

## **Dissimilarity in mother and adolescent illness representations of type 1 diabetes and negative emotional adjustment**

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*(Received 26 October 2006; in final form 7 May 2007)*

### **Abstract**

The study explored how two measures of mother–adolescent dissimilarity in illness representations relate to negative emotional adjustment in mothers and adolescents. Eighty-four adolescents with type 1 diabetes (age 11.5–17.5) and their mothers completed the Revised Illness Perceptions Questionnaire and measures of negative emotional adjustment. Adolescents viewed diabetes as less chronic, containing fewer negative emotional representations, and that mother had less control over the illness than did mothers. Mother–adolescent mean differences in representations were not associated with negative adjustment for adolescents; mean differences in coherence were related to negative adjustment for mothers, when controlling the individual’s own representations. A measure of dissimilarity based on the sum of squared differences between mother and adolescent was associated with negative adolescent adjustment when controlling adolescent’s own representations, but no relations were found for mothers. Dyadic approaches to coping with chronic illness will benefit by understanding how dissimilarity in illness representations between patient and caregiver relate to adjustment.

**Keywords:** *Illness representations, type 1 diabetes, adjustment, adolescents, maternal*

In the past decade pediatric illnesses such as diabetes, have been described as shared by family members rather than the adolescent’s illness alone (Beveridge, Berg, Wiebe, & Palmer, 2006; Hauser, DiPlacido, Jacobson, Willet, & Cole, 1993; Seiffge-Krenke, 2001). When the adolescent views the family as involved in dealing with aspects of the illness, this may be beneficial for the adolescent’s

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psychosocial adjustment (Drotar, 1997; Wiebe et al., 2005). Family support may relate to adolescent's psychosocial outcomes by facilitating illness representations that are adaptive for the illness (Skinner, John, & Hampson, 2000). Family members, however, can differ in the specific ways they represent the illness (e.g., chronicity, consequences, control) and such differences hold important implications for adjustment (Leventhal, Brissete, & Leventhal, 2002; Weinman, Heijmans, & Figueiras, 2002). Dyadic dissimilarity in illness representations and relations to patient adjustment has only recently been examined with mixed results (Figueiras & Weinman, 2003; Heijmans, de Ridder, & Bensing, 1999; Law, 2002). Small sample sizes, the study of different illnesses, different patient-caregiver dyads (e.g., husband-wife *vs.* parent-child), and variability in conceptualizations of dissimilarity have hampered our understanding of the relation between dyad dissimilarity and adjustment. The present study explores how different metrics of dissimilarity in mother-child illness representations are associated with both mother and adolescent emotional adjustment.

The existing literature has drawn on Leventhal et al.'s (2002) model of illness representations to examine dissimilarity in patient-carer representations of illness. In the Common-sense Model of Self-regulation (Leventhal et al., 2002), individuals with chronic illness have conceptions of the illness that guide their self-regulation as they cope with illness-related stressors. In the present study we examined seven dimensions of illness representations drawing on Moss-Morris and colleagues' (Moss-Morris et al., 2002) revision of the Illness Perceptions Questionnaire (IPQ-R). These dimensions include the *chronic* nature of the illness, whether the timeline is *cyclical* in that the symptoms come and go, the *consequences* or severity of the illness, personal *control* over the illness, beliefs regarding efficacy of *treatment control* over the illness, illness *coherence* in having a clear understanding of the illness, and *emotional* representations regarding the negative effect represented by the illness. These domains portray individuals' representations of experiences, beliefs, expectations, and goals related to their illness.

Research regarding the relation between patient-carer dissimilarity in illness representations and emotional adjustment has yielded mixed results. Dissimilarity has been measured by either examining the mean differences between patient and carer (parent or spouse) on the IPQ (Heijmans et al., 1999; Law, 2002) or constructing discrete groups reflecting whether patient and carer are both high, both low, or discrepant on subscales (Figueiras & Weinman, 2003). In the only study to date regarding adolescents' and their mother's illness representations, Law (2002) found that mean differences in illness representations were not related to the adolescent's negative psychosocial adjustment. As the authors note, however, Law's study had a small sample (30 adolescents and 26 mothers), which may have affected the power to detect effects and used a single measure of psychosocial adjustment not traditionally used in the literature. In contrast, Heijmans et al. (1999) found that when the spouse viewed the illness as having more negative consequences than did the patient, this was associated with better psychosocial adjustment for patients with Addison's disease, but poorer

adjustment among those with chronic fatigue syndrome (Heijmans et al., 1999). Heijmans et al. speculate that the spouse's beliefs may play a balancing role in counteracting the tendency of Addison's patients to over-engage and chronic fatigue patients to under-engage in daily activities. Figueiras and Weinman (2003), using the discrete groups approach, found that patient recovery from a myocardial infarction (MI) was best when couples had similar positive illness perceptions rather than similar negative or discrepant perceptions.

The current research suggests a complex relation between dyadic dissimilarity and patient adjustment. Most studies have examined the relation between dissimilarity in illness representations and the patient's adjustment without taking into account the patient's own illness representations. One limitation to this approach is that significant correlations between mean differences and adjustment could be due to the fact that an individual's illness representation is associated with adjustment and is contained within the measure of mean difference. Both Heijmans et al. (1999) and Law (2002) report that the mean difference dissimilarity score was highly correlated with both patient's and carer's individual scores (range between 0.50–0.80). Importantly, none of the studies examining dissimilarity in illness perceptions have examined whether dissimilarity is associated with adjustment independently of the contribution of individual perceptions. Adults' illness representations are associated with psychosocial adjustment and coping among patients with rheumatoid arthritis (Groarke, Curtis, Coughlan, & Gsel, 2005), epilepsy (Kemp, Morley, & Anderson, 1999), Huntington's disease (Kaptein et al., 2006), asthma, chronic obstructive pulmonary disease, cancer, and cardiovascular disease (see Hagger & Orbell, 2003 for a review). Similarly during adolescence, perceptions of greater consequences of type 1 diabetes and lower personal control are associated with greater anxiety and lower positive well-being (Law, Kelly, Huey, & Summerbell, 2002; Skinner & Hampson, 1998), whereas beliefs regarding treatment control are associated with better well-being (Edgar & Skinner, 2003). Thus, the current study utilizes a stronger test of whether dissimilarity in illness representations is important for understanding adjustment by first controlling for the individual's representation and testing whether dissimilarity adds anything additional to an understanding of negative psychosocial adjustment.

In addition, we add to the existing literature by comparing typical measures of dissimilarity (e.g., mean differences in patient–carer representations) that examine the direction of difference between patient and carer to a measure that assesses a dimension ranging from similarity to dissimilarity. Consider the most frequent case in the literature where dissimilarity in illness representations is calculated as mean carer perceptions minus mean patient perceptions. Scores on this dimension range from negative values (i.e., carer minimizes the illness relative to patient) to positive values (i.e., carer maximizes relative to patient). Similarity is represented at the midpoint of the scale. Although self-regulation and illness perception theory suggests that the direction of difference is meaningful for adjustment, we hypothesized that adolescence is a time when any difference between child and parent may be problematic. In the present study we compared

the mean difference dimension to a score that ranges from similarity to dissimilarity. We calculated a measure of the sum of squared differences on each item aggregating by subscales, allowing for a sensitive measure of how mothers and adolescents view the illness on precisely the same items. Low scores reflect greater similarity, whereas higher scores reflect greater dissimilarity irrespective of the direction of the difference. For example, dissimilarities in how the adolescent and mother view the adolescent's control over the illness may be associated with poorer adjustment, both in the cases when mother perceives the adolescent has more control than the adolescent perceives and when the adolescent perceives he or she has more control than the mother perceives. The sum of squared difference measure treats these two differences as the same, whereas the mean difference measure does not. In order to provide a conservative test of the value of this new dimension of dissimilarity, we conducted analyses to see whether the sum of squared difference measure predicted adjustment over and above the mean difference measure, while controlling for individual illness representations. We also examined how dissimilarity in representations affected not only patient adjustment, but also the parent, consistent with a transactional perspective of parent-child relationships (Beveridge & Berg, 2007).

In the present study, we focus on the representations that adolescents and mothers hold regarding type 1 diabetes. Children and adolescents who have been diagnosed with diabetes have to be vigilant in maintaining their diabetes regimen: testing blood sugar many times daily, exercising properly, watching food consumption, and injecting insulin in order for the body to be able to use the glucose in the blood stream. Adolescents, in particular, struggle with fulfilling the requirements of the disease because diabetes management occurs in the context of other physiological, emotional, psychological, and social changes (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997; Wysocki, 1993). As age-related differences have been found in aspects of illness representations (Paterson, Moss-Morris, & Butler, 1999), age differences may occur in how adolescents represent the illness (with greater similarity occurring with age as adolescents acquire a more realistic view of their illness as chronic). Thus, the examination of dissimilarity in illness representations is important among adolescents with diabetes and their mothers, given that adolescents continue to benefit from their mother's involvement, while transitioning to more adolescent responsibility for management (Palmer et al., 2004).

We examined data from 84 mother and adolescent dyads to compare two different metrics of dissimilarity in predicting negative emotional adjustment (depression, positive and negative affect, poor diabetes quality of life), while controlling for the individual's own representations. First, we compared mother-adolescent mean scores on the IPQ-R to see if mothers and adolescents were different in how they represented the adolescent's diabetes and whether these individual perceptions were related to negative emotional adjustment. Second, we examined if mean difference scores (mother minus adolescent as examined by Law (2002) predicted negative emotional adjustment over and above the individual's own representations. We hypothesized that relationships between

dissimilarity (measured as mean differences) and negative emotional adjustment would be reduced when individuals' representations were controlled. Finally, we used sum of squared differences of the subscales of the IPQ-R to see if any difference in illness representations would predict negative psychosocial adjustment for both mother and adolescent after controlling for individual representations and mean differences. We expected that dissimilarity measured as sum of squared differences would be especially important for adolescents, as this is a time when any difference between adolescent and parents may be salient.

## Method

### *Participants*

Participants included 84 adolescents and their mothers who were being recontacted 1.5 years after completing an initial project (Palmer et al., 2004; Wiebe et al., 2005). The original participants were mailed an invitation to participate in the follow-up phase of the study. The majority of the sample (66%) returned a signed informed consent form and was mailed a packet of questionnaires. Adolescents who participated in the follow-up were not different from those who did not participate in their negative emotional adjustment (mother's depression, children's depression,  $p > 0.7$ ). Adolescents were 11.5–17.5 years of age ( $M = 14.16$ ,  $SD = 1.7$ ; 53% male, 47% female) and had been diagnosed with type 1 diabetes for at least one year before starting the initial project ( $M = 4.00$ ,  $SD = 2.8$ ). The adolescents were on an intensified diabetes regimen taking an average number of 3.51 injections and 4.64 blood glucose tests daily during the initial assessment.

Mothers ranged in age from 30.2 to 60.2 years ( $M = 48.6$ ,  $SD = 5.7$ ), were largely Caucasian (97%), married (86%), and had at least some college education. The mothers reported an annual income with over 60% indicating an annual income of over \$50 000. The average Hollingshead Index was 4.18, indicating a medium business, minor professional class sample.

### *Measures*

*Illness representations.* Adolescents and mothers completed the IPQ-R measure (Moss-Morris et al., 2002) rating 44 items on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Adolescents rated these items for their own illness, while mothers rated perceptions of their adolescent's diabetes (see items in parentheses for examples). We used seven distinct domains of illness representations tapped by this measure: *timeline chronic* (belief that the illness will last a long time, e.g., My (child's) illness is likely to be permanent rather than temporary); *timeline cyclical* (beliefs regarding illness variability and unpredictability, e.g., I (My child) go(oes) through cycles in which my (his/her) diabetes gets better and worse); *consequences* (beliefs about the consequences of the diabetes, e.g., My (child's) diabetes has major consequences on my (his/her) life); *personal control* (we separately asked for the degree to which *adolescent had control*

over or manages the illness – e.g., There is a lot I (my child) can do to control my (his/her) symptoms – and *mother had control* over or manages the illness – There is a lot my mother (I) can do to control my (child's) symptoms); *treatment control* (beliefs in efficacy of treatment to control/manage disease, e.g., My (child's) treatment can control my (his/her) diabetes); *illness coherence* (an individual's ability to understand the illness so that it makes sense and is not puzzling, e.g., I have a clear picture or understanding of my (child's) diabetes); and *emotional representations* (degree of emotional impact of disease, e.g., I get depressed when I think about my (child's) diabetes). We did not include the subscales of identity or causal beliefs due to concerns of subject burden and relevance for the larger protocol examining parental involvement in diabetes management. These subscales demonstrate high reliability in past studies ( $\alpha$  range from 0.79 to 0.89; Moss-Morris et al., 2002). In our sample, reliabilities ranged from fair to excellent for both adolescents and mothers, respectively (chronicity 0.81 and 0.66, cyclical 0.58 and 0.70, severity 0.72 and 0.63, child controls 0.73 and 0.63, mom controls 0.72 and 0.70, treatment controls 0.55 and 0.34, cohesion 0.79 and 0.76, emotional representations 0.82 and 0.85). Because of the low reliability of the treatment control subscale, we dropped this subscale from subsequent analyses.<sup>1</sup> Mean scores were computed separately for each IPQ-R subscale.

*Adolescent's negative emotional adjustment.* Adolescents' negative emotional adjustment was measured using three scales. The CDI is a 27-item self-report scale that measures the extent to which adolescents experience depressive symptoms and is associated with difficulties in managing diabetes (Kovacs, 1985). The CDI has high internal consistency and test-retest reliability ( $r$ 's < 0.71). The PANAS measures the adolescent's positive and negative affect. It is a 20-item scale that consists of 10 positive and 10 negative descriptors that are rated on a 1 (slightly) to 5 (extremely) scale which indicates how the adolescent felt during the past month. The PANAS has high reliability and construct validity (Watson, Clark, & Tellegen, 1988). The Diabetes Quality of Life (DQOL) scale for youth (Ingersoll & Marrero, 1991) measures the psychosocial impact of diabetes. It consists of three subscales that assess: (a) diabetes life satisfaction (17 items), (b) negative disease impact (23 items), and (c) disease-related worries (11 items), with each item answered on a 5-point Likert scale. Internal consistency for each scale was high ( $\alpha$  > 0.85).

*Maternal negative emotional adjustment.* Maternal negative emotional adjustment was measured using two scales: the PANAS (described above) and the Center of Epidemiological Studies of Depression Scale (CES-D; Radloff, 1977). The CES-D was used to measure maternal depression (Radloff, 1977). This scale has excellent reliability ( $\alpha$  = 0.85), validly discriminates between psychiatric and nonpatient groups, and has been shown to be sensitive to difficulties in parenting a child with type 1 diabetes (Kovacs et al., 1990).

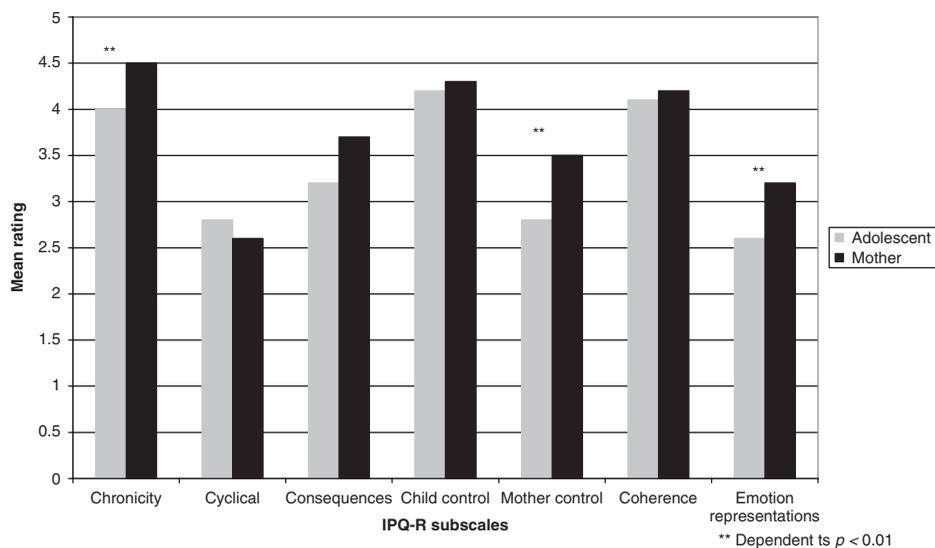


Figure 1. Adolescent and mother means in IPQ-R subscales.

*Factor analysis of negative emotional adjustment.* In order to reduce the number of dependent measures reflecting negative emotional adjustment, principal component analyses were conducted on the final scores for each of the adjustment scales, separately for adolescents and mothers. For adolescents, one factor with an eigenvalue of 3.9 (accounting for 56.1% of the variance) was found indicating overall negative emotional adjustment. Similarly, mothers' measures of adjustment loaded on one factor with an eigenvalue of 2.8 (70% of the variance accounted for). *Z*-scores for the negative emotional adjustment measures were calculated and averaged separately for adolescents and mothers to generate a measure of negative emotional adjustment for adolescents and mothers used in the analyses subsequently.

## Results

### *Mother-adolescent differences in IPQ-R subscales and negative emotional adjustment*

We first examined differences in mother's and adolescent's mean scores on the subscales of the IPQ-R (Figure 1). Separate dependent *t*-tests were conducted for each subscale. Significant differences were found for chronicity ( $t = -6.2$ ,  $df = 81$ ,  $p < 0.01$ ), mother's control over the illness ( $t = -7.6$ ,  $df = 81$ ,  $p < 0.01$ ), and emotional representations ( $t = -5.4$ ,  $df = 81$ ,  $p < 0.01$ ). Adolescents viewed the illness as being less chronic, that mothers had less control over the illness, and that the illness was associated with fewer negative emotional representations than did mothers.

Correlations were computed to examine whether individual representations related to negative emotional adjustment. As can be seen in Table I, greater

Table I. Correlations of adolescent IPQ scores and adolescent negative adjustment and mother IPQ scores and mother negative adjustment.

Individual perception	Adolescent negative adjustment	Mother negative adjustment
Chronicity	0.01	0.04
Cyclical	0.37**	0.24*
Consequences	0.40**	0.03
Child control	-0.31**	-0.10
Mother control	-0.20	0.10
Coherence	-0.48**	-0.30**
Emotional representations	0.65**	0.48**

\* $p < 0.05$ , \*\* $p < 0.01$ .

adolescent negative adjustment was associated with the adolescent’s views of the illness as cyclical, having more consequences, less child control, less coherence, and greater emotional representations. Greater mother negative adjustment was associated with mother’s views of the illness as cyclical, less coherence, and more emotional representations. The relations between emotional representations and negative emotional adjustment are not surprising as they tap similar emotional constructs. Thus, numerous aspects of each individual’s illness representations were associated with negative emotional adjustment for both adolescents and mothers.

We also examined age differences in the subscales of the IPQ-R. For the mothers, none of the subscales were associated with the age of the adolescent (all  $p$ ’s  $> 0.15$ ). For the adolescents, older adolescents perceived the illness as having more consequences ( $r = 0.24$ ,  $p < 0.05$ ) and being more chronic ( $r = 0.24$ ,  $p < 0.05$ ) than did younger adolescents.

*Dissimilarity as the difference between mother and adolescent means*

In order to replicate Law’s analysis, we computed for each mother–adolescent dyad a dissimilarity index by subtracting the adolescent’s score on a given subscale from his or her mother’s subscale score. These separate subscale difference scores were then correlated with adjustment. For adolescents, significant relationships were found between adolescent negative adjustment and mother–adolescent differences in consequences, illness coherence, and emotional representations (Table II). That is, adolescents reported poorer adjustment when they perceived the illness as having more negative consequences, lower coherence, and more emotional representations than did their mothers.

For mothers, a significant relationship was found between differences in emotional representations of the illness and the mother’s negative adjustment. Mothers who viewed the illness as having more negative emotional representations than the adolescent were experiencing greater negative emotional

Table II. Correlations of the mean differences between mother and adolescent and their negative psychosocial adjustment.

Mean difference score (Mother-adolescent)	Adolescent negative adjustment	Mother negative adjustment
Chronicity	0.06	0.14
Cyclical	-0.15	0.06
Consequences	-0.25*	-0.04
Child control	0.09	0.04
Mother control	-0.01	0.05
Coherence	0.31**	0.08
Emotional representations	-0.43**	0.29**

\* $p < 0.05$ , \*\* $p < 0.01$ .

Table III. The  $\beta$ 's from multiple regressions for adolescent negative adjustment.

	Step 1		Step 2	
	Adolescent IPQ	M-A mean difference	Square differences	
	$\beta$	$\beta$	$\beta$	$R^2$ change
Chronicity	0.14	0.17	0.24	0.03
Cyclical	0.39**	0.09	0.17	0.03
Consequences	0.49**	0.05	0.17	0.02
Child control	-0.35**	-0.09	0.26*	0.05*
Mother controls	-0.32*	-0.21	0.36**	0.15**
Coherence	-0.53**	-0.08	0.24*	0.05*
Emotional Representations	0.62**	-0.06	-0.04	0.00

\* $p < 0.05$ , \*\* $p < 0.01$ .

adjustment, perhaps reflecting simply mothers who were experiencing greater emotional distress.

Age differences in these mean difference scores revealed that older adolescents perceived greater consequences of the illness than their mothers ( $r = -0.27$ ,  $p < 0.05$ ) and greater personal control over the illness than their mothers perceived they had ( $r = -0.23$ ,  $p < 0.05$ ). No other age differences were significant (all  $p$ 's  $> 0.10$ ).

Next, analyses were conducted to see if these mean differences predicted adjustment when controlling for the individual's own representations. That is, for adolescents, seven multiple regressions (one for each analyzed subscale) were conducted with the adolescent's representation and the mean difference between mother's and adolescent's perception entered simultaneously as independent variables predicting negative psychosocial adjustment. As noted in Table III (middle column), the mean difference score did not predict negative adjustment over and above the adolescent's own representations for any subscale ( $p$ 's range from 0.13 to 0.33).

Table IV. The  $\beta$ 's from multiple regressions for mother negative adjustment.

	Step 1		Step 2	
	Adolescent IPQ	M-A mean difference	Square differences	
	$\beta$	$\beta$	$\beta$	change in $R^2$
Chronicity	-0.03	0.02	0.18	0.02
Cyclical	0.39**	-0.21	-0.06	0.00
Consequences	0.10	-0.06	-0.08	0.01
Child control	-0.13	0.10	0.06	0.00
Mother controls	0.14	-0.05	0.03	0.00
Coherence	-0.49**	0.33**	0.11	0.01
Emotional representations	0.47**	0.00	0.15	0.02

\*\* $p < 0.01$ .

Similar analyses were conducted for mother's negative adjustment (see Table IV, middle column). Seven multiple regressions were conducted with the mother's representation and the mean difference between her representation and the adolescent's representation as the independent variables predicting the mother's negative adjustment. Only one subscale revealed a significant effect of mean differences over and above the mother's own representations. Independent of her own perceptions of coherence, when mothers perceived greater coherence than her adolescent, she reported greater negative adjustment. All other effects were not significant ( $p$ 's ranging from 0.24 to 0.96) for the effect of mean differences.

In sum, dissimilarity between mother and adolescent perceptions (measured as mean differences) was not related to emotional adjustment in the adolescent once the adolescent's perception was considered. Thus, for adolescents, conceptualizing dissimilarity as mean difference scores seems to confound dissimilarity with the adolescent's own representations. In fact, correlations between the mean difference score and the individual's perception were extremely high both for adolescent (range across subscales -0.56--0.76) and mother (range 0.47-0.70).<sup>2</sup> For mothers, mean differences in coherence did predict greater maternal negative emotional adjustment beyond mothers' own perceptions of coherence. Age moderations of these effects were tested with interactions between mean differences and age. No significant interactions were found for either mother or adolescent adjustment.

#### *Dissimilarity as sum of squared differences*

We next performed analyses to test whether the measure of dissimilarity of sum of the squared differences for each item of the subscale would predict negative emotional adjustment over and above the individual's representations and the mean difference measure. Thus, to the multiple regressions mentioned above for adolescent and mother (controlling for individual representations and the mean

difference dissimilarity score) we added at Step 2, the sum of squared difference score. In this way, we conducted a conservative test of whether the sum of squared difference measure of dissimilarity accounted for additional variance after controlling for the individual's own representation and the more typical measure of dissimilarity used in the field. These analyses were conducted separately for adolescents and mothers.

For adolescents (see Table III, third and fourth column), the squared differences between mother and adolescent were related to adjustment, over and above their own mean and the mean difference score, for perceptions of how much control the adolescent had over the illness, of how much control the mother had over the illness, and of illness coherence. In each case, the greater the difference between mother and adolescent perceptions, regardless of the direction of that difference, the greater the negative adjustment. For mothers (see Table IV, third and fourth column), no additional effect was found for the sum of squared difference score.<sup>3</sup> For mothers, for coherence, with sum of squared differences in the equation, the mean difference measure remained significant ( $\beta = 0.27$ ,  $p < 0.05$ ). Age moderations of these effects were tested with interactions between squared differences and age. No significant interactions were found for either mother or adolescent adjustment.

The results comparing these two different metrics of dissimilarity (mean differences and sum of squared differences) were not influenced by statistical properties of these metrics.<sup>4</sup> The sum of squared differences metric was much less related to individual illness representations than was the mean difference score (correlations ranging from  $-0.40$  to  $0.34$ ) and measured something different than the mean difference score (correlations ranging from  $-0.06$  to  $0.57$ ).

## **Discussion**

The results of this study demonstrate some of the complexities involved in examining illness representations from a shared perspective rather than the patient's perspective alone. Mothers and adolescents differed in how they each represented the adolescent's diabetes. However, whether dissimilarity in adolescent's and mother's representations was associated with negative emotional adjustment depended on the measure of dissimilarity used. The measure of dyadic dissimilarity often used in the literature (mean differences between patient and carer) was not related to adolescent negative adjustment when the adolescent's own illness representations were controlled. However, after accounting for her personal illness beliefs, mothers exhibited greater negative adjustment when she perceived more coherence than her adolescent perceived. When operationalized as the sum of squared differences, however, dissimilarity was related to higher negative emotional adjustment for adolescents over and above the adolescent's own illness representations and the mean difference score; this measure of dissimilarity was not associated with mothers' negative emotional adjustment. The results indicate that measures of dyadic dissimilarity in illness representations must take into account the individual's own illness

representations and suggests that mothers and adolescents may be affected by different aspects of dissimilarity.

Mothers and adolescents viewed the adolescent's diabetes somewhat differently. In general, mothers viewed the adolescent's diabetes as more chronic, containing more negative emotional consequences, and that she had more control over the disease than the adolescent perceived she had. These differences may reflect that mothers maximized the illness (reported higher scores than the adolescent) because they were in some way balancing out the adolescent's somewhat optimistic representations of the disease (Heijmans et al., 1999). In this case, maximization may mean that mothers were helping the adolescent to acquire a more medically accurate view of their disease, especially for subscales like chronicity. The fact that mothers reported more negative emotional representations of the illness than adolescents (see also Law, 2002) points to the important way that an adolescent's chronic illness may affect the parent. Older adolescents held a view of diabetes as more chronic and severe than younger adolescents and thus were less dissimilar to their mothers' representations. These results are suggestive of a developmental change in the way that adolescents come to view their illness (see also Paterson et al., 1999), although the cross-sectional nature of our design precludes such developmental conclusions.

Comparing our results to those of Law (2002) revealed some inconsistencies in the relationship between negative adjustment and the mean differences of illness representations. Law (2002) found no relationships between mean differences and negative adjustment either for mothers or adolescents. However, in our study we found several relationships for adolescent's and mother's negative adjustment. Differences in dissimilarity results between this study and the study by Law (2002) may reflect methodological differences (e.g., the present sample was larger and used multiple measures of psychosocial adjustment).

The present study compared two alternative measures of dissimilarity–mean differences (Heijmans et al., 1999; Law, 2002) and the sum of squared differences between the mother and adolescent on each item of the subscale – and examined whether these measures of dissimilarity carry information beyond that captured by the individual's perception alone. Importantly, our results suggest that the measure of dissimilarity used in the literature, mean differences, is related to adolescent negative adjustment largely because of its relationship to the adolescent's representations that make up the mean difference. Thus, when examining dissimilarity, it is important to take into account the adolescent's own representations. However, for mothers, the direction of the difference may be more important for her negative adjustment, than having any difference between her perceptions and her adolescent's perceptions. That is, even when mother's representations, mean differences, and sum of squared differences were entered simultaneously, mean differences in coherence were predictive of mother's adjustment. Adolescence can be a difficult time emotionally for parents as they struggle with their own mid-life developmental issues including greater distance and conflict with their developing child (Steinberg & Silk, 2002), which may be

heightened in the context of dealing with chronic illness (Seiffge-Krenke, 2001). Mothers may find it especially difficult when their adolescents do not understand diabetes, as reflected by the subscale coherence, especially as they worry about the long-term consequences of this lack of understanding for diabetes management.

The measure of sum of squared differences between mother and adolescent was associated with negative adolescent adjustment. This measure captured a dimension ranging from similarity to dissimilarity, whereas the dimension of mean differences captured a dimension of direction of difference. However, for the mother's negative emotional adjustment, squared differences did not predict over and above her own representations and the mean difference. These results point to the possibility that for adolescents, any difference between mother and adolescent may be related to negative emotional adjustment, as opposed to whether the adolescent differs from mother in a particular direction. Adolescence is a time during development when the adolescent's growing autonomy and independence (Steinberg & Morris, 2000) may make salient any differences between the adolescent and mother. For example, regarding perceptions of how much control the adolescent has over the illness and negative emotional adolescent adjustment, either maximization or minimization of child's control by the mother may be important. In the case where the adolescent feels that he or she has more control over the illness than the mother perceives the adolescent to have, the mother may try to make adjustments (e.g., take over control for the adolescent) that are viewed by the adolescent as being intrusive or controlling, which is associated with negative adjustment (Wiebe et al., 2005) as well as more conflict (Miller & Drotar, 2003). Alternatively, in the case where the mother feels that the adolescent has more control than the adolescent feels that he or she has, the mother may let the adolescent be responsible for managing his/her diabetes prematurely, leading to mismanagement and negative emotional adjustment (Wysocki, 1993). For the adolescent, dissimilarity in understanding aspects of the diabetes itself (i.e., the coherence subscale) was also related to negative emotional adjustment. This particular subscale may be important as it reflects a mismatch between mothers and adolescents in crucial aspects of understanding the disease itself. The lack of age moderations of these relationships suggests that differences between mother and adolescent continue to be important throughout adolescence.

Future research is needed to understand how dyads come to a more similar understanding of the illness and why differences in any direction seem to be more important for understanding adolescent's negative adjustment than mother's adjustment. Similar illness representations could result from mothers and adolescents working collaboratively together around diabetes management tasks (Wiebe et al., 2005). Daily interaction surrounding insulin injections and diet monitoring may facilitate conversations about and shared understandings of diabetes-relevant concepts (e.g., how much control the adolescent, mother, and treatment have).

The study results need to be interpreted in the context of several limitations. First, because this study was a cross-sectional design it is impossible to ascertain

the direction of causality between dissimilarities and psychosocial adjustment. That is, dissimilarity in illness representations could contribute to negative psychosocial adjustment or be a result of negative psychosocial adjustment. Further, as the effect of illness representations on adjustment may be mediated through coping strategies (Gray & Rutter, 2007; Hagger & Orbell, 2003), the effect of dissimilarity in illness representations on adjustment may be partially mediated by the coping strategies of the dyad (Berg & Upchurch, *in press*). Second, the relatively high level of optimal management of diabetes among this sample may have truncated the dissimilarity between mothers and adolescents as the diabetes center where families were seen provides a context for an excellent understanding of diabetes. Third, some of the subscales of the IPQ achieved somewhat lower reliabilities than desirable, particularly among adolescents (note Law, 2002) does not report reliabilities with his sample on the IPQ for comparisons). Such low reliabilities for subscales such as cyclical may be due to the nature of diabetes during adolescence (e.g., where symptoms do fluctuate). Future longitudinal research should be conducted to address causality, whether dissimilarity is more apparent and more strongly associated with emotional adjustment in a broader sample, and the nature of illness representations in diabetes.

Research on coping with chronic illness has recently viewed coping as a dyadic process occurring between the patient and his/her caregiver. Current research, however, has been somewhat inconsistent as to whether dissimilarities in illness representations are important for psychosocial adjustment (Figueiras & Weinman, 2003; Heijmans et al., 1999; Law, 2002). The present study points to the importance of controlling for an individual's own representations when understanding whether dissimilarities in patient and carer representations predict adjustment. In addition, the results suggest that different metrics of dissimilarity may be important for patient and carer, especially when they are at varying places in the developmental life course. Although research in this area is still relatively new, such research acknowledges that chronic illness affects not only the patient but other close relationships (Berg et al., *in press*; Berg & Upchurch, *in press*; Revenson, Kayser, & Bodenmann, 2005).

### **Acknowledgements**

This study was supported by grant 51000821 from the Primary Children's Medical Center Research Foundation awarded to Deborah J. Wiebe and Cynthia A. Berg. Cynthia Berg and Deborah Wiebe were supported by grant R01 DK063044-01A1 from the National Institute of Diabetes and Digestive Kidney Diseases while writing the article. We would like to thank the children and mothers who so graciously agreed to participate in the study and the physicians and staff at the Utah Diabetes Clinic. We would also like to thank Renn Upchurch, Carolyn Korbel, and Deborah Palmer for their assistance in managing the data.

## Notes

- [1] Some of the items on the treatment control scale may not have been well adapted to a chronic illness like diabetes (e.g., My child's treatment will be effective in curing his/her diabetes), contributing to the low reliabilities obtained. However, item to total correlations were conducted and determined that low reliability was not due to a specific item or items.
- [2] Despite the high intercorrelations between individual scores and mean difference scores, tolerance statistics indicated it was acceptable to include both individual and mean difference scores in a single analysis.
- [3] Multiple regressions were also conducted with only the individual's representations and the sum of squared differences measure predicting negative emotional adjustment to examine the contribution of sum of squared differences without controlling for mean differences. These analyses largely revealed the same results with significant effects for adolescents for child control and coherence (mother's control became marginal,  $p=0.128$ ). For mothers, one subscale achieved significance, that of coherence.
- [4] Because the two measures of dissimilarity differed in their range (with mean differences having a much smaller range than the measure of sum of squared differences), analyses were conducted to ascertain whether the restriction of range of the mean difference measure contributed to its lack of significant effects. All independent variables in the analyses (an individual's own representation, mean differences, and sum of squared differences) were standardized as  $z$ -scores and regressions were conducted. The results of these regressions were the same as those reported in the article. Thus, differences in the scale of the dissimilarity indices did not contribute to the results.

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