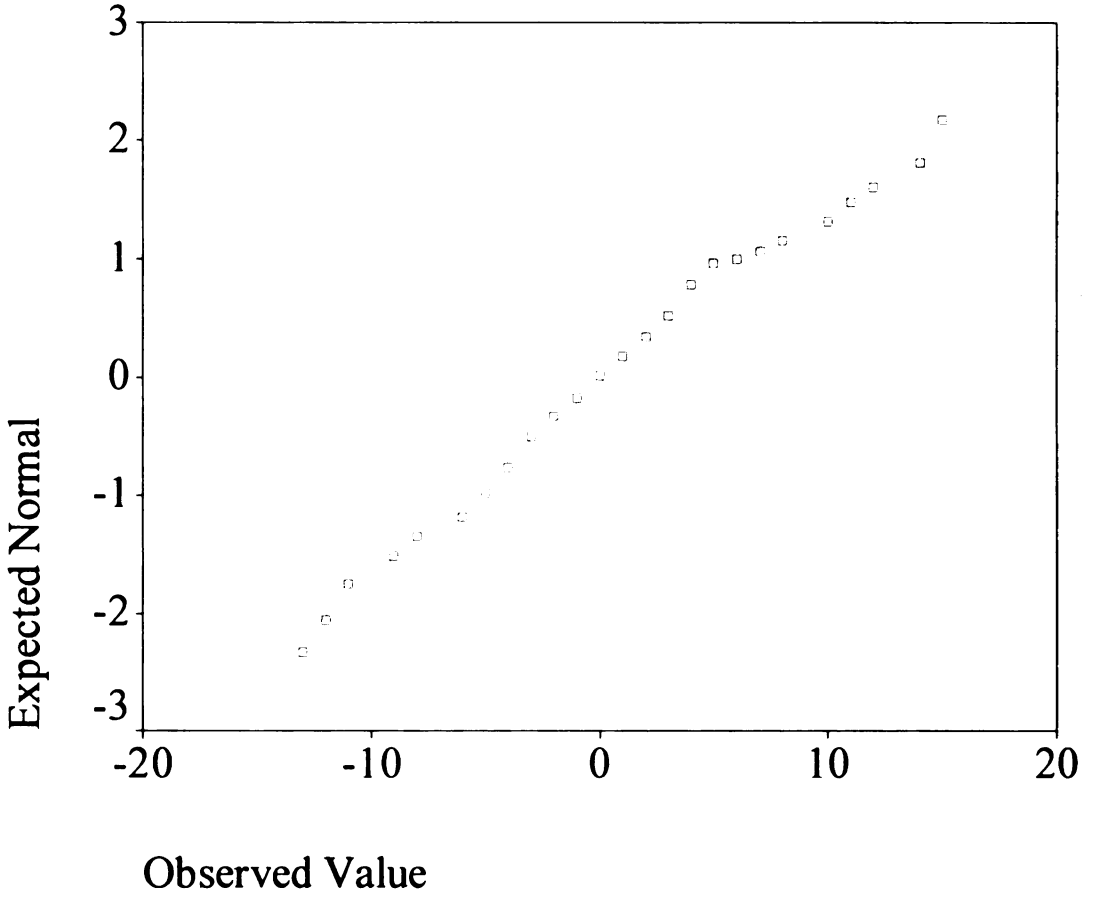

Figure A22. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Boys) (N= 100)

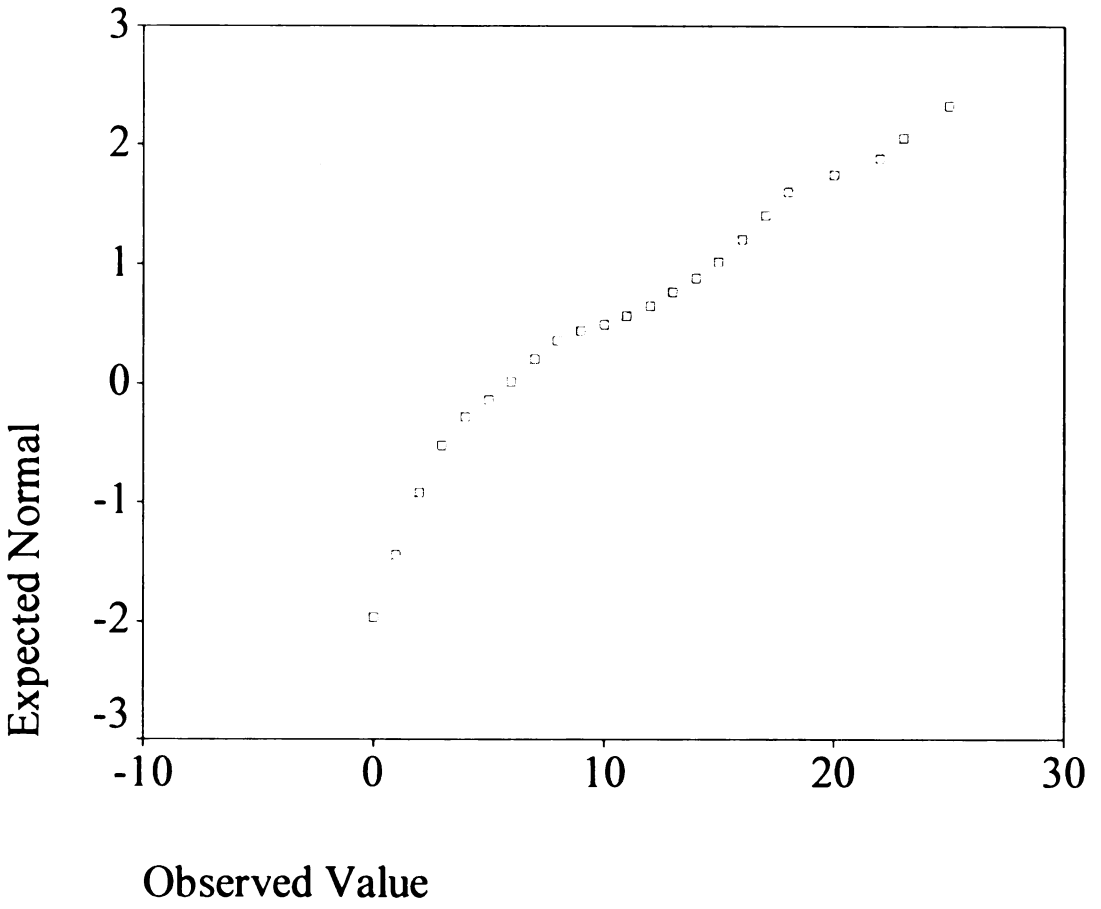

Figure A23. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Boys) (N= 100)

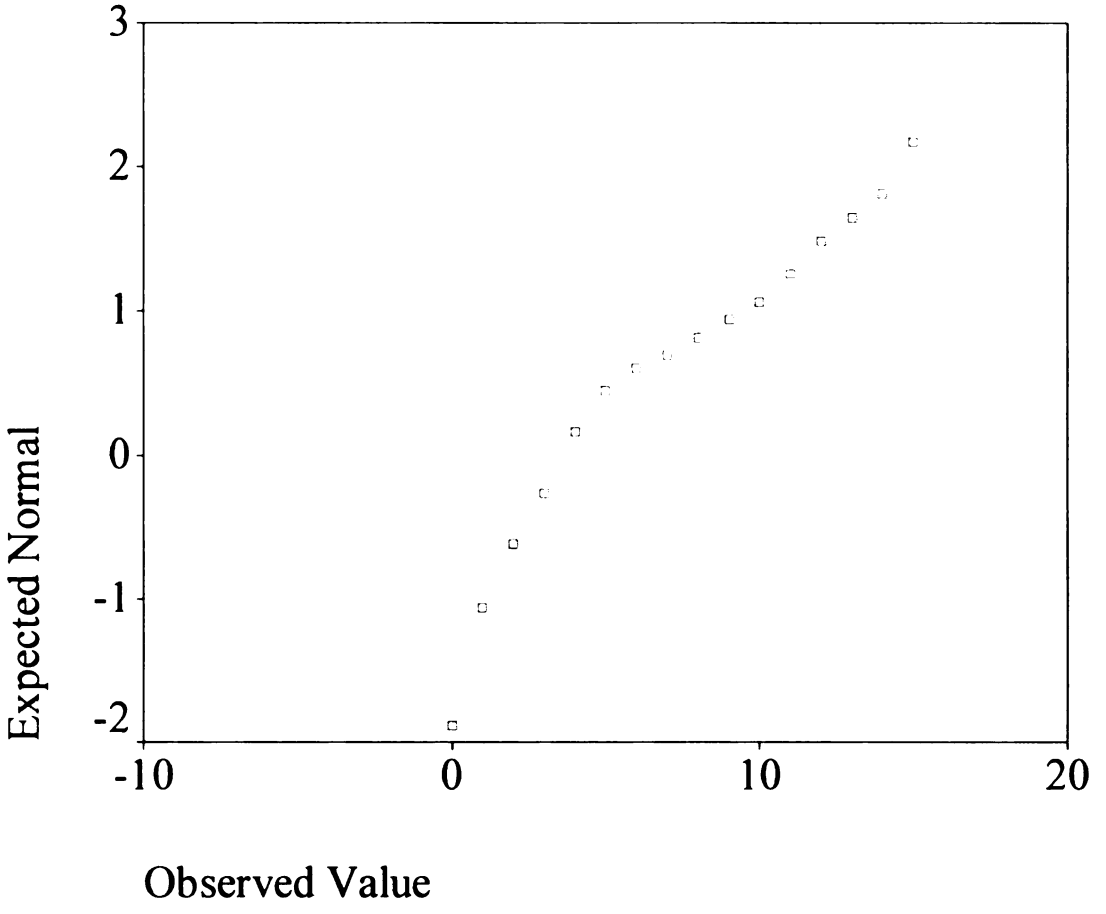

Figure A24. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Boys) (N= 100)

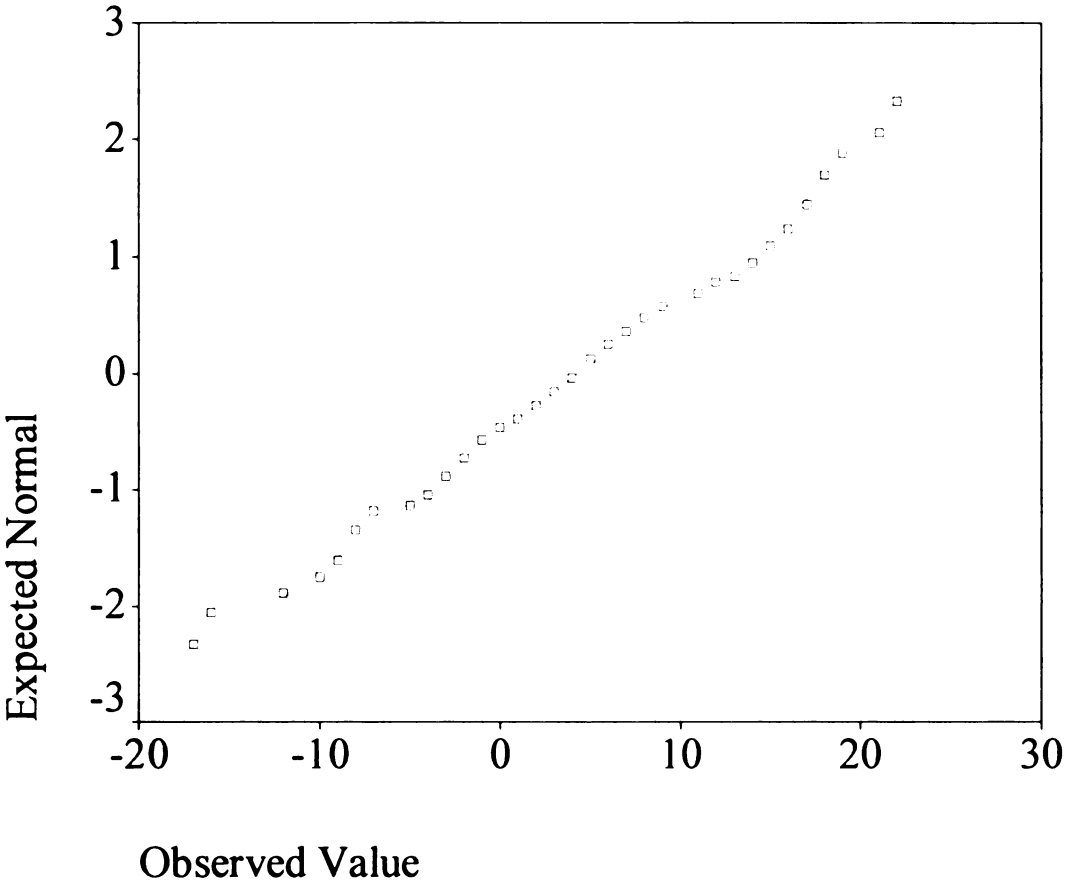

Figure A25. Normal Probability Plot (Q-Q Plot) for Relative Paternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Boys) (N= 100)

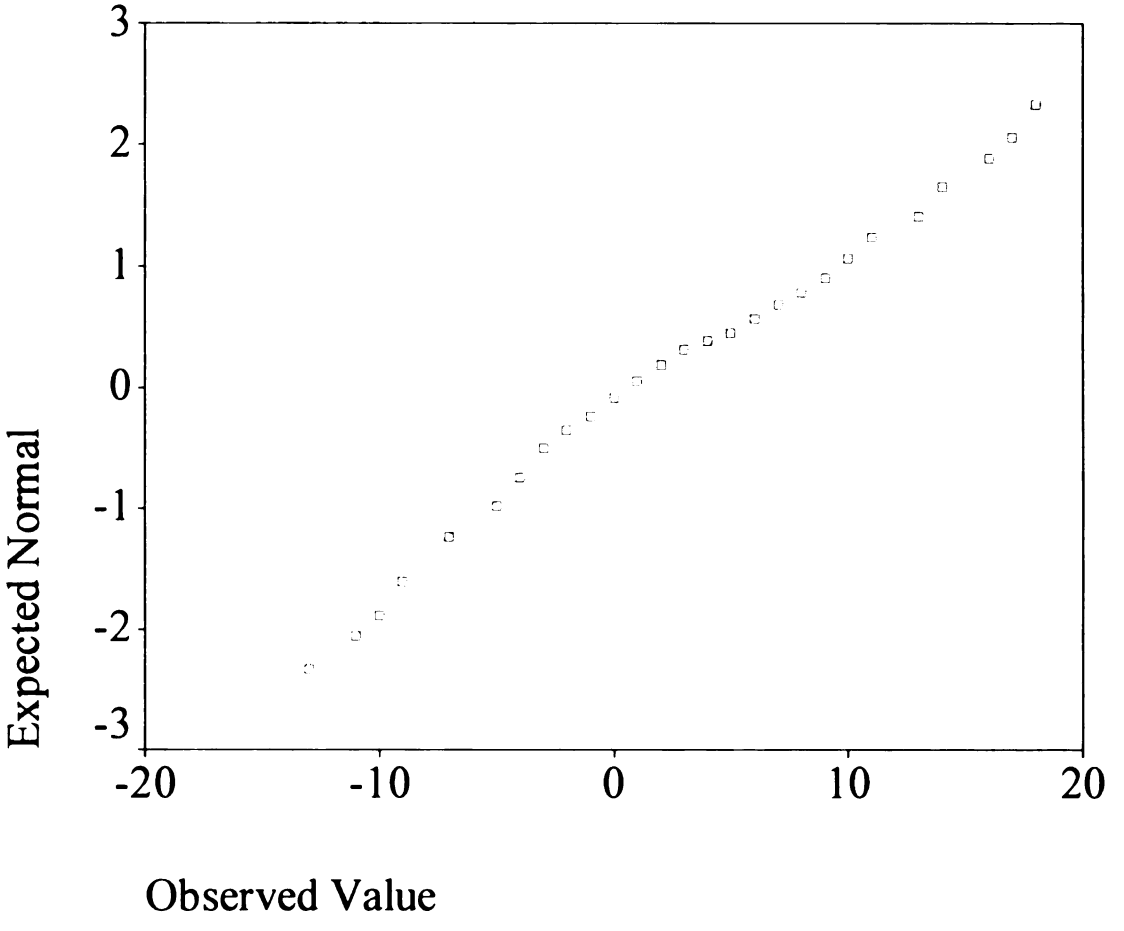

Figure A26. Normal Probability Plot (Q-Q Plot) for Relative Paternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Boys) (N= 100)

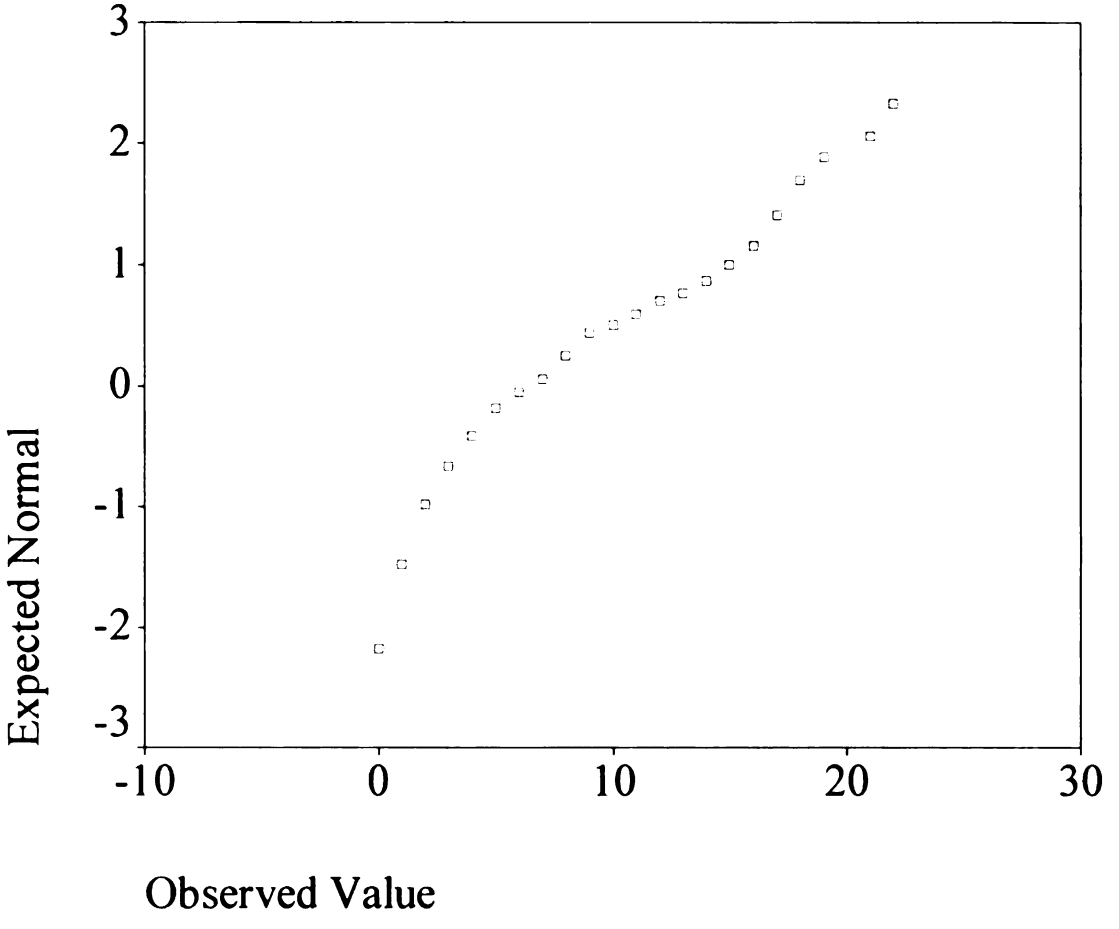

Figure A27. Normal Probability Plot (Q-Q Plot) for *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Boys) (N= 100)

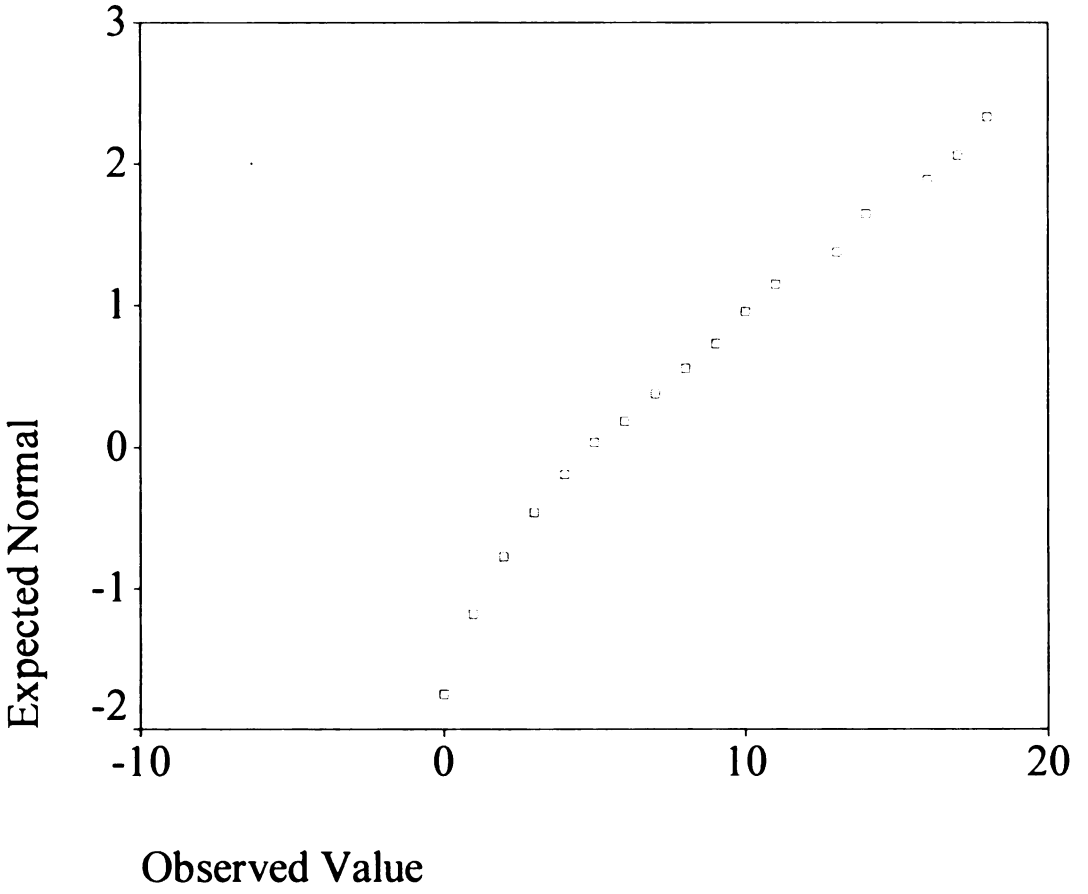

Figure A28. Normal Probability Plot (Q-Q Plot) for *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Boys) (N= 100)

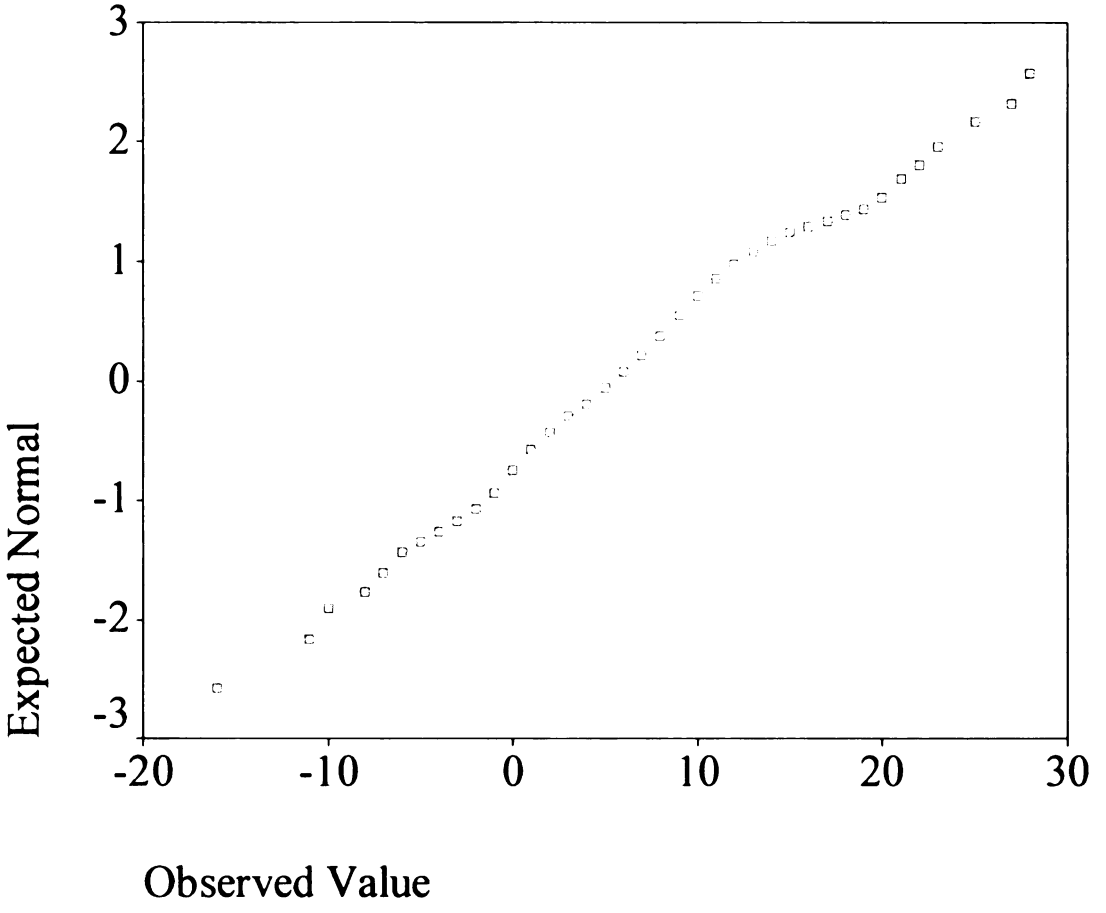

Figure A29. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Girls) (N= 296)

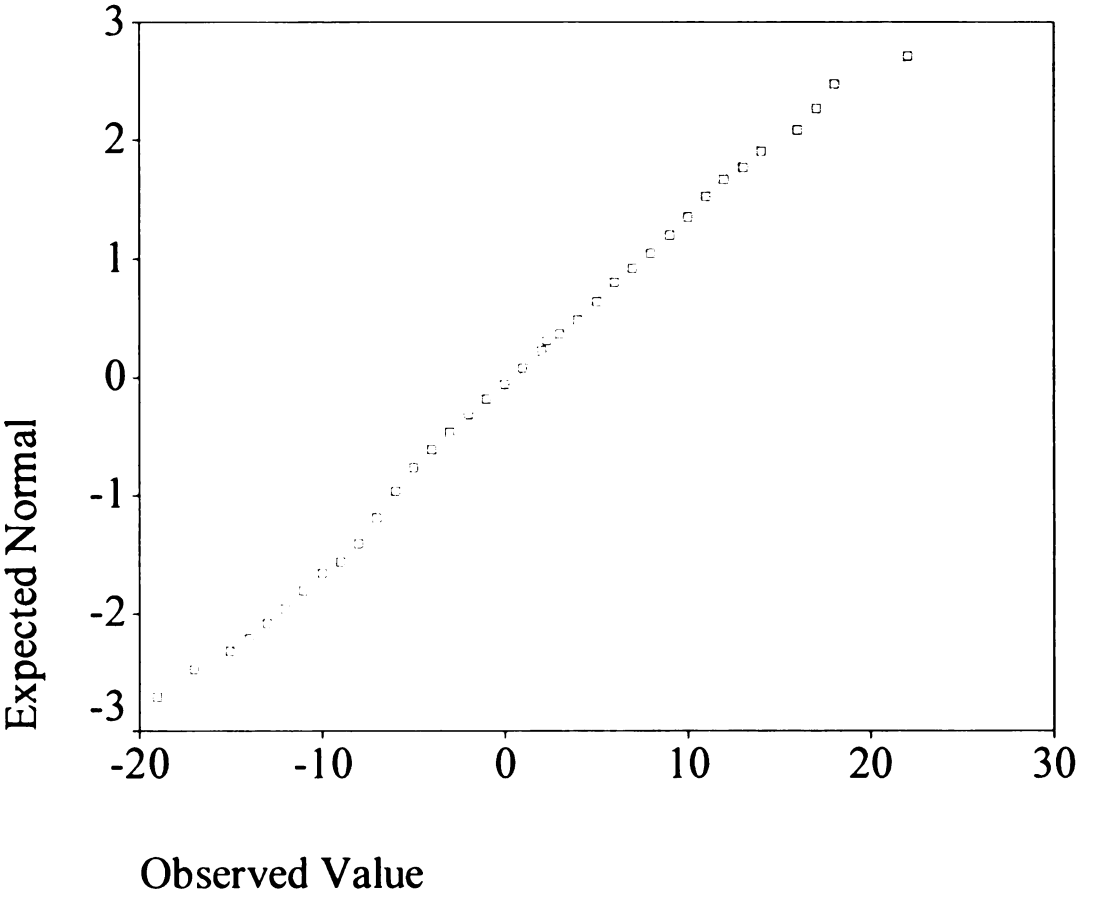

Figure A30. Normal Probability Plot (Q-Q Plot) for Relative Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Girls) (N= 296)

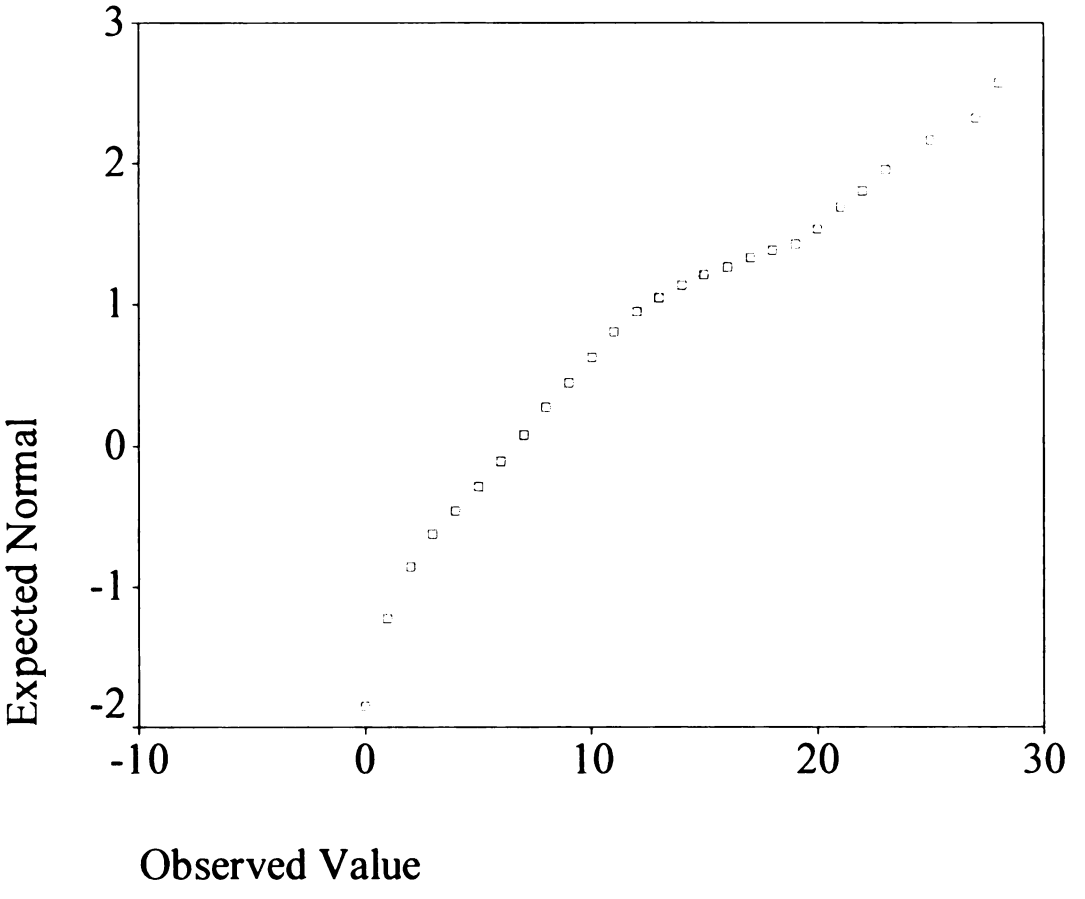

Figure A31. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Girls) (N= 296)

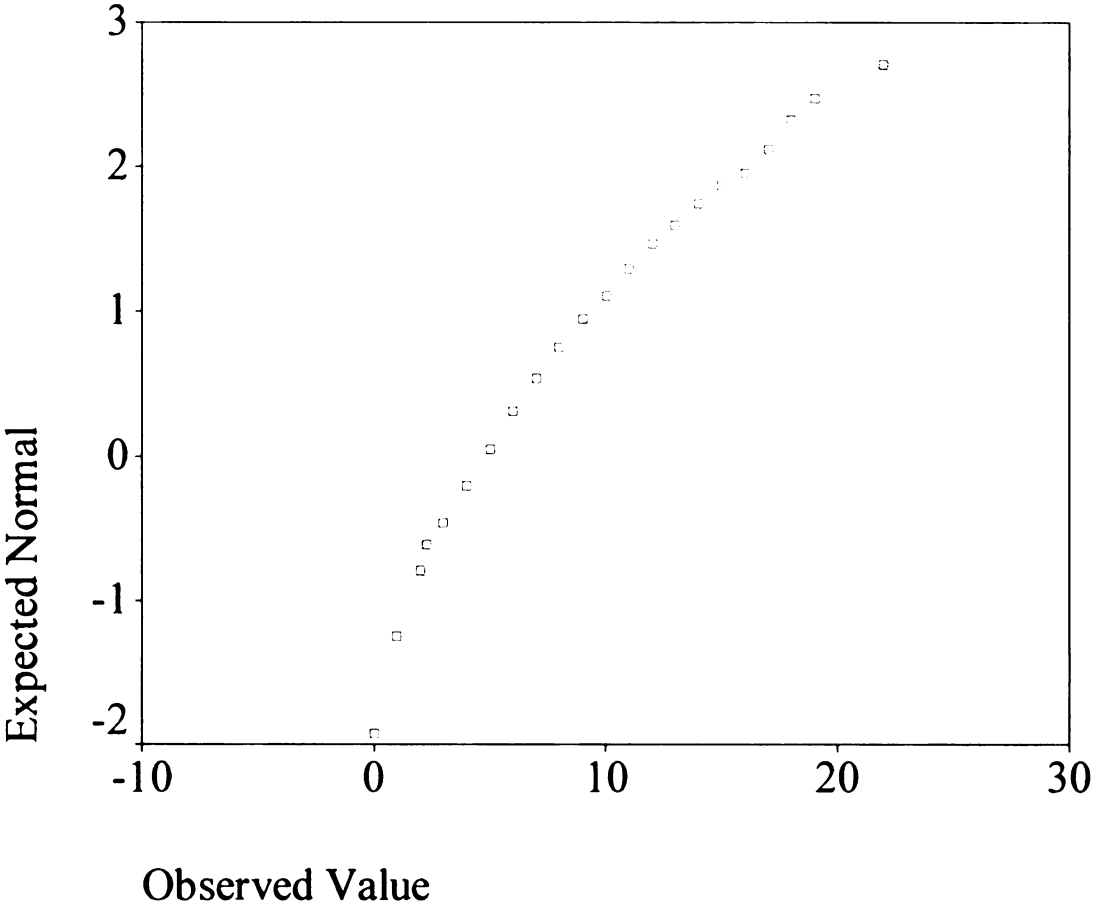

Figure A32. Normal Probability Plot (Q-Q Plot) for *Absolute* Maternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Girls) (N= 296)

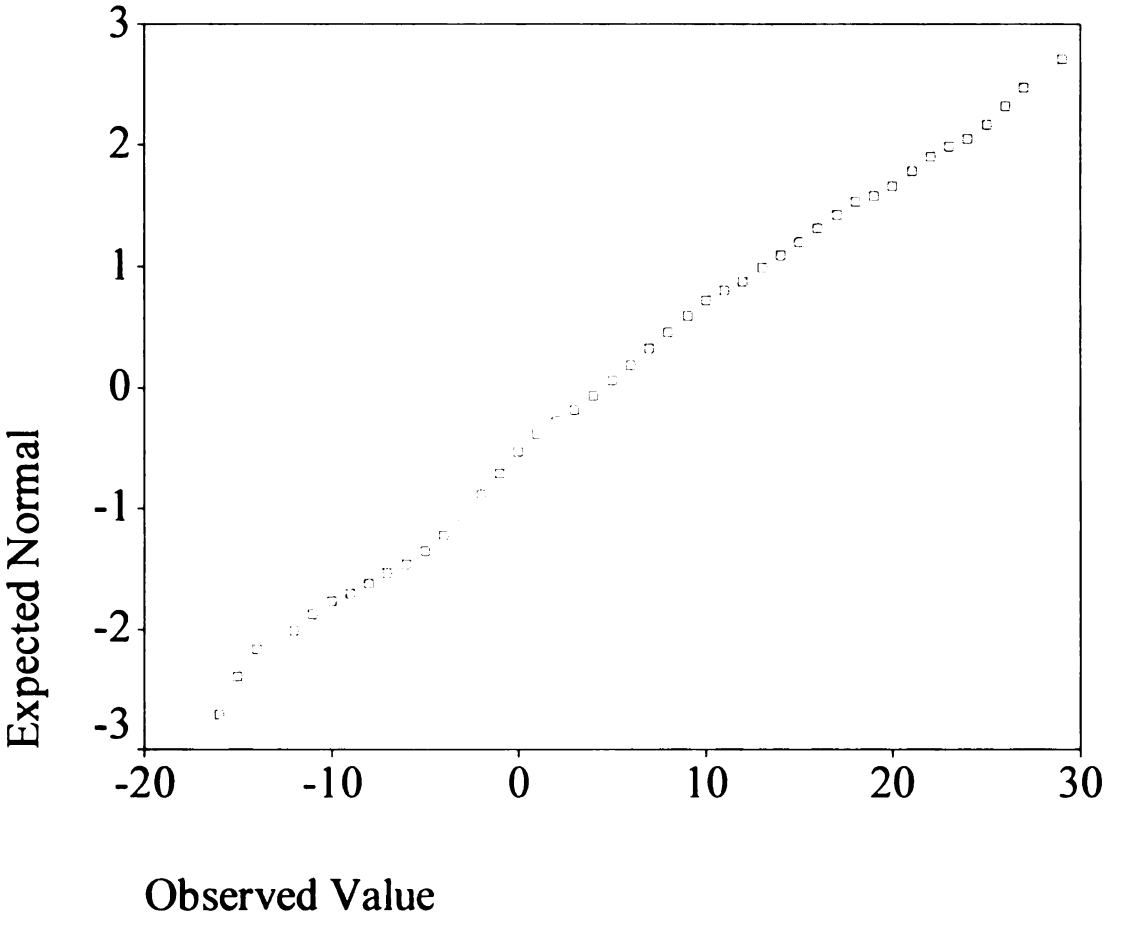

Figure A33. Normal Probability Plot (Q-Q Plot) for Relative Paternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Girls) (N= 296)

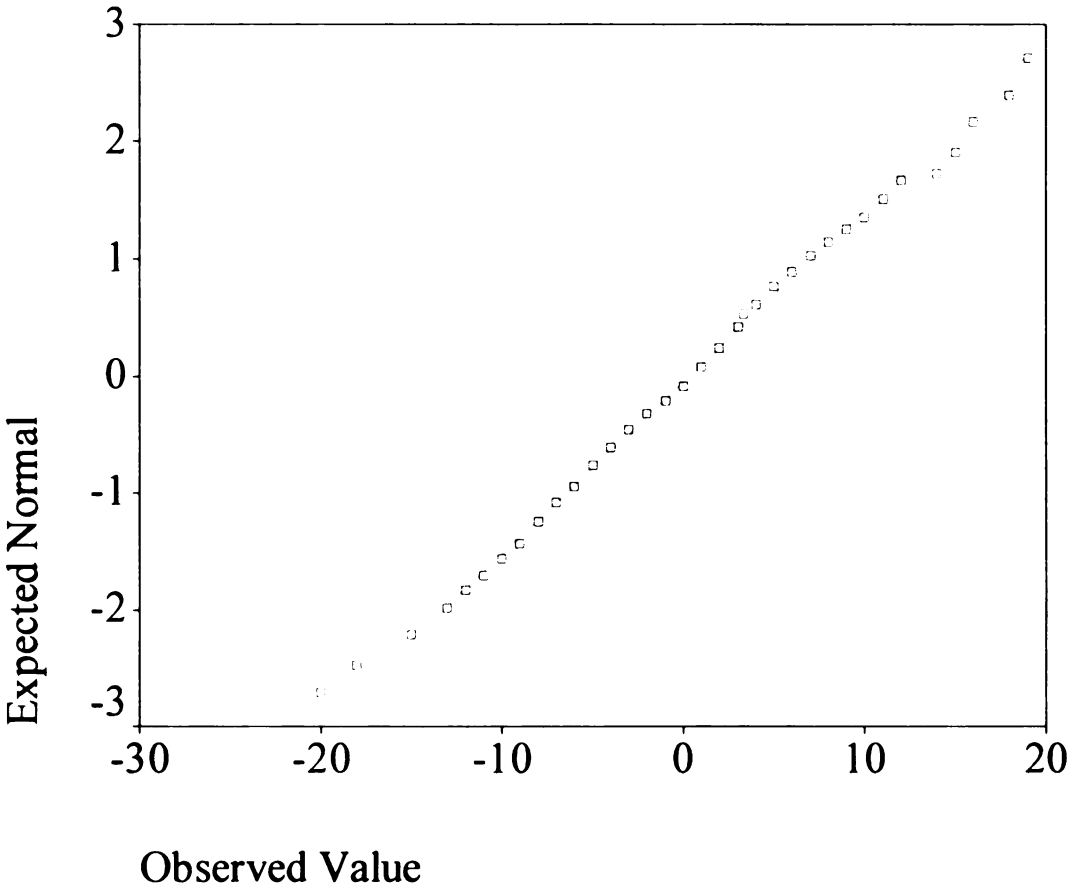

Figure A34. Normal Probability Plot (Q-Q Plot) for Relative Paternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Girls) (N= 296)

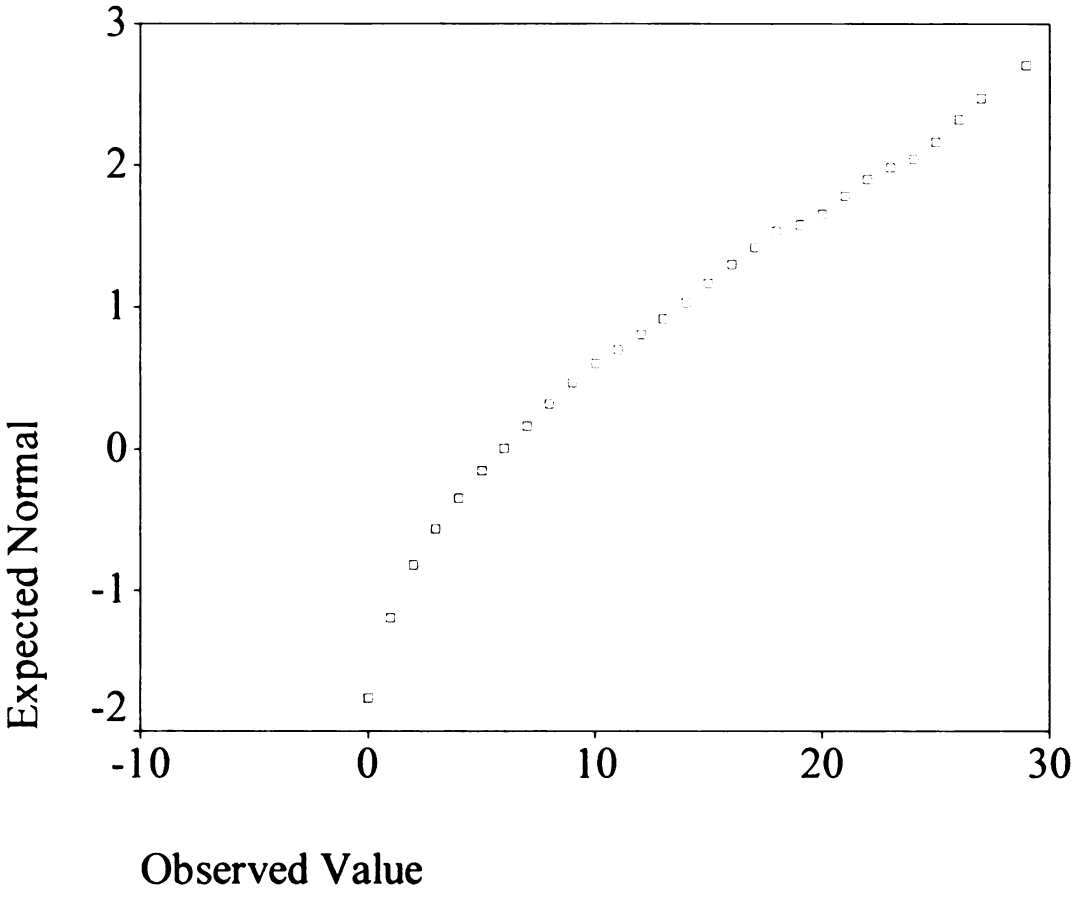

Figure A35. Normal Probability Plot (Q-Q Plot) for *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Cohesion - Sample 2 (Girls) (N= 296)

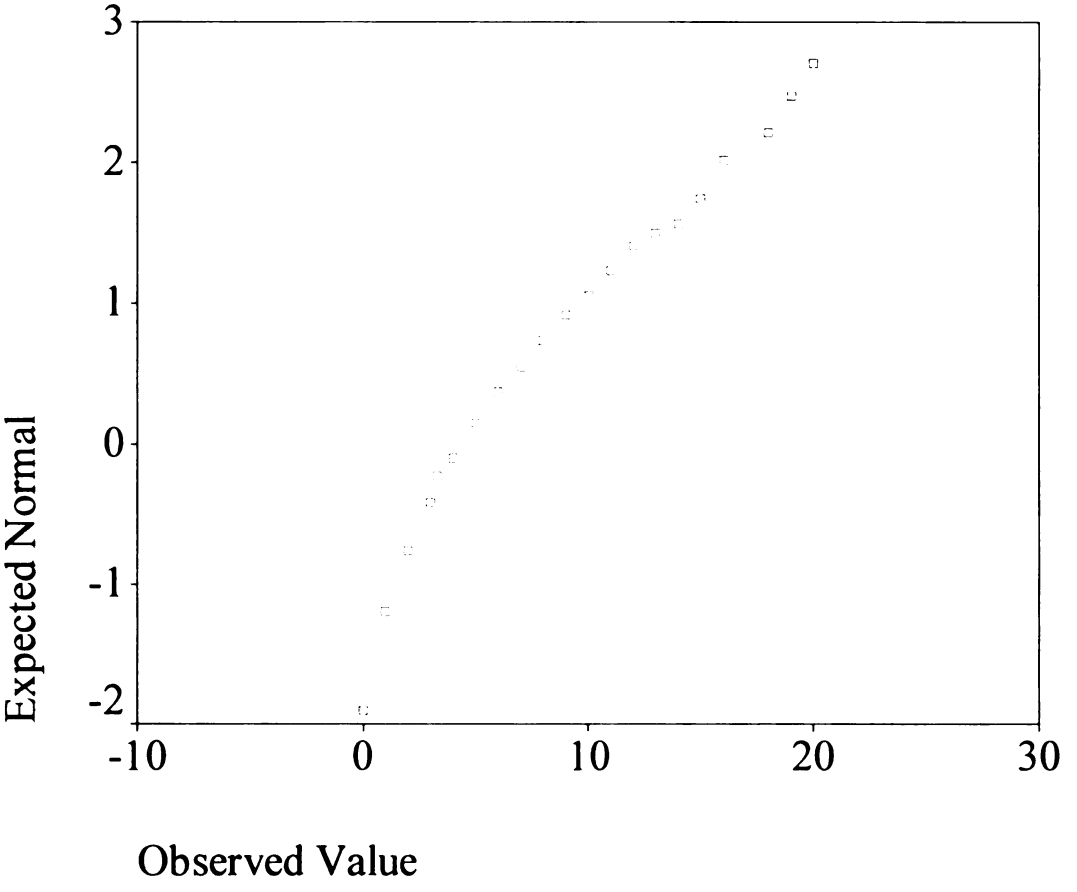

Figure A36. Normal Probability Plot (Q-Q Plot) for *Absolute* Paternal-Adolescent Discrepancies in Perceptions of Adaptability - Sample 2 (Girls) (N= 296)

Table A1.

Pearson correlations for Absolute and Relative Parental-Adolescent Discrepancies

	Adolescents with Maternal Data Sample 1		Adolescents with Maternal & Paternal Data Sample 2	
	Males (N=146)	*Females (N=480)*	*Males (N=100)*	*Females (N=296)*
Absolute M-A Discrepancies in Cohesion & Adaptability	.15	.17****	*.18*	*.19***
Relative M-A Discrepancies in Cohesion & Adaptability	.29****	.39****	*.26**	*.40****
Absolute P-A Discrepancies in Cohesion & Adaptability	--	--	*.04*	*.20****
Relative P-A Discrepancies in Cohesion & Adaptability	--	--	*.30***	*.44****

Note. M-A = Maternal-Adolescent. P-A = Paternal-Adolescent.

* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$.

APPENDIX B:

Family Group Status Analyses

Table B1.

Demographics and Mean Scores on Primary Study Variables across Family Group Status

	Adolescents			
	Single Family (n = 126)		Intact Family (n = 500)	
	M	*SD*	*M*	*SD*
Age	13.91	1.36	13.92	1.30
Age of Onset of Weight Problems	8.53	3.05	8.36	3.26
Body Mass Index (BMI)	31.24	3.94	30.75	4.28
BDI-SF Total Depression Score	6.56	6.47	5.99	5.86
RCMAS Total Anxiety Score	12.37	6.29	12.63	6.61
Worthlessness Total Score	12.16	4.03	12.05	4.06
FACES-III Scores:				
Adolescent Family Cohesion	33.12	7.77	32.66	8.43
Adolescent Family Adaptability	24.98	6.03	24.63	5.86
Maternal Family Cohesion	37.44	6.16	37.75	5.85
Maternal Family Adaptability	25.77	4.83	25.11	4.51
Maternal-Adolescent Relative Discrepancy in:				
Family Cohesion	4.32	8.16	5.09	7.73
Family Adaptability	0.79	6.77	0.49	6.41

Note. n = total number of valid cases for each group.

Table B2.

Preliminary Data Analyses of Family Group Status Comparisons

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Age of Onset	1	0.30	--	--
Body Mass Index	1	1.36	--	--
Internalizing Symptoms	--	--	.996	6.27
Depression	2	0.94	--	--
Anxiety	2	0.16	--	--
Worthlessness	2	0.08	--	--
Adolescent Perceptions of FF	--	--	0.999	2.63
Family Cohesion	1	0.31	--	--

Table B2 continued.

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Family Adaptability	1	0.37	--	--
Maternal Perceptions of FF	--	--	0.996	2.51
Family Cohesion	1	0.28	--	--
Family Adaptability	1	2.07	--	--
M-A Relative Discrepancies in:	--	--	0.997	1.10
Family Cohesion	1	0.99	--	--
Family Adaptability	1	0.21	--	--

Table B2 continued.

Note. FF = Family Functioning. M-A = Maternal-Adolescent. Results presented are from MANOVAs, ANOVAs, and Box's M Test for Equality of Covariance Matrices.

* $p < .05$. ** $p < .01$.

APPENDIX C:

Demographics & Preliminary Gender Analyses

Table C1.

Demographics and Mean Scores on Primary Study Variables for Boys and Girls in Sample 1

	Adolescents			
	Females (n = 480)		Males (n = 146)	
	M	*SD*	*M*	*SD*
Age	14.00	1.35	13.64	1.14
Age of Onset of Weight Problems	8.57	3.24	7.81	3.08
Body Mass Index (BMI)	30.56	4.20	31.80	4.14
BDI-SF Total Depression Score	6.41	5.94	5.08	6.04
RCMAS Total Anxiety Score	12.98	6.62	11.23	6.14
Worthlessness Total Score	12.49	3.95	10.70	4.07
FACES-III Scores:				
Adolescent Family Cohesion	32.87	8.35	32.36	8.14
Adolescent Family Adaptability	24.88	5.95	24.11	5.67
Maternal Family Cohesion	37.94	5.90	36.86	5.91
Maternal Family Adaptability	25.43	4.55	24.63	4.64
Maternal-Adolescent Relative Discrepancy in:				
Family Cohesion	5.07	7.74	4.50	8.08
Family Adaptability	.56	6.59	.52	6.14

Note. n = total number of valid cases for each group.

Table C2.

Demographics and Mean Scores for Girls and Boys in Sample 2

	Females		Males	
	(*n*=296)		(*n*=100)	
	M	*SD*	*M*	*SD*
Age	14.01	1.37	13.58	1.13
Age of Onset of Weight Problems	8.59	3.22	7.87	3.01
Body Mass Index (BMI)	30.57	4.34	31.81	4.14
BDI-SF Total Depression Score	5.92	5.51	4.92	5.74
RCMAS Total Anxiety Score	13.18	6.78	11.17	5.96
Worthlessness Total Score	12.36	3.98	10.50	3.98
FACES-III Scores:				
Adolescent Family Cohesion	32.52	8.48	32.90	8.62
Adolescent Family Adaptability	24.75	6.14	24.13	5.80
Maternal Family Cohesion	38.05	5.65	37.43	5.95
Maternal Family Adaptability	25.36	4.43	24.46	4.60
Paternal Family Cohesion	37.36	6.02	37.24	6.36
Paternal Family Adaptability	25.09	4.60	25.70	4.96
Maternal-Adolescent Relative Discrepancy in:				
Family Cohesion	5.53	7.87	4.53	8.49
Family Adaptability	.62	6.74	.33	6.09

Note. n = total number of valid cases for each group.

Table C2 continued...

	Adolescents			
	Females (n=296)		Males (n=100)	
	M	*SD*	*M*	*SD*
Paternal-Adolescent Relative Discrepancy in:				
Family Cohesion	4.84	8.17	4.34	8.48
Family Adaptability	.34	6.80	1.57	7.02

Note. n = total number of valid cases for each group.

Table C3.

Preliminary Data Analyses of Gender Comparisons for Adolescents in Sample 1

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Age of Onset	1	6.30	--	--
Body Mass Index	1	9.87**	--	--
Internalizing Symptoms	--	--	0.962****	3.63
Depression	1	5.65	--	--
Anxiety	1	8.09**	--	--
Worthlessness	1	22.56****	--	--
Adolescent Perceptions of FF	--	--	0.997	1.32
Family Cohesion	1	0.43	--	--

Table C3 continued.

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Family Adaptability	1	1.90	--	--
Maternal Perceptions of FF	--	--	0.990	1.73
Family Cohesion	1	3.78	--	--
Family Adaptability	1	3.46	--	--
M-A Relative Discrepancies in:	--	--	0.999	3.20
Family Cohesion	1	0.59	--	--
Family Adaptability	1	0.004	--	--

Table C3 continued.

Note. FF = Family Functioning. M-A = Maternal-Adolescent. Results presented are from MANOVAs, ANOVAs, and Box's M Test for Equality of Covariance Matrices.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

Table C4.

Preliminary Data Analyses of Gender Comparisons for Adolescents in Sample 2

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Age of Onset	1	3.91	--	--
Body Mass Index	1	6.24*	--	--
Internalizing Symptoms	--	--	0.951****	5.14
Depression	1	2.41	--	--
Anxiety	1	6.93**	--	--
Worthlessness	1	16.30****	--	--
Adolescent Perceptions of FF	--	--	0.996	1.01
Family Cohesion	1	0.15	--	--

Table C4 continued.

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Family Adaptability	1	0.78	--	--
Maternal Perceptions of FF	--	--	0.991	2.63
Family Cohesion	1	0.89	--	--
Family Adaptability	1	3.06	--	--
Paternal Perceptions of FF	--	--	0.996	2.23
Family Cohesion	1	0.03	--	--
Family Adaptability	1	1.27	--	--
M-A Relative Discrepancies in:	--	--	0.997	4.60
Family Cohesion	1	1.16	--	--

Table C4 continued.

Source	*df*	*F*	*Wilk's λ*	*Box's M*
Family Adaptability	1	0.14	--	--
P-A Relative Discrepancies in:	--	--	0.990	3.35
Family Cohesion	1	0.27	--	--
Family Adaptability	1	2.41	--	--

Note. FF = Family Functioning. M-A = Maternal-Adolescent. P-A = Paternal-Adolescent. Results presented are from MANOVAs, ANOVAs, and Box's M Test for Equality of Covariance Matrices.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

APPENDIX D:

Regressions Examining Family Functioning as a Moderator

Table D1.

Summary of Linear Regressions Examining Total Adolescent Family Functioning as a Moderator between Age of Onset and Internalizing Symptoms for All Girls

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	.17	.38	.09
Total Family Functioning	-.13	.06	-.27*
Age of Onset*Total FF.	-.002	.01	.75
Step 1 – Anxiety			
Age of Onset	-.01	.43	-.04
Total Family Functioning	-.15	.07	-.29*
Age of Onset*Total FF.	.002	.01	.05
Step 1 – Worthlessness			
Age of Onset	-.002	.25	-.01
Total Family Functioning	-.11	.04	-.33**
Age of Onset*Total FF.	.001	.004	.07

Note. n=480. FF = Family Functioning; $R^2 = .10$, $p < .0001$ for Step 1 – Depression; $R^2 = .07$, $p < .0001$ for Step 1 – Anxiety; $R^2 = .09$, $p < .0001$ for Step 1 – Worthlessness.

Table D1 continued.

* $p < .05$. ** $p < .01$.

Table D2.

Summary of Linear Regressions Examining Adolescent Family Cohesion as a Moderator between Age of Onset and Internalizing Symptoms for All Girls

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	.11	.31	.06
Family Cohesion	-.21	.08	-.29**
Age of Onset*Fam. Coh.	-.002	.01	-.03
Step 1 – Anxiety			
Age of Onset	-.002	.36	-.01
Family Cohesion	-.20	.10	-.26*
Age of Onset*Fam. Coh.	.001	.01	.02
Step 1 – Worthlessness			
Age of Onset	.07	.21	.05
Family Cohesion	-.13	.06	-.27*
Age of Onset*Fam. Coh.	-.0002	.01	-.01

Table D2 continued.

Note. n=480. Fam. Coh. = Family Cohesion; $R^2 = .10$, $p < .0001$ for Step 1 – Depression; $R^2 = .06$, $p < .0001$ for Step 1 – Anxiety; $R^2 = .08$, $p < .0001$ for Step 1 – Worthlessness.

* $p < .05$. ** $p < .01$.

Table D3.

Summary of Linear Regressions Examining Adolescent Family Adaptability as a Moderator between Age of Onset and Internalizing Symptoms for All Girls

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	.19	.35	.11
Family Adaptability	-.16	.13	-.16
Age of Onset*Fam. Adapt.	-.01	.01	-.09
Step 1 – Anxiety			
Age of Onset	-.12	.39	-.06
Family Adaptability	-.26	.14	-.23
Age of Onset*Fam. Adapt.	.005	.02	.07
Step 1 – Worthlessness			
Age of Onset	-.09	.23	-.07
Family Adaptability	-.20	.08	-.30*
Age of Onset*Fam. Adapt.	.01	.01	.14

Table D3 continued.

Note. n=480. Fam. Adapt. = Family Adaptability; $R^2 = .05$, $p < .0001$ for Step 1 – Depression; $R^2 = .04$, $p < .0001$ for Step 1 – Anxiety; $R^2 = .05$, $p < .0001$ for Step 1 – Worthlessness.

* $p < .05$.

Table D4.

Summary of Linear Regressions Examining Total Adolescent Family Functioning as a Moderator between Age of Onset and Internalizing Symptoms for All Boys

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	1.36	.89	.69
Total Family Functioning	.02	.13	.03
Age of Onset*Total FF.	-.02	.02	-.72
Step 1 – Anxiety			
Age of Onset	1.61	.91	.81
Total Family Functioning	.07	.13	.13
Age of Onset*Total FF.	-.02	.02	-.75
Step 1 – Worthlessness			
Age of Onset	1.12	.56	.85*
Total Family Functioning	-.02	.08	-.05
Age of Onset*Total FF.	-.02	.01	-.84

Table D4 continued.

Note. n=146. FF = Family Functioning; $R^2 = .12$, $p < .01$ for Step 1 – Depression; $R^2 = .09$, $p < .01$ for Step 1 – Anxiety; $R^2 = .23$, $p < .0001$ for Step 1 – Worthlessness.

* $p < .05$.

Table D5.

Summary of Linear Regressions Examining Adolescent Family Cohesion as a Moderator between Age of Onset and Internalizing Symptoms for All Boys

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	.96	.77	.49
Family Cohesion	-.003	.20	-.004
Age of Onset*Fam. Coh.	-.03	.02	-.53
Step 1 – Anxiety			
Age of Onset	1.46	.79	.73
Family Cohesion	.13	.20	.18
Age of Onset*Fam. Coh.	-.04	.02	-.70
Step 1 – Worthlessness			
Age of Onset	.81	.50	.61
Family Cohesion	-.01	.13	-.03
Age of Onset*Fam. Coh.	-.02	.02	-.61

Table D5 continued.

Note. n=146. Fam. Coh. = Family Cohesion; $R^2 = .11, p < .01$ for Step 1 – Depression; $R^2 = .09, p < .01$ for Step 1 – Anxiety; $R^2 = .17, p < .0001$ for Step 1 – Worthlessness.

* $p < .05$.

Table D6.

Summary of Linear Regressions Examining Adolescent Family Adaptability as a Moderator between Age of Onset and Internalizing Symptoms for All Boys

Variable	*B*	*SE B*	β
Step 1 – Depression			
Age of Onset	1.09	.76	.56
Family Adaptability	.09	.25	.08
Age of Onset*Fam. Adapt.	-.09	.03	-.58
Step 1 – Anxiety			
Age of Onset	.99	.78	.50
Family Adaptability	.04	.26	.04
Age of Onset*Fam. Adapt.	-.03	.03	-.41
Step 1 – Worthlessness			
Age of Onset	1.06	.48	.80*
Family Adaptability	-.005	.16	.01
Age of Onset*Fam. Adapt.	-.04	.02	-.79

Table D6 continued.

Note. n=146. Fam. Adapt. = Family Adaptability; $R^2 = .06$, $p < .05$ for Step 1 – Depression; $R^2 = .05$, $p = ns$ for Step 1 – Anxiety; $R^2 = .18$, $p < .0001$ for Step 1 – Worthlessness.

* $p < .05$.

Table D7.

Summary of Linear Regressions Examining Maternal Family Functioning as a Potential Moderator for Girls and Boys in Sample 1

	Females (*N*=480)			Males (*N*=146)		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Step 1 – Depression						
Age of Onset	.72	.62	.40	1.16	1.05	.59
Maternal Family Functioning	-.06	.09	-.08	.02	.14	.03
Age of Onset*Maternal FF	-.01	.01	-.38	-.02	.02	-.56
Step 1 – Anxiety						
Age of Onset	.81	.70	.40	1.33	1.04	.67
Maternal Family Functioning	.01	.10	.01	-.06	.14	-.08
Age of Onset*Maternal FF	-.01	.01	-.41	-.02	.02	-.54
Step 1 – Worthlessness						
Age of Onset	.31	.41	.25	1.12	.70	.84
Maternal Family Functioning	-.07	.06	-.14	.02	.09	.03

Table D8 continued.

	Females (*N*=480)			Males (*N*=146)		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Age of Onset*Maternal FF	-.004	.01	-.21	-.02	.01	-.76

Note. FF = Family Functioning Score. Females: $R^2 = .05, p < .0001$ for Step 1 – Depression; $R^2 = .02, p < .05$ for Step 1 – Anxiety; $R^2 = .05, p < .0001$ for Step 1 – Worthlessness. Males: $R^2 = .03, p = ns$ for Step 1 – Depression; $R^2 = .09, p < .01$ for Step 1 – Anxiety; $R^2 = .06, p < .05$ for Step 1 – Worthlessness.

* $p < .05$.

Table D8.

Summary of Linear Regressions Examining Maternal Family Cohesion as a Potential Moderator for Girls and Boys in Sample 1

	Females (*N*=480)			Males (*N*=146)		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Step 1 – Depression						
Age of Onset	.64	.51	.35	1.18	.96	.60
Maternal Family Functioning	-.12	.12	-.12	.14	.22	.13
Age of Onset*Maternal FF	-.01	.01	.34	-.03	.03	-.58
Step 1 – Anxiety						
Age of Onset	.32	.58	.16	1.15	.97	.58
Maternal Family Functioning	-.10	.14	-.09	.03	.22	.03
Age of Onset*Maternal FF	-.01	.02	-.16	-.23	.03	-.46
Step 1 – Worthlessness						
Age of Onset	.36	.34	.29	1.12	.64	.85
Maternal Family Functioning	-.07	.08	-.10	.12	.14	.17
Age of Onset*Maternal FF	-.01	.01	-.26	-.03	.02	-.78

Table D8 continued.

Note. FF = Family Functioning Score. Females: $R^2 = .06$, $p < .0001$ for Step 1 – Depression; $R^2 = .02$, $p < .05$ for Step 1 – Anxiety; $R^2 = .04$, $p < .0001$ for Step 1 – Worthlessness. Males: $R^2 = .02$, $p = ns$ for Step 1 – Depression; $R^2 = .05$, $p = ns$ for Step 1 – Anxiety; $R^2 = .05$, $p = ns$ for Step 1 – Worthlessness.

* $p < .05$.

Table D9.

Summary of Linear Regressions Examining Maternal Family Adaptability as a Potential Moderator for Girls and Boys in Sample 1

	Females (*N*=480)			Males (*N*=146)		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Step 1 – Depression						
Age of Onset	.18	.47	.10	.32	.82	.16
Maternal Family Functioning	-.04	.16	-.03	-.11	.27	-.08
Age of Onset*Maternal FF	-.004	.02	-.06	-.01	.03	-.10
Step 1 – Anxiety						
Age of Onset	.65	.52	.32	.51	.81	.26
Maternal Family Functioning	.16	.18	.11	-.24	.27	-.18
Age of Onset*Maternal FF	-.02	.02	-.34	-.01	.03	-.11
Step 1 – Worthlessness						
Age of Onset	.04	.31	.03	.34	.55	.26
Maternal Family Functioning	-.11	.11	-.13	-.10	.18	-.11
Age of Onset*Maternal FF	.001	.01	.03	-.01	.02	-.14

Table D9 continued.

Note. FF = Family Functioning Score; Females: $R^2 = .01$, $p = ns$ for Step 1 – Depression; $R^2 = .004$, $p = ns$ for Step 1 – Anxiety; $R^2 = .02$, $p < .05$ for Step 1 – Worthlessness. Males: $R^2 = .02$, $p = ns$ for Step 1 – Depression; $R^2 = .08$, $p < .05$ for Step 1 – Anxiety; $R^2 = .05$, $p = ns$ for Step 1 – Worthlessness.

* $p < .05$.

APPENDIX E:

Multiple-Group Analyses Using Maximum-Likelihood Estimation

Table E1.

Results of ML Estimation: Examining Perceptions of Family Functioning, Internalizing Symptoms, & Age of Onset (Hypothesis 1) for Adolescents in Sample 1

Model	*Description of Nested Models*	χ^2 *(df)*	X^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	26.35 (14)*	1.88	--	.96	.08 (.03-.12)
	2nd Model – eliminated path (adolescent perceptions → internalizing symptoms)	27.07 (15)*	1.81	0.72 (1)	.96	.07 (.02-.12)
	3rd & Final Model – eliminated path (internalizing symptoms → maternal perceptions)	27.12 (16)*	1.70	0.05 (1)	.96	.07 (.02-.11)
Females	1st Model – reciprocal relationships	12.10 (14)	0.86	--	.99	.00 (.00-.04)
	2nd Model – eliminated path (adolescent perceptions → internalizing symptoms)	17.53 (15)	1.17	5.43 (1)*	.99	.02 (.00-.05)
	3rd & Final Model – eliminated path (internalizing symptoms → maternal perceptions)	17.54 (16)	1.10	0.01 (1)	.99	.01 (.00-.05)

Table E1 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	44.74 (32)	1.40	--	.98	.03 (.00-.04)
	Fully Constrained – Final Model	58.05 (52)	1.12	13.32 (20)	.98	.01 (.00-.03)

Note. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses. Statistical significance was set at $p < .05$ for SEM analyses.

* $p < .05$.

Table E2.

Results of ML Estimation: Examining Relative Discrepancies in Perceptions, Internalizing Symptoms, & Age of Onset (Hypothesis 2) for Adolescents in Sample 1

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	*Inadmissible Solution* – Negative Error Variance for M-A Discrepancies in Cohesion				
		14.22 (7)*	2.03	--	.97	.08 (.01-.15)
	2nd Model & Final Model – eliminated path (M-A Relative Discrepancies in FF → Internalizing Symptoms)	16.37 (8)*	2.05	--	.96	.09 (.02-.14)
Females	1st Model – reciprocal relationships	3.14 (7)	0.49	--	.998	.00 (.00-.03)
	2nd Model & Final Model – eliminated path (M-A Relative Discrepancies in FF → Internalizing Symptoms)	3.80 (8)	0.48	0.66 (1)	.997	.00 (.00-.03)

Table E2 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	X^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	20.23 (16)	1.26	--	.99	.02 (.00-.05)
	Fully Constrained – Final Model	29.93 (29)	1.03	9.71 (13)	.99	.01 (.00-.03)

Note. M-A = Maternal-Adolescent. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI = goodness-of-fit index. RMSEA = root mean square error of approximation. CI = 90% Confidence Interval in parentheses.

* $p < .05$.

Table E3.

Results of ML Estimation: Examining Perceptions of Family Functioning, Internalizing Symptoms, & Age of Onset (Hypothesis 1) for Adolescents in Sample 2

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2 */df*	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	74.15 (31)****	2.39	--	.87	.12 (.08-.15)
	2nd Model – added 1 error covariance (maternal adaptability error ↔ paternal adaptability error)	*Inadmissible Solution* – Negative Error Variance for Paternal Cohesion				
		60.85 (30)**	2.03	--	.89	.10 (.07-.14)
	3rd Model – eliminated path (adolescent perceptions → internalizing symptoms)	*Inadmissible Solution* – Negative Error Variance for Paternal Cohesion				
		62.00 (31)**	2.00	--	.89	.10 (.06-.14)
	4th Model – eliminated path (internalizing symptoms → parental perceptions)	*Inadmissible Solution* – Negative Error Variance for Paternal Cohesion †				
		63.97 (32)**	2.00	--	.89	.10 (.06-.14)

Table E3 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2 */df*	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Females	1st Model – reciprocal relationships	*Inadmissible Solution* – Negative Error Variance for Adolescent Family Cohesion				
		110.66 (31)****	3.57	--	.93	.09 (.08-.11)
	2nd Model – set error variance for adolescent cohesion to1/3 its variance (i.e., equals 20)	118.21 (32)****	3.69	--	.93	.10 (.08-.11)
	3rd Model – eliminated path (adolescent perceptions → internalizing symptoms)	165.52 (33)****	5.02	47.31 (1)***	.90	.12 (.10-.14)
	4th Model – eliminated path (internalizing symptoms → parental perceptions)	165.91 (34)****	4.88	0.39 (1)	.90	.12 (.10-.13)
	5th Model – added path (parental perceptions → adolescent perceptions)	116.80 (33)****	3.54	49.11 (1)***	.93	.09 (.08-.11)

Table E3 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2 */df*	χ^2_{diff}	GFI	RMSEA (CI)
	6th Model – tested addition of reverse path (adolescent → parental perceptions) to the 4th Model	116.48 (33)****	3.53	49.43 (1)*** *Compared to 4th Model*	.93	.09 (.08-.11)
	7th Model – building on the 5th Model, added error covariance (maternal ↔ paternal adaptability)	75.81 (32)****	2.37	40.99 (1)***	.95	.07 (.05-.09)
	8th Model – added error covariance (maternal adaptability ↔ paternal cohesion)	63.02 (31)**	2.03	12.79 (1)***	.96	.06 (.04-.08)
	9th & Final Model – added error covariance (paternal ↔ adolescent adaptability)	53.41 (30)**	1.78	9.61 (1)**	.97	.05 (.03-.07)
	10th Model – eliminated path (parental perceptions → adolescent perceptions)	103.97 (31)****	3.35	50.56 (1)***	.94	.09 (.07-.11)

Table E3 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2 */df*	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	*Inadmissible Solution* – Not Positive Definite Covariance Matrix for Males				
		110.35 (60)****	1.84	--	.95	.05 (.03-.06)
	Fully Constrained – Final Model	131.22 (85)**	1.54	*See text for explanation*	.94	.04 (.02-.05)

Note. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval in parentheses. Statistical significance was set at $p < .05$ for SEM analyses.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

† Final Model was not found.

‡ While model converged, empirical problems persisted.

Table E4.

Results of ML Estimation: Examining Relative Discrepancies in Perceptions, Internalizing Symptoms, & Age of Onset (Hypothesis 2) for Adolescents in Sample 2

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Single Group Analyses						
Males	1st Model – reciprocal relationships	*Inadmissible Solution* – Iteration limit reached due to Not Positive Definite Covariance Matrix for Males				
	2nd Model & Final Model – eliminated path (M-A Discrepancies in → Internalizing Symptoms)	*Inadmissible Solution* – Iteration limit reached due to Not Positive Definite Covariance Matrix for Males				
Females	1st Model – reciprocal relationships	23.07 (16)	1.44	--	.98	.04 (.00-.07)
	2nd Model & Final Model – eliminated path (M-A Relative Discrepancies → Internalizing Symptoms)	24.28 (17)	1.43	1.21 (1)	.98	.04 (.00-.07)

Table E4 continued.

Model	*Description of Nested Models*	χ^2 (*df*)	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Multiple-Group Analysis						
	Unconstrained – Final Model	*Inadmissible Solution* – Non Positive Covariance Matrix for Males				
		57.48 (34)**	1.69	--	.97	.04 (.02-.06)
	Measurement Weights – Final Model	63.46 (39)**	1.63	--	.96	.04 (.02-.06)
	Fully Constrained – Final Model	73.47 (53)*	1.39	10.01 (14)	.96	.03 (.01-.05)

Note. M-A = Maternal-Adolescent. FF = Family Functioning. *df* = degrees of freedom in parentheses. GFI = goodness-of-fit index. RMSEA = root mean square error of approximation. CI = 90% Confidence Interval in parentheses.

* $p < .05$. ** $p < .01$.

APPENDIX F:

Multiple-Group Analyses Using Data without Outliers

Table F1.

Results of Multiple-Group Analyses without Outliers for Adolescents in Sample 1

Model	*Description of Nested Models*	χ^2 *(df)*	X^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Hypothesis 1: Examining Individual Perceptions of FF & Internalizing Symptoms						
Multiple Group Analysis						
	Unconstrained – Final Model – GLS	38.69 (32)	1.21	--	.98	.02 (.00-.04)
	Fully Constrained – Final Model – GLS	64.97 (52)	1.25	26.28 (20)	.97	.02 (.00-.04)
Hypothesis 2: Examining Relative M-A Discrepancies in Perceptions of FF & Internalizing Symptoms						
Multiple-Group Analysis						
	Unconstrained – Final Model – GLS	13.69 (16)	0.86	--	.99	.00 (.00-.03)
	Fully Constrained – Final Model – GLS	31.97 (29)	1.10	18.27 (13)	.98	.01 (.00-.04)

Note. n=594. FF = Family Functioning. M-A = Maternal-adolescent. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval.

* $p < .05$.

Table F2.

Results of Multiple-Group Analyses without Outliers for Adolescents in Sample 2

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
Hypothesis 1: Examining Individual Perceptions of FF & Internalizing Symptoms						
Multiple-Group Analysis						
	Unconstrained – Final Model - GLS	*Inadmissible Solution* – Not Positive Definite Covariance Matrix for Males				
		89.89 (60)**	1.50	--	.95	.04 (.02-.05)
	Fully Constrained – Final Model - GLS	137.73 (85)****	1.62	*See text for explanation*	.93	.04 (.03-.05)
Hypothesis 2: Examining Relative M-A Discrepancies in Perceptions of FF & Internalizing Symptoms						
Multiple-Group Analysis						
	Unconstrained – Final Model - GLS	*Inadmissible Solution* – Non Positive Covariance Matrix for Males				
		43.62 (34)	1.28	--	.97	.03 (.00-.05)
	Measurement Weights – Final Model - GLS	55.37 (39)*	1.42	--	.96	.03 (.01-.05)

Table F2 continued.

Model	*Description of Nested Models*	χ^2 *(df)*	χ^2/df	χ^2_{diff}	GFI	RMSEA (CI)
	Fully Constrained – Final Model - GLS	*72.52 (53)**	*1.37*	*17.15 (14)*	.95	.03 (.01-.05)

Note. n=594. FF = Family Functioning. M-A = Maternal-adolescent. *df* = degrees of freedom in parentheses. GFI= goodness-of-fit index. RMSEA= root mean square error of approximation. CI = 90% Confidence Interval.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

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