

Illness Centrality and Well-Being Among Male and Female Early Adolescents with Diabetes

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Objective We examined the implications of illness centrality for psychological and physical health among male and female early adolescents with type 1 diabetes. **Methods** We interviewed 132 adolescents before or after a routine clinic appointment. We measured the extent to which they defined themselves in terms of their illness, their views of the illness, psychological well-being, self-care behavior, and metabolic control. **Results** Females scored higher on illness centrality than males. Illness centrality was related to poor psychological well-being when the illness was perceived in negative terms, but only for females. For males, illness centrality was unrelated to psychological well-being. Illness centrality was related to poor metabolic control. **Conclusions** The extent to which adolescent females define themselves in terms of their illness is most problematic when the illness is perceived in highly negative terms. Future research should examine how illness centrality and views of illness change over the course of adolescence.

Key words adolescents with diabetes; gender; health; self-concept.

The advances in cognitive development that occur during adolescence provide for the possibility of a greater differentiation of the self (Harter, 1990a, 1999; Harter, Bresnick, Bouchev, & Whitesell, 1997). One's conception of the self expands during adolescence to represent the increasing number of roles and diverse experiences (Harter et al., 1997). Contemporary research on the self has emphasized that there are multiple facets to the self during adolescence (Harter, 1986, 1990b; Marsh, 1987). According to Jones et al. (1984), an "individual actively constructs a self-concept from the information contained in his or her unfolding experiences" (p. 115). In this report, we focus on how adolescents integrate a particular experience into their self-concept—the presence of a chronic illness.

In the adult literature, there is discussion as to how the diagnosis of a chronic illness affects one's sense of self. According to Charmaz (1991), one's sense of self is transformed from a healthy self to a sick self. To the extent that a chronic illness is viewed as a stigmatizing condition, there may be difficulties integrating this

experience into one's sense of self (Jones et al., 1984). However, there is variability in the extent to which people incorporate an illness into their self-concepts. Charmaz (1991) made the distinction between people who incorporate the illness into their self-concepts, making it a defining part of who they are, and people who "contain" the illness by trying not to let it intrude or interfere with their lives. Research on stigma has noted that some individuals build their self-concepts around the stigmatizing condition but others disregard it (Jones et al., 1984). That is, individuals vary in the extent to which they define themselves in terms of their illness, or what we refer to as "illness centrality."

What are the implications of illness centrality for psychological and physical health among adolescents? To the extent that an illness is viewed as a stigmatizing condition (and it may not be—we will return to this point later), the stigma literature predicts that illness centrality will be related to more psychosocial difficulties (Jones et al., 1984). To the extent that an illness is regarded as an area of weakness or viewed as underperformance in the health

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domain, other work suggests that illness centrality will be related to low self-esteem. More specifically, drawing on the work of William James (1890, 1892), Harter and colleagues (see Harter, 1999, for a review) have suggested that adolescent self-esteem is a function of one's performance in a domain as well as the importance that one attaches to that domain. Performing well in domains that are regarded as important is associated with high self-esteem, whereas performing poorly in domains that are regarded as important is associated with low self-esteem (Harter, Whitesell, & Junkin, 1998). Overall, the relation of performance to self-esteem is much stronger for domains that are self-defining than domains that are not (Harter, 2003). These ideas also are reflected in self-evaluation maintenance (SEM) theory (Tesser, 1988), which focuses on self-evaluations as a product of comparisons with others. SEM theory states that self-esteem will be threatened when one performs worse than another in a domain that one regards as self-relevant. Both theories suggest that how one perceives an illness will be more strongly related to self-esteem for those who attach greater importance to the illness or view the illness as more central to their self-concepts.

The literature also suggests that people can preserve their self-esteem when performance is poor by discounting the importance of a domain (Harter, 2003; Tesser, 1988). Performing poorly in a domain that is defined as less central to the self will not have negative implications for self-esteem (Harter & Whitesell, 2001; Harter et al., 1998). Thus, one way to preserve self-esteem in the face of chronic illness may be to make it less central to the self-concept.

Although the predictions for the relation of illness centrality to psychological health may be clear, the predictions for physical health outcomes are less clear. These theorists were not specifically discussing aspects of the self that would have implications for physical health, like managing a chronic illness such as diabetes. Discounting diabetes as less central to the self might be related to good mental health but also could be related to poor self-care behavior which could then affect overall physical health. We now know that self-care behaviors during childhood and adolescence can have long-term consequences for physical health (Diabetes Control and Complications Trial Research Group, 1993). In fact, some have argued that viewing an illness as central to one's self-concept might have beneficial effects on physical health if it leads individuals to take better care of themselves. For that reason, Wiebe, Berg, Palmer, Korbel, and Beveridge (2002) argued that illness centrality would be adaptive when the demands of an illness were

high, as they are in the case of diabetes, because illness centrality would lead to better self-care behavior.

Thus far, we have been assuming that people perceive a chronic illness in negative terms, as a stigmatizing condition or as a domain of underperformance. However, it is likely that people vary in their attitudes toward having a chronic illness. In his seminal work on stigma, Goffman (1963) noted that there is variability in the extent to which an individual attaches shame to the condition. Wiebe et al. (2002) suggested that the impact of illness centrality on health outcomes would depend on the individual's attitude toward the illness, that is, whether the individual perceived the illness in positive or negative terms. They predicted that perceiving an illness that one views negatively as central to the self would be associated with poor health outcomes, whereas perceiving an illness that one views positively (or less negatively) as central to the self would have fewer negative consequences for health. They tested this hypothesis in a study of 128 children, 10–16 years of age, with diabetes. Illness centrality was related to more depressive symptoms only when the illness was perceived in highly negative terms. Illness centrality also was related to poor metabolic control only when the illness was perceived negatively. Thus, the goal of the present research was to examine the effect of illness centrality on psychological and physical health among adolescents with diabetes and to determine the extent to which one's attitude toward the illness (i.e., illness valence) affects these relations.

One issue that Wiebe et al. (2002) neglected in their research on illness centrality and health is the participant's sex. There are reasons to believe that females may be more likely than males to integrate an illness into their identities. Women are more interested in health matters than men. Women report that they think about health and read about health in newspapers and magazines more than men do (Green & Pope, 1999). Females visit the doctor more frequently than males (Kandrack, Grant, & Segall, 1991), are more likely to take vitamins than males (Slesinski, Subar, & Kahle, 1996), engage in better health behavior than males (Shi, 1998), and attach greater value to good health behavior than males (Weissfeld, Kirscht, & Brock, 1990). In one study, females attached more importance to healthy eating than males, and this finding generalized across 23 cultures (Wardle et al., 2004). All of this evidence suggests that girls growing up in an environment where women are more concerned with health than men may learn to do the same.

Females also respond to illness quite differently than males. Females are said to be more likely than

males to adopt the "sick role," meaning that they are more likely than males to respond to illness by taking medication, restricting activities, or seeking the help of health care professionals (Green & Pope, 1999; Kandrack et al., 1991; Waldron, 1997). By contrast, males reject the sick role, for example, by acting as if they are healthy when ill. One of the clearest arenas in which this can be observed is the area of sports, where males are socialized to deny pain, hide pain, and suppress pain (White, Young, & McTeer, 1995). Admitting pain is a sign of weakness. Men have been found to be less willing than women to report pain and to associate pain with embarrassment, and these sex differences have been linked to gender-role expectations (Klonoff, Landrine, & Brown, 1993; Wise, Price, Myers, Heft, & Robinson, 2002). Even as children, boys are more likely than girls to keep their feelings about an illness to themselves. Two classic studies conducted several decades ago showed a sex difference in stoicism among children that increased with age (Campbell, 1978; Mechanic, 1966). In a study of children with chronic disease, parents reported that girls had more problems with dependence than boys, although mothers perceived the illness as equally restrictive for boys and girls (Eiser, Havermans, Pancer, & Eiser, 1992). Another study showed that girls report more sympathy from parents and greater encouragement of illness behaviors such as taking medication and missing school than boys when ill (Walker & Zeman, 1992). Sweeting (1995) has argued that illness behaviors among children become more differentiated by sex during adolescence.

The links of being female to a greater concern for health and a greater willingness to assume the sick role when ill suggest that girls attach more importance to the status of their health and may be more likely than boys to integrate an illness into their self-concepts. The only evidence to date that this is the case is that girls with a chronic illness are more likely to share their illness with others (Miller, Willis, & Wynn, 1993; Prout, 1989). Boys may be more likely than girls to compartmentalize an illness and keep it from others. Not only may girls be more likely than boys to integrate an illness into their self-concepts, it also is possible that such integration (i.e., illness centrality) has stronger implications for behavior and well-being among girls than boys.

Thus, the goal of this study is to examine the impact of illness centrality on psychological and physical health among male and female early adolescents with diabetes. We focused on early adolescents for three reasons. First, early adolescence is a difficult time for those with diabetes. Difficulties with self-care behavior increase during

early adolescence (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997; Glasgow et al., 1999; Weissberg-Benchell et al., 1995), and metabolic control declines (Anderson et al., 1997; Pound, Sturrock, & Jeffcoate, 1996). Thus, early adolescence is an important time to study the relation of psychosocial factors to psychological and physical health. Second, the presence of a chronic illness during early adolescence might pose particular challenges for one's sense of self. It is during early adolescence that the self becomes more differentiated (Harter, 2003). In addition, the goals of adolescence are to establish a sense of identity and independence from parents (Baumrind, 1987; Collins, Gleason, & Sesma, 1997). Taking care of a chronic illness poses demands that may interfere with these goals. Thus, early adolescence is an important time to study the implications of an illness for one's self-concept. Third, early adolescence is a time of gender intensification (Galambos, Almeida, & Petersen, 1990; Hill & Lynch, 1983; McNeill & Petersen, 1985)—that is, one's identity as a male or a female becomes quite salient. Thus, to the extent that illness is more consistent with the female than the male role, females should perceive the illness as more central to the self than males, and illness centrality is likely to have greater implications for female than male health.

First, we hypothesized that girls would be more likely than boys to define themselves in terms of their illness; that is, score higher on a measure of illness centrality. Second, in accordance with Wiebe et al. (2002), we hypothesized that the relation of illness centrality to health outcomes would depend on whether the illness was viewed in positive or negative terms, or what we refer to as "illness valence." Specifically, we hypothesized that illness centrality would be related to increased psychological distress, poor self-care behavior, and worse metabolic control when one viewed the illness negatively. However, when one perceived the illness in positive terms (or less negatively), we predicted that illness centrality would be either unrelated to these outcomes or related to less psychological distress, better self-care behavior, and better metabolic control. Third, we hypothesized that the relation of illness centrality to these outcomes would be stronger for females than males. That is, we examined whether gender moderated the relations of illness centrality and illness valence to health.

Method

Participants

Participants were 132 adolescents with diabetes (70 girls, 62 boys). Ages ranged from 10.73 to 14.21 years,

with a mean of 12.10. The majority of the children (80%) were aged 11 and 12. Males and females were of a similar age. Length of illness ranged from 1 to 13 years ($M = 4.91$, $SD = 2.96$). The majority of participants were white (93%), 2% were African American, 1% were Asian, 1% were American Indian, and 3% were mixed races. These figures are consistent with the diabetes population seen at Children's Hospital, which draws from a largely suburban and partly rural area. The four-factor Hollingshead index (1975) (mother and father education and occupation) of social status revealed an average family score of 41.97 ($SD = 11.05$), which reflects the lower end of technical workers, medium business, and minor professionals.

Procedure

The study was approved by the appropriate Institutional Review Boards. Letters ($N = 307$) of invitation were sent to all adolescents with diabetes who were between the ages of 10–14 (approaching 11 or having just turned 14 to keep the age range as homogenous as possible) attending Children's Hospital. Families could return a postcard indicating that they did not want to be contacted by telephone about the study. Twenty families returned these postcards, refusing contact about the study without us being able to determine eligibility. We were able to reach 261 of the remaining 287 families by telephone and determined that 90 were not eligible—meaning that they no longer went to Children's Hospital; they had had diabetes for less than 1 year; they were not in 5th, 6th, or 7th grade; or they had another major chronic illness (i.e., cancer and rheumatoid arthritis). Of the 171 eligible families, 39 refused and 132 agreed. Thus, our effective response rate was 77%.

For families who agreed, we set up an appointment immediately before or after the next clinic visit. Interviews were conducted at the hospital in a research room that was on a separate floor from the clinic and not associated with the clinic. Parent consent and child assent were obtained at that time. Interviews with children were conducted aloud. (The CDI was completed by the child in private because of the sensitive nature of these items.) Research assistants unrelated to Children's Hospital administered measures of illness centrality, illness valence, psychological distress, self-perceived competence, and self-care behavior. Children were provided with response cards (i.e., 1 = *not at all*; 2 = *a little*; 3 = *a lot*) for standardized instruments. Children were paid for their participation in the study.

Instruments

Illness Centrality

Illness centrality was measured with four items, three of which were used by Wiebe et al. (2002) ["I think of diabetes when I think of who I am," "I think a lot about my diabetes," and "I think of my diabetes only when I need to take care of it" (reverse scored)], and one of which we added ["Diabetes is a small part of my life" (reverse scored)]. The internal consistency was .51 for our 4-item measure in this study. [Inspection of the intercorrelations among the four items revealed that the first two were most strongly related ($r = .47$, $p < .001$). Thus, we reran the analyses with this 2-item index and found largely the same results. Therefore, we retained the 4-item index. We acknowledge the low reliability of the 4-item index, but also point out that the best way to increase the reliability of an index is to add items (Nunnally, 1978). According to Nunnally (1978), adding eight items to this index would increase the reliability to .76.] On average, adolescents varied in their perceptions of illness centrality, with the mean reflecting the midpoint of the scale ($M = 3.08$; $SD = .81$).

Illness Valence

To determine how positively or negatively adolescents viewed the illness, we asked adolescents to identify up to five words that described themselves as a person with diabetes. To familiarize adolescents with the nature of the task, we adapted the procedure that Wiebe et al. (2002) used and asked them to consider two more concrete tasks—asking them first to think about themselves as a friend and second to think about themselves as a girl or boy. Descriptors were elicited for each of these two questions. We believed that providing participants with the opportunity to form responses to these two more concrete domains (friend and boy/girl) would make responding to the more abstract diabetes domain easier. Then they were told, "Now, I want you to think of yourself as someone with diabetes. Fill in the blank: [name] is a ____ person with diabetes. How would you describe yourself as someone with diabetes?" Two raters coded each of the responses into three categories: positive, neutral, or negative. Disagreements were resolved by a third independent rater. Inter-rater reliability was high ($\kappa = .80$).

Six participants were unable to identify any characteristics of being a person with diabetes. Thus, these individuals were not included in the data analysis. Remaining adolescents identified between 1 and 5 features of being a person with diabetes, with an average of 2. The average person identified 1 positive feature,

5 neutral features, and 5 negative features. There was no sex difference in the overall number of features named, the number of features coded into each of the three categories, or the percentage of features coded into the three categories.

Because we were focused on those who perceived their illness negatively, we used the percentage of attributes named that were coded as negative (which ranged from 0 to 100%) as our measure of valence. Examples of items coded negatively are "abnormal," "weird," "scary," and "restricted." Higher numbers reflect a more negative view of the illness, and lower numbers reflect a less negative view of the illness.

Psychological Distress

We examined three indicators of psychological distress: depressive symptoms, anxiety, and anger. We used the abbreviated form of the Children's Depression Inventory (CDI) to assess depressive symptoms (Kovacs, 1985, 2001). The CDI is a self-report measure that was designed for children and adolescents. The abbreviated form consists of 10 items that are comprehensible at a first-grade reading level. Reliability of the CDI has been established through administration to psychiatric and medical outpatient populations. Internal consistency and test-retest reliability are high. In the present study, the α was .76.

We measured anxiety with the seven items from the Revised Children's Manifest Anxiety Scale. These were the seven items that were unique to anxiety when the instrument was factor analyzed with the CDI (Stark & Laurent, 2001). To increase variability in our scale (because we had reduced the number of items), we changed the true/false format to 3-point scale (*not at all true, sort of true, or very true of me*). The internal consistency in the present study was .68.

We used the 3-item anger subscale of the Differential Emotions Scale (Izard, Libero, Putman, & Haynes, 1993). This is a self-report scale of different emotions that has been used with children. Test-retest reliability is high, and validity with comparable scales has been reported. The anger scale has been associated with aggression. We mixed these items with the seven anxiety items. For consistency, we changed the response format to a 3-point scale. The internal consistency was .76. Because depressive symptoms, anxiety, and anger were only modestly related (r 's ranged from .22 to .43), we examined them separately.

Self-Perceived Competence

We administered three subscales from the Self-Perception Profile for Children (Harter, 1985) to assess children's

judgments of their perceived competence. We selected two domains that we thought would be most relevant to adolescents—physical appearance and social competence—and also administered the global self-worth scale. The authors have shown that children are able to discriminate among domains of perceived competence, which has been confirmed by factor analytic studies. The internal consistencies for the three subscales were high in the present study (physical appearance .81; social competence .73; global self-worth .75). The three scales were moderately related (r 's ranged from .31 to .53, p 's < .001).

Diabetes Outcomes

We measured self-care behavior with the 14-item Self-Care Inventory (La Greca, Swales, Klemp, & Madigan, 1988). This instrument asks respondents to indicate how well they followed their physician's recommendations for glucose testing, insulin administration, diet, exercise, and other diabetes-related behaviors. This scale reflects domains of self-care that have been regarded as important by the American Diabetes Association, and it has been associated with metabolic control among adolescents in several studies (Delameter, Applegate, Edison, & Nemery, 1998; La Greca et al., 1988; La Greca, Follansbee, & Skyler, 1990). Validity of this self-report measure was established by comparisons with the 24-h recall gold standard measure of self-care behavior (Greco et al., 1990). Each item is rated on a 1 (*never do it*) to 5 (*always do this as recommended*) scale. We updated this scale by adding eight more contemporary items: three negative behaviors from Weissberg-Benchell et al. (1995: made up blood tests results because numbers were too high, made up blood test results because did not really test, and took extra insulin because ate inappropriate food); three negative behaviors of our own (skipping meals, skipping injections, and eating foods that should be avoided); and two positive behaviors (rotating injection sites and measuring food). We reverse scored the negative items, summed across all the items, and took the average. The internal consistency was high ($\alpha = .78$). Our revised measure was correlated .94 with La Greca's original 14-item scale.

Metabolic control was measured with hemoglobin A_{1c} (HbA_{1c}) obtained at the clinic appointment. HbA_{1c} values indicate the average blood glucose level over the course of the past 3 months. For the laboratory that conducted the tests, the range of blood glucose values for healthy individuals without diabetes is 4.3–6.1. In the current sample, the average HbA_{1c} for our sample of adolescents with diabetes was 8.04 ($SD = 1.31$). A normal HbA_{1c} in a population without diabetes is <6%.

Current recommendations for 13- to 19-year-old adolescents are that their HbA_{1c} be <8% (American Diabetes Association, 2006)

Results

Sex Differences in Illness Centrality

As predicted, females viewed diabetes as more central to their self-concepts ($M = 3.25$; $SD = .79$) than males ($M = 2.88$; $SD = .79$), $t(130) = 2.75$, $p < .01$ (partial $\eta^2 = .06$)

Correlates of Illness Centrality

Illness centrality was unrelated to illness valence. Social status and race were not related to illness centrality. Although pubertal status was related to sex, that is, girls higher than boys, $t(130) = 7.53$, $p < .001$, it was not related to illness centrality or illness valence. Age was negatively associated with illness centrality, such that older children viewed the illness as less central to their self-concepts ($r = -.19$, $p < .05$). Children who had had diabetes for a longer period also viewed the illness as less central to their self-concepts ($r = -.23$, $p < .01$). Age and length of diabetes were independent correlates. When the length of diabetes was statistically controlled, age continued to predict illness centrality (When all of the demographic variables and valence were entered into a multiple regression analysis to predict centrality, age and length of illness emerged as significant predictors; sex became marginally significant; and pubertal status, social status, race, and valence were not significant.)

Illness Centrality and Illness Valence as Predictors of Outcomes

To test whether the relation of illness centrality to outcomes was influenced by illness valence, we conducted hierarchical regression analyses. We entered sex, age, and length of diabetes on the first step of the equation as statistical controls, because they were related to illness centrality. We did not control for race, pubertal status, or social status, as these variables were not related to illness centrality or valence. Thus, although they may independently predict outcomes, they cannot account for any relations we obtain with illness centrality or valence. (Controlling for pubertal status and social status did not alter any of the findings that we report in this article.) The main effects of illness centrality and valence were entered on the second step of the equation, the two-way interactions between sex, illness valence, and centrality were entered on the third step (sex \times valence; sex \times centrality; centrality \times valence), and the three-way interaction of sex, valence, and centrality was entered on

the final step of the equation. Variables were centered before computing interaction terms. Significant interactions were interpreted using the procedures outlined by Aiken and West (1991) to plot slopes (i.e., outcomes of adolescents who scored ± 1 SD from the mean on centrality for those who regarded the illness as high or low in negativity).

Psychological Distress

For depressive symptoms, there was a main effect of sex ($\beta = .20$, $p < .05$), such that females had more depressive symptoms than males. There also was a sex \times valence interaction ($\beta = .18$, $p < .05$) that was qualified by a sex \times valence \times centrality interaction ($\beta = .31$, $p < .005$). To examine the nature of this interaction, we conducted separate regression analyses for males and females and found that the predicted valence \times centrality interaction emerged for females ($\beta = .32$, $p < .01$) but not for males. These findings are depicted in Fig. 1, using the procedures outlined by Aiken and West (1991) for plotting slopes. For females, illness centrality was related to more depressive symptoms when the illness was perceived the most negatively but was unrelated to depressive symptoms when the illness was viewed as low in negativity. For males, illness centrality was unrelated to depressive symptoms regardless of illness valence.

For anxiety, there was a main effect of centrality ($\beta = .27$, $p = .005$), such that centrality was associated

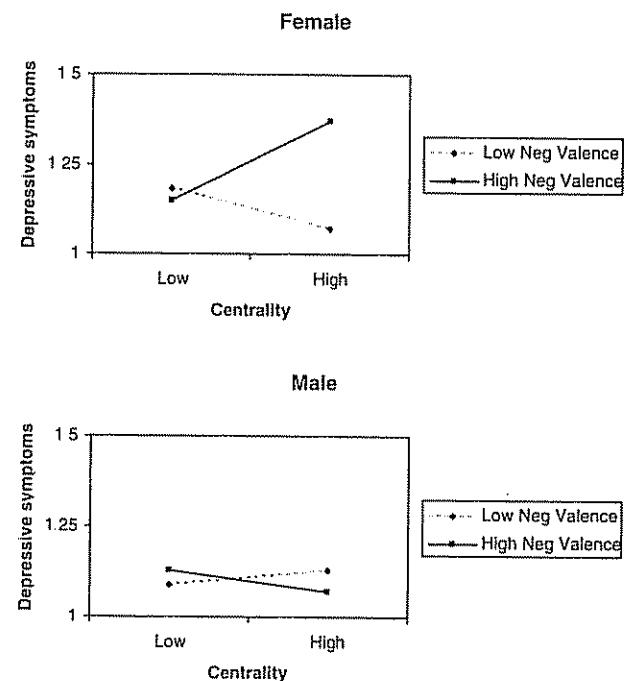


Figure 1. The relation of illness centrality and illness valence to depressive symptoms for females and males.

with more anxiety that was qualified by the anticipated sex \times valence \times centrality interaction ($\beta = .27, p < .01$). Again, the valence \times centrality interaction was significant for females ($\beta = .32, p < .01$) but not for males. The findings were similar to those shown in Fig. 1. For females, illness centrality was related to more anxiety when the illness was viewed as high in negativity but was unrelated to anxiety when the illness was not viewed negatively. For males, illness centrality was related to more anxiety, regardless of valence.

For anger, there was a sex \times valence interaction ($\beta = .18, p < .05$) that was qualified by a three-way interaction involving centrality ($\beta = .23, p < .05$). The valence \times centrality interaction was significant for females ($\beta = .32, p < .01$) but not for males. Similar to the findings shown in Fig. 1, for females, illness centrality was related to more anger when the illness was perceived as high in negativity but less anger when the illness was perceived as low in negativity. For males, illness centrality was unrelated to anger.

Self-Perceived Competence

We examined three domains of perceived competence: appearance, social, and global self-worth. For global self-worth, there was a main effect of sex ($\beta = -.20, p < .05$), such that males had higher self-worth than females. There also was a main effect of valence ($\beta = -.21, p < .05$) that was qualified by a significant sex \times valence interaction ($\beta = -.29, p = .001$). As shown in Fig. 2, perceiving the illness in highly negative terms was related to lower self-worth for females only. There were no centrality effects.

For appearance esteem, there was a main effect of sex ($\beta = -.35, p < .001$) and a main effect of valence ($\beta = -.23, p < .005$). Being male and perceiving the illness less negatively were associated with greater appearance esteem. There also was a significant sex \times valence interaction ($\beta = -.34, p < .001$) that was qualified by a three-way interaction with centrality ($\beta = -.20, p < .05$). Separate

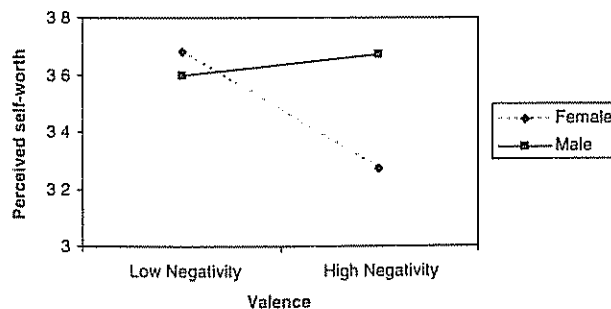


Figure 2. The relation of illness valence to perceived self-worth for females and males.

regression analyses for males and females revealed that the predicted valence \times centrality interaction appeared for females ($\beta = -.23, p < .05$) but not for males, as shown in Fig. 3. For females, illness centrality was related to lower appearance esteem when the illness was viewed as highly negative but was unrelated to appearance esteem when the illness was viewed as low in negativity. For males, neither centrality nor valence was related to appearance esteem. There were no effects of centrality or valence on perceived social competence.

Self-Care Behavior

There was a marginally significant centrality \times valence interaction ($\beta = -.17, p = .07$). As shown in Fig. 4, centrality was associated with good self-care behavior only when the illness was perceived as low in negativity.

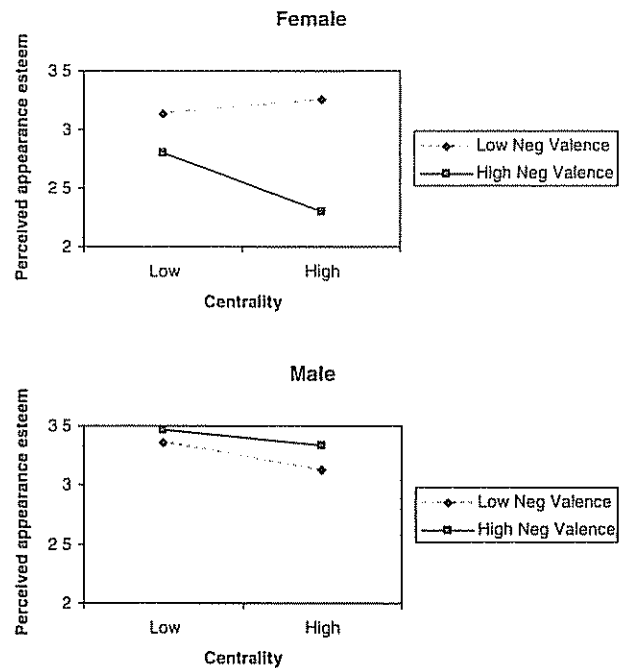


Figure 3. The relation of illness centrality and illness valence to perceived appearance esteem for females and males.

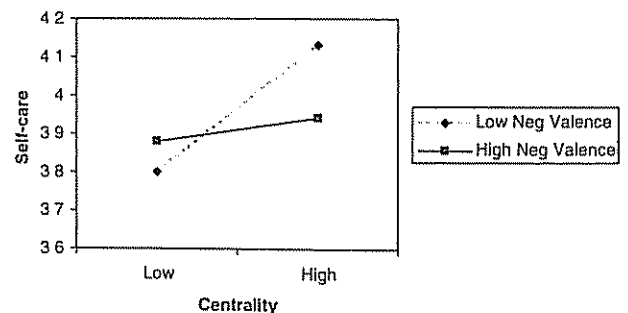


Figure 4. The relation of illness centrality and illness valence to self-care behavior.

There were no other main effects or interactions involving sex, illness centrality, or illness valence on self-care behavior.

Metabolic Control

Illness centrality was related to worse metabolic control ($\beta = .25, p < .05$). There were no other main effects or interactions involving sex, illness centrality, or illness valence. We also note that, although the relation of self-care to good metabolic control was in the predicted direction, it was not significant ($r = -.13, p = .13$).

Discussion

Sex and Centrality

We predicted that females with diabetes would view their illness as more central to their self-concepts than males. Our results confirmed this prediction. Perhaps, because females are more attentive to matters of health in our society and are more likely to assume the "sick role" when ill compared with males; females also are more likely than males to incorporate a chronic illness into their self-definitions.

Illness Centrality and Psychological Health

We predicted that the extent to which adolescents defined themselves in terms of their diabetes would only be harmful to their psychological health if they viewed the illness in highly negative terms. This hypothesis was supported, replicating the findings of Wiebe et al. (2002)—but only for females. Wiebe et al. (2002) did not examine whether sex moderated their findings. In our study, sex was a significant moderator. Illness centrality was related to all three indicators of greater psychological distress (depressive symptoms, anxiety, and anger), when females regarded the illness negatively. Illness centrality was generally unrelated to psychological health when females did not view the illness negatively. Thus, the extent to which one integrates an illness into one's self-concept alone does not necessarily predict how one will respond psychologically. It is the combination of viewing the illness as integral to the self and viewing the illness in aversive terms that is distressing—at least for females. Perceiving something benign as integral to the self has few implications for psychological well-being. These findings are consistent with Harter's (1999) and Tesser's (1988) basic theoretical work on the self-concept.

Interestingly, the one domain in which findings for centrality did not appear was global self-worth. This is surprising because Harter's (1999) work on the self-concept, as well as SEM theory (Tesser, 1988), focuses specifically on self-esteem, predicting that one's performance

in a domain has stronger implications for self-esteem when the domain is regarded as more central to the self-concept. Instead, only valence or one's attitude toward the illness affected overall feelings of self-worth—and, again, only for females. However, Harter's and Tesser's theories were supported when a specific aspect of self-esteem was investigated—appearance esteem. Once again, for females, illness centrality was related to lower appearance esteem when the illness was viewed more negatively but unrelated to appearance esteem when the illness was viewed less negatively. Centrality and valence did not influence men's appearance esteem. Physical appearance is a domain of self-worth that is especially relevant to adolescent females (Polce-Lynch, Myers, Kilmartin, Forssmann-Falck, & Kliever, 1998).

The psychological aspects of the illness that we studied—illness centrality and illness valence—seemed far less important for psychological health among males. Perhaps, because males have compartmentalized the illness, their view of the illness has fewer implications for their overall psychological well-being.

Our finding that sex influenced the relations of centrality and valence to psychological health can be linked to the developmental literature on the self. Harter et al. (1997) have found sex differences in the emergence of contradictory aspects of the self during adolescence. During middle adolescence, youth come to recognize contradictions within different aspects of the self. Prior to this time, children are either unaware of the contradictions or not bothered by them. The literature on this topic has shown that girls recognize the contradictions earlier than boys over the course of adolescence and that these contradictions are more troublesome for girls than boys (see Harter et al., 1997, for a review). To the extent that having diabetes is perceived as a contradiction with healthy aspects of the self, it makes sense that girls would be more adversely affected by an illness that they regard negatively. Perceiving diabetes in negative terms was more strongly related to low self-esteem for girls than boys in this study. Future research should examine the extent to which these sex differences are due to gender-role characteristics, as the prior work also found that adolescents who held the female gender role were most disturbed by contradictory aspects of the self (Harter et al., 1997).

Illness Centrality and Diabetes Outcomes

In terms of diabetes outcomes, there was some evidence that centrality was associated with good self-care behavior, consistent with the predictions of Wiebe et al. (2002)

but only when the illness was perceived as low in negativity. It makes sense that those who perceive the illness as more central to their identities would integrate the illness into their everyday lives and enact better self-care behaviors. The finding here suggests that this may only be the case if the illness is not viewed in highly negative terms. We interpret this finding with caution, however, as it was only marginally significant.

In terms of metabolic control, illness centrality was related to poor physical health. This finding might seem counterintuitive, given that illness centrality was associated with better self-care behavior for a subset of participants (i.e., those who viewed the illness less negatively). However, self-care behavior and metabolic control were unrelated in this study. [Interestingly, when one controls for illness centrality, self-care behavior reveals a modest relation ($\beta = -.17, p = .07$) to better metabolic control.] Although previous studies that have employed our measure of self-care behavior have obtained relations to metabolic control, the evidence for relations of self-report measures of self-care behavior to metabolic control has been underwhelming. There are several reasons for the lack of a relation between the two (see Delameter, 2000, for a review). First, studies are less likely to obtain a relation of self-care to metabolic control when global indices rather than specific aspects of self-care are measured (e.g., blood glucose monitoring; Johnson, Freund, Silverstein, Hansen, & Malone, 1990; Lloyd, Wing, Orchard, & Becker, 1993; Van Tilburg et al., 2001). Second, our measure of self-care behavior was based on self-report, which may be vulnerable to demand characteristics. We guarded against this by emphasizing the confidentiality of the interview, and that the data that adolescents provided would not be reported to their physician. Third, physiological factors related to puberty affect metabolic control (Amiel, Sherwin, Simonson, Lauritano, & Tamborlane, 1986; La Greca & Skyler, 1991), which may weaken any relations of behavior to metabolic control. The relation of illness centrality to poor metabolic control in this study may be better understood in terms of centrality resulting from poor control than causing poor control. Adolescents who are not in good control may perceive their life as more disrupted by diabetes and the illness as all encompassing. That is, the poor control could directly result in greater perceptions of illness centrality. Future research should examine the sources of illness centrality.

Implications for Health Care Professionals

These results have implications for health care professionals as well as family members who interact with

children with diabetes. People should be less concerned with whether or not a child is defining himself or herself as a person with diabetes. Consistent with the psychological literature on the self-concept, there may be advantages and disadvantages to integrating an illness into one's self-concept. Instead, people should be concerned that they do not engender a negative view of diabetes—especially in the case of females who are more prone to psychological distress during adolescence than males, regardless of the presence of a chronic illness (Twenge & Nolen-Hoeksema, 2002). Rather than dwell on the negative aspects of the illness, health care professionals could emphasize the fact that diabetes is an illness for which one has some degree of control over its effects on the body. Again, this may be particularly important in the case of females who tend to perceive that they have less control over their lives than males in general (Nolen-Hoeksema, Larson, & Grayson, 1999).

Although one would not want to minimize an illness such as diabetes, there may be opportunities to identify positive consequences of having diabetes. A burgeoning field of research in the area of health psychology is "post-traumatic growth" or "benefit-finding," which has to do with the ability to derive benefits from trauma (Helgeson, Reynolds, & Tomich, in press; Park, Cohen, & Murch, 1996; Tedeschi & Calhoun, 1995). Clinicians and researchers alike could explore whether this field of research has promise for children with diabetes. We have anecdotal evidence from some of the physicians in this study that they point out the potential for benefits of diabetes, such as becoming more responsible and more organized. There is also evidence from a recent meta-analytic review of the literature that females are more likely than males to respond to a traumatic event, such as a chronic illness, by construing benefits (Helgeson et al., in press); however, this literature focused on adults. It remains to be seen whether female adolescents are receptive to construing benefits from their illness.

Limitations and Future Directions

A major limitation of this study is its cross-sectional design. Because centrality and health outcomes were measured at the same time, one cannot be sure whether centrality is leading to health or health is leading to centrality. Reciprocal relations are likely.

Another limitation had to do with the low reliability of our measure of illness centrality. Low internal consistency, however, typically detracts from one's ability to detect significant associations. In our case, we had numerous interactions involving centrality, despite its

low internal consistency, that were consistent with predictions. Thus, we can be more confident of the findings that did than those that did not emerge for illness centrality. A thornier issue is whether conceptually our measure of illness centrality was capturing a single or multiple constructs. Two of our items seem to be more central to the construct of centrality—"thinking about diabetes when I think of who I am" and "diabetes is a small part of my life" (reverse scored). However, the other two items might also tap rumination—"thinking a lot about diabetes" and "only thinking of diabetes when taking care of it" (reverse scored). Given the well-documented sex difference in rumination (e.g., Nolen-Hoeksema, 1994), we wondered whether our sex difference in centrality was reducible to rumination. An examination of the four individual centrality items revealed that the largest sex difference and the only statistically significant difference ($p < .01$) occurred for an item that was less reflective of rumination—"diabetes is a small part of my life." The smallest sex difference, which was not significant ($p = .33$), appeared for the clearest rumination item—"thinking a lot about diabetes." Nonetheless, our illness centrality items may be tapping other dimensions relevant to psychosocial adjustment, such as preoccupation with the illness. Future research should examine the potential for multiple dimensions of illness centrality.

Future research also should examine the extent to which the sex differences in this study are due to gender role rather than biological sex. Our theoretical explanations for why women are more concerned with their health and why their self-concepts might be more affected by an illness are grounded in the gender-role socialization literature (see Ruble & Martin, 1998, for a review). That is, psychological femininity, or more specifically, communion, may be more strongly linked to illness centrality than sex. Similarly, the effects of illness centrality and valence may have a greater impact on high-communion individuals rather than females.

There were several other study limitations. First, we interviewed adolescents at Children's Hospital which might have heightened their awareness of having diabetes, increasing the measure of illness centrality. When one's attention is drawn to a specific aspect of the self, that aspect of the self can be overemphasized, a phenomenon known as a "focusing illusion" (Schkade & Kahneman, 1998). However, the interviews did not take place in the clinic and were conducted by university research staff who were not associated with the clinic or the hospital. Nonetheless, by conducting the interviews in the hospital at a time coincident with their diabetes clinic visit, participants' illness was made more salient than it otherwise might have been.

Second, the racial composition of our sample was quite homogenous, making unclear the extent to which our findings generalize to ethnic groups other than Caucasians. Third, several of our measures did not have a lengthy history of psychometric validation. The centrality and valence measures were adapted from a single previous study of adolescents with diabetes. We also used a modified measure of anxiety to distinguish it more clearly from depressive symptoms. In addition, our primary outcomes were based on self-report rather than on behavior.

Finally, we only examined adolescents at one point in their lives, during the early stage of adolescence. The measure that we used to evaluate illness valence may have been limited by the age of our participants. These early adolescents did not provide a lot of descriptors about themselves in relation to their diabetes. We know that differentiation of the self is only just beginning in early adolescence (Harter, 2003). With cognitive maturation, we may gain more variability in how negatively or positively adolescents perceive their illness. We also know that the emergence of awareness of contradictory characteristics within the self does not appear until middle adolescence, which suggests that diabetes might pose greater difficulties for self-esteem over the next couple of years. Future research should examine how centrality and illness valence change over the course of adolescence. Adolescence is a difficult period for those with diabetes as they are beginning to assume more responsibility for taking care of their illness (Anderson et al., 1997) at a time when their attention is increasingly focused on the development of peer relations (Collins, Gleason, & Sesma, 1997). Although one might predict that the emergence of additional roles would reduce the salience of diabetes, the extent to which diabetes interferes with those roles (e.g., disrupts peers relations, makes it more difficult to fit in with peers) may increase illness centrality, while also heightening the negative aspects of the disease. Future work with adolescents might examine the role that parental support can play in alleviating some of these demands, possibly affecting the valence that adolescents attach to the disease.

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