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The association of personal resilience with stress, coping, and diabetes outcomes in adolescents with type 1 diabetes: Variable- and person-focused approaches

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Abstract

This study explored the association between personal resilience and distress, coping, and diabetes outcomes in 50 adolescents with type 1 diabetes. Resilience was defined by a factor score derived from validated instruments measuring self-efficacy, optimism, and self-esteem. Variable- and person-focused methodologies were used to explore these associations. Low resilience was associated with higher distress, poor quality of life, and poor glycemic control. Participants with low resilience used more maladaptive coping strategies and were at greatest risk of poor outcomes. Findings suggest that resilience is a promising candidate for interventions designed to reduce distress and improve outcomes for adolescents with type 1 diabetes.

Keywords

adolescence; chronic illness; coping; diabetes; distress; outcomes; resilience

Introduction

Adolescence is an important period of transition in any young person, and those with chronic illness face additional challenges and stressors. While they face normal developmental milestones including social, biological, and cognitive changes associated with maturing into a young adult, those with chronic illness such as type 1 diabetes (T1D) must also adapt to burdensome and challenging treatment plans, including intensive insulin management, blood sugar checking, and adherence to nutrition and exercise guidelines, in order to optimally control their disease. Coupled with taking over their self-care routine from their caregivers, adolescents face temptations of other risky and experimental behaviors which may further detriment their health (Sawyer et al., 2007). Furthermore, adolescents are not adept at linking their behavioral risk factors to their own health (Dickerson et al., 2012).

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Unfortunately, as indicated by glycated hemoglobin (A1C) levels, only a small proportion of adolescents with T1D maintain optimal diabetes management and control (Petitti et al., 2009; Weissberg-Benchell et al., 1995) as recommended by the American Diabetes Association (2011) or the International Society of Pediatric and Adolescent Diabetes (International Diabetes Foundation and International Society of Pediatric and Adolescent Diabetes, 2011). As the Diabetes Control and Complications Trial (DCCT) has shown, every 1 percent increase in A1C can increase risk for complications by 40 percent.

Adolescents with T1D are also at risk for depression and elevated distress (Birmaher et al., 1996; Di Battista et al., 2009; Kanner et al., 2003). Compared to nondiabetic youth, the prevalence of major depression may be at least 2–3 times greater (Grey et al., 2002; Kovacs et al., 1997). Emotional distress is common as well (Herzer and Hood, 2010; Weissberg-Benchell and Antisdel-Lomaglio, 2011). Depression and distress have been independently associated with worse glycemic control, more complications, higher health-care costs, and increased frequency for adverse events (Herzer and Hood, 2010; Lawrence et al., 2006; Leichter and See, 2005; Yi et al., 2008b).

Resilience is a construct describing an individual's capacity to maintain psychological and/or physical well-being in the face of stress. Resilience has been shown to positively impact healthy choices and outcomes across multiple adolescent populations (Rew and Horner, 2003). Measurement of personal resilience embodies combined personal resources including self-esteem, optimism, and self-efficacy (Connor and Davidson, 2003; Yi et al., 2008a). As with these individual constructs, defining resilience as a trait-like quality does not limit the applicability of intervention; in fact, several successful interventions have been implemented to improve trait characteristics such as self-esteem and optimism (Haney and Durlak, 1998; Meevissen et al., 2011; Ventegodt et al., 2007). Early work in resilience interventions seems to suggest that promoting resilience helps improve coping and emotional well-being, which thereby may enable better self-care and health outcomes (Burton et al., 2010; Carver, 2005).

Although much has been written about personal resilience in children and adolescents facing acute stress (Garmezy et al., 1984; Masten et al., 1988; Werner, 1989; Williams et al., 2008), less is known about resilience in populations facing chronic stressors. The study of resilience in individuals with diabetes, a group under significant stress from the burden of their treatment plan (Di Battista et al., 2009), is particularly relevant, but limited, despite evidence that positive psychosocial resources influence glycemic control and quality of life (QOL; Rose et al., 2002; Sousa et al., 2005; Whittemore et al., 2005; Yi-Frazier et al., 2012). In adults with diabetes, higher personal resilience predicted lower A1C 1 year later, providing a buffer from worsening outcomes in the face of rising distress (Yi et al., 2008a). Specifically, those with low resilience showed deteriorating A1C levels and self-care behaviors in the face of stress, while those with high resilience did not. A follow-up study showed maladaptive coping to be an important mechanism of this association (Yi-Frazier et al., 2010). Given adults with diabetes often have had the disease for many years, allowing for the development of various coping strategies for living with the burden and stress of diabetes management, there may be even more promise for resilience buffering stress and improving overall outcomes for adolescents.

Very few studies have been conducted on personal resilience in the pediatric diabetes population. Thus, this pilot study was designed to explore the impact of personal resilience in adolescents with T1D specifically through analysis of three study hypotheses: higher personal resilience is associated with (1) lower diabetes-related distress; (2) improved diabetes outcomes, including self-care, QOL, and glycemic control; and (3) increased/more adaptive coping strategies.

Materials and methods

Participants

A total of 50 participants 13–18 years old with a T1D diagnosis for 1 year or longer agreed to participate in this study. Recruitment was purposive, such that eligible patients were contacted during consecutive clinic appointments at the Seattle Children's Hospital in Seattle, WA. Contact occurred by mail, phone, or in person prior to their regular clinic appointment. The institutional review board approved the protocol, and voluntary written informed consent was obtained from each participant and his or her caregiver. All participants completed a questionnaire packet, and adolescents also participated in an interview during a research visit and were compensated with a US$20 gift card for their time. The interview was conducted by a trained research associate. Medical record review was conducted for all clinical measures, including A1C and insulin regimen.

Measures

Resilience factor—Resilience was defined by a "resilience factor" score which was derived from personal, protective resources that are commonly used to define resilience (Cederblad et al., 1994; Cicchetti et al., 1993; Rutter, 1985; Yi-Frazier et al., 2010). These variables included optimism, self-esteem, and self-efficacy and were chosen as they have been used in previous research on resilience and coping in diabetes populations (Vedhara and Nott, 1996; Wagnild and Young, 1993; Yi et al., 2008a; Yi-Frazier et al., 2010).

Total scores for self-esteem, optimism, and self-efficacy were entered into a principal components analysis, and 71.6 percent of the variance was explained by a single component, which was designated as the "resilience factor." This procedure has been used previously and verified via structural equation modeling (Yi et al., 2008a; Yi-Frazier et al., 2010), and closely related psychosocial resources such as these have been analyzed and reported as a single factor in many other studies investigating resilience (Hull et al., 1991; Major et al., 1998; Vedhara and Nott, 1996). A higher resilience factor score indicated more personal resilience.

The specific surveys used for the factor score are listed below.

Optimism was measured by the Life Orientation Test (LOT), an 8-item self-report measure assessing generalized optimism versus pessimism, for example, "In uncertain times, I usually expect the best" (Scheier and Carver, 1987). Higher scores indicated higher optimism. Cronbach's alpha for the scale was 0.80.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1979), which assesses global self-esteem and feelings of personal self-worth, for example, “I have a good feeling about myself.” Higher scores indicated higher self-esteem. Cronbach’s alpha was 0.95.

The Self-efficacy for Diabetes (SED) scale was administered to assess *self-efficacy*, for example, “I believe I can keep track of my own blood sugar levels” (Grossman et al., 1987). The SED is a 26-item measure commonly used in the literature and shown to be predictive of glycemic control (Grossman et al., 1987). Higher scores indicated higher self-efficacy. Cronbach’s alpha was 0.94.

Coping was assessed via interview with the Kidcope (Spirito et al., 1988), which measured the frequency of use and perceived efficacy of coping strategies in adolescents. We report only on the frequency subscales in this article. As used in previous diabetes-specific research (Edgar and Skinner, 2003), participants were asked to recall and describe a period of time when their blood glucose levels were “too high.” Coping strategy subscales, including distraction, social withdrawal, cognitive restructuring, self-criticism, blaming others, problem solving, seeking social support, wishful thinking, and resignation, were then presented for frequency of use.

An “adaptive balance” score was also calculated (Vitaliano et al., 1990) by subtracting the sum of the mean item scores for distraction, self-criticism, social withdrawal, wishful thinking, blaming others, and resignation (maladaptive subscales) from the sum of the mean item scores for cognitive restructuring, problem solving, and social support (adaptive subscales). A higher score on this index indicates a stronger tendency to use the adaptive coping strategies.

Diabetes-related distress was measured by the Problem Areas in Diabetes Scale (PAID), a commonly used 20-item measure assessing a broad range of feelings related to living with diabetes and its treatment, including guilt, anger, frustration, depressed mood, worry, and fear (Welch et al., 1997). Higher scores indicated more distress. This scale has been previously used in adolescents (Husted et al., 2011; Nouwen et al., 2009). Cronbach’s alpha was 0.92.

QOL was assessed by the Pediatric Quality of Life Inventory (PedsQL; Varni et al., 1999, 2001). The Generic PedsQL is a 23-item empirically validated, age-specific instrument, with a Cronbach’s alpha of 0.91. A Diabetes QOL Module of the PedsQL, a 28-item questionnaire, age-specific for 13- to 18-year-olds (Varni et al., 2003), was used to assess diabetes-specific QOL (Cronbach’s alpha = 0.88). For both measures, higher scores indicated higher QOL.

Self-care was measured by the Diabetes Self-Management Profile (DSMP), a semi-structured interview designed to assess self-care over the preceding 3 months (Harris et al., 2000). The DSMP included 23 items assessing exercise, hypoglycemia, diet, blood glucose testing, and insulin administration/adjustment. Higher scores indicated more self-care. Cronbach’s alpha for the total score was 0.73.

Glycemic Control as assessed by A1C measures glycemic control over the prior 2–3 months and is used in all major clinical trials of diabetes (Diabetes Control and Complications Trial Research Group, 1993). A1C values were assessed from clinical blood tests as recorded from the electronic medical record. Higher values indicated worse glycemic control.

Statistical analyses

Models of resilience have been investigated in two primary ways: variable- and person-focused studies. In variable-focused studies, the study population is not grouped; instead, statistical power of the full sample is maximized through use of methods including regression, path analysis, and/or structural modeling to reflect the independent contribution of particular variables to the chosen outcome criterion. In person-focused studies, groups of individuals are compared to differentiate trends between groups (Masten, 2001). This study uses elements of both approaches to maximize understanding of resilience and provide initial data on the role of resilience in this population.

Variable-focused analyses included Pearson correlation coefficients and Student *t*-tests to estimate associations between distress, coping subscales, demographic variables, and the resilience factor. Pearson correlation coefficients were also estimated to examine associations between coping subscales and A1C overall.

Person-focused analyses used the resilience factor scores to determine low (LO), moderate (MOD), and high (HI) groups of resilience, by using the tertile cut points as group cutoffs (Yi-Frazier et al., 2010). A total of 17 participants were labeled as having “low resilience” (range = −2.61 to −.38), 16 participants were considered to have moderate levels of resilience (range = −.37 to .43), and 17 participants were labeled as having “high resilience” (range = .47 to 2.04).

Three-way multivariate analyses of variance (ANOVAs) and chi-square tests were used to compare the resilience groups on key variables including demographic and clinical variables. Post hoc contrast tests were used to explore the specific pairwise comparisons between the groups for those variables that had significant overall ANOVAs. No corrections for multiple comparisons have been made; the *p*-values are reported for exploratory purposes. Because of the small sample size, large number of potential covariates, and limited power, we do not present any formal regression modeling in this article and limit our analyses to exploratory tests and descriptive statistics.

Results

Demographic and clinical characteristics

Table 1 shows means and standard deviations (SDs) or percentages overall and by resilience group. Those with higher resilience scores had diabetes longer ($p < .05$). There were no other statistically significant differences between groups including age, sex, education, race, and insulin regimen.

Variable- and person-focused analyses of the association of resilience with distress and diabetes outcomes

Diabetes-related distress was negatively associated with the resilience factor ($r = -.36$, $p = .01$), and QOL scores (general and diabetes-specific) were positively associated ($r = .50–.60$, $p < .001$; Table 2). No associations were found between resilience and self-care or A1C.

Person-focused analyses compared means and SDs for the outcome variables by resilience group (Table 2). Those with high resilience had higher diabetes-specific and general QOL scores than those with low resilience (ps < .05), and A1C values were the highest among those with low resilience ($p = .048$).

Variable- and person-focused analyses of the association of resilience with coping subscales

The resilience factor was negatively associated with the total maladaptive coping sub-scale ($r = -.38$, $p = .006$), and specifically the maladaptive coping subscales: social withdrawal, self-criticism, and wishful thinking (rs = −.34 to −.42, ps < .05; Table 2). Positive associations were found for cognitive restructuring ($r = .31$, $p = .03$) and the adaptive balance score, which indicates more adaptive coping for those with higher resilience ($r = .47$, $p = .001$).

For coping, those with high resilience scored higher in overall adaptive coping strategies ($p = .03$) and problem solving in particular ($p = .04$), than those with lower levels of resilience. The adaptive balance score was higher for those with high resilience than those in the LO and MOD resilience groups ($p = .02$), indicating greater use of adaptive coping. Of the maladaptive subscales, those with high resilience reported lower wishful thinking than the other groups ($p = .02$).

Post hoc contrast tests

In post hoc contrast tests, the LO and HI groups were significantly different for diabetes-related distress, diabetes and general QOL, wishful thinking, total maladaptive coping, and the adaptive balance score (all ps < .05, data not shown). For A1C, the primary difference was found between the LO and MOD resilience groups (value of contrast = 1.39, $t = 2.44$, $p = .02$).

Discussion

It is well known that adolescents with T1D struggle with their diabetes management. Given the elevated stress from a multitude of factors including normal adolescent development on top of an intensive diabetes regimen and increasing responsibility for one's diabetes care, understanding the role and impact of personal resilience may be an important way to identify and improve outcomes for this population. Our overall objectives were to inform the development of interventions designed to promote resilience as a means to reduce stress and improve outcomes among youth with T1D.

Our study explored the associations of personal resilience with distress, coping, and diabetes outcomes using both variable- and person-focused analyses. We found evidence from both

variable- and person-focused approaches that resilience was associated with distress, as well as QOL, such that those with higher personal resilience had lower distress and higher QOL scores. This parallels other research in chronic disease, such as cancer and spinal cord injury, and adults with diabetes (Min et al., 2013; Shin et al., 2012; Yi et al., 2008a). Although these relationships may seem intuitive, to our knowledge, this is the first pediatric study confirming these associations in adolescents with T1D.

Interestingly, in analyses of the coping sub-scales, it was the maladaptive subscales that seemed to be more commonly associated with low resilience in the variable-focused analyses. Wishful thinking was a maladaptive strategy that seemed to be particularly significant, with high-resilience participants much less likely to use this strategy than those with low or moderate levels of resilience. This was consistent with previous work showing maladaptive coping to be a particular source of concern for diabetes outcomes (Jaser and White, 2011; Yi-Frazier et al., 2010). Person-focused analyses also revealed that the HI resilience group consistently scored higher on the adaptive coping sub-scales, which included the adaptive coping total as well as the adaptive balance score. Clearly, a passive approach to coping, such as engaging in high levels of wishful thinking or social withdrawal, counters the proactive needs of an individual with diabetes and highlights a potentially critical intervention point.

An association with A1C was only found in the person-focused analysis, where the primary finding was that the LO resilience group had the highest A1C, and specifically differed most from the MOD resilience group. No associations were found between resilience and self-care behaviors. This differed from one of the few previously reported studies in adolescents with T1D that showed associations between resilience and A1C and blood glucose monitoring (rs = .32–.36, $p \leq .05$) (Perfect and Jaramillo, 2012). Unfortunately, both these studies were cross-sectional and limited in their predictive ability on long-term self-care and A1C. Because a primary interest in evaluating the clinical utility of resilience seems to lie in its ability to buffer stress (Cohen and Wills, 1985), seeing an effect on self-care and/or A1C may take time, and a longitudinal, prospective approach may be more successful in observing how resilience buffers stress (Yi et al., 2008a). Furthermore, objective measures of self-care such as frequency of blood glucose monitoring may be warranted for future studies.

Efforts are needed to improve resilience and reduce stress in this population. Although no resilience-bolstering interventions have been published in pediatric diabetes thus far, much promise has been demonstrated in other populations including coronary heart disease, cancer, and adults with type 2 diabetes (Bradshaw et al., 2007; Burton et al., 2010; Ishibashi et al., 2010; Steinhardt et al., 2009) where it has been shown that resilience-building interventions can improve strategies for coping with stress and build positive meaning (Burton et al., 2010; Carver, 2005; Southwick and Charney, 2012). These data support these studies by showing that modifying maladaptive coping behavior may be a promising strategy for improving resilience, and identifying those with low resilience can help target those most at need.

Despite small numbers in this pilot study, relatively large differences were observed between participants with different levels of personal resilience, suggesting meaningful differences

and relatively low variance. In light of these findings and the fact that this is a pilot study, a larger study is needed to detect true effect sizes (Kraemer et al., 2006). In addition, this was a fairly homogenous sample with 94 percent Caucasian and only 38 percent with an income less than US$75,000, limiting the generalizability of these findings. Future research on resilience in underrepresented socioeconomic status (SES) and ethnic minority groups would be extremely useful. Finally, the resilience composite score had a mix of general and diabetes-specific constructs which limits the use of this assessment of resilience to the population at hand. A more general resilience scale, such as the Connor–Davidson Resilience Scale which approaches resilience in the same manner, may be more appropriate for future research (Campbell-Sills and Stein, 2007; Connor and Davidson, 2003).

Identifying and promoting personal resilience seems a promising target for adolescents with T1D who may be struggling with the stressors of growing into adulthood with a demanding chronic illness. In this pilot study, we demonstrated the impact of personal resilience on distress, QOL, and coping in this population. Clinical implications suggest that intervening at the level of bolstering personal resilience may be a fruitful avenue to impact reductions in stress and improvements in self-care, QOL, and glycemic outcomes. Improving coping skills, particularly reducing passive, maladaptive coping, as a mechanism to bolster resilience seems warranted. Future research on resilience in pediatric diabetes populations could further inform development, screening, and implementation of tailored interventions for improvement of health outcomes.

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References

American Diabetes Association. Standards of medical care in diabetes—2011. Diabetes Care. 2011; 34(Suppl 1):S11–S61. [PubMed: 21193625]

Birmaher B, Ryan ND, Williamson DE, et al. Childhood and adolescent depression: A review of the past 10 years. Part I. Journal of the American Academy of Child and Adolescent Psychiatry. 1996; 35:1427–1439. [PubMed: 8936909]

Bradshaw BG, Richardson GE, Kumpfer K, et al. Determining the efficacy of a resiliency training approach in adults with type 2 diabetes. The Diabetes Educator. 2007; 33(4):650–659. [PubMed: 17684166]

Burton NW, Pakenham KI, Brown WJ. Feasibility and effectiveness of psychosocial resilience training: A pilot study of the READY program. Psychology, Health & Medicine. 2010; 15(3):266–277.

Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience. Journal of Traumatic Stress. 2007; 20:1019–1028. [PubMed: 18157881]

Carver CS. Enhancing adaptation during treatment and the role of individual differences. Cancer. 2005; 104:2602–2607. [PubMed: 16247785]

Cederblad M, Dahlin L, Hagnell O, et al. Salutogenic childhood factors reported by middle-aged individuals. European Archives of Psychiatry and Clinical Neuroscience. 1994; 244:1–11. [PubMed: 7918695]

Cicchetti D, Rogosch FA, Lynch M, et al. Resilience in maltreated children: Processes leading to adaptive outcome. Development and Psychopathology. 1993; 5:629–647.

Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychological Bulletin. 1985; 98:310–357. [PubMed: 3901065]

Connor KM, Davidson JRT. Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depression and Anxiety. 2003; 18:76–82. [PubMed: 12964174]

Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. New England Journal of Medicine. 1993; 329(14):977–986. [PubMed: 8366922]

Di Battista AM, Hart TA, Greco L, et al. Type 1 diabetes among adolescents: Reduced diabetes self-care caused by social fear and fear of hypoglycemia. The Diabetes Educator. 2009; 35(3):465–475. [PubMed: 19321802]

Dickerson JB, Smith ML, Sosa E, et al. Perceived risk of developing diabetes in early adulthood: Beliefs about inherited and behavioral risk factors across the life course. Journal of Health Psychology. 2012; 17:285–296. [PubMed: 21708872]

Edgar KA, Skinner TC. Illness representations and coping as predictors of emotional well-being in adolescents with type 1 diabetes. Journal of Pediatric Psychology. 2003; 28:485–493. [PubMed: 12968040]

Garmezy N, Masten AS, Tellegen A. The study of stress and competence in children: A building block for developmental psychopathology. Child Development. 1984; 55:97–111. [PubMed: 6705637]

Grey M, Whittemore R, Tamborlane W. Depression in type 1 diabetes in children: Natural history and correlates. Journal of Psychosomatic Research. 2002; 53:907–911. [PubMed: 12377302]

Grossman HY, Brink S, Hauser ST. Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. Diabetes Care. 1987; 10(3):324–329. [PubMed: 3595399]

Haney P, Durlak JA. Changing self-esteem in children and adolescents: A meta-analytic review. Journal of Clinical Child Psychology. 1998; 27:423–433. [PubMed: 9866079]

Harris MA, Wysocki T, Sadler M, et al. Validation of a structured interview for the assessment of diabetes self-management. Diabetes Care. 2000; 23:1301–1304. [PubMed: 10977022]

Herzer M, Hood KK. Anxiety symptoms in adolescents with type 1 diabetes: Association with blood glucose monitoring and glycemic control. Journal of Pediatric Psychology. 2010; 35:415–425. [PubMed: 19684117]

Hull JC, Lehn DA, Tedlie JC. A general approach to testing multifaceted personality constructs. Journal of Personality and Social Psychology. 1991; 61:932–945. [PubMed: 1774631]

Husted GR, Thorsteinsson B, Esbensen BA, et al. Improving glycaemic control and life skills in adolescents with type 1 diabetes: A randomised, controlled intervention study using the Guided Self-Determination-Young method in triads of adolescents, parents and health care providers integrated into routine paediatric out-patient clinics. BMC Pediatrics. 2011; 11:55. [PubMed: 21672252]

International Diabetes Foundation and International Society of Pediatric and Adolescent Diabetes. IDF/ISPAD 2011 global guideline for diabetes in childhood and adolescence. 2011. Available at: http://www.ispad.org/resource-type/idfispad-2011-global-guideline-diabetes-childhood-and-adolescence

Ishibashi A, Ueda R, Kawano Y, et al. How to improve resilience in adolescents with cancer in Japan. Journal of Pediatric Oncology Nursing. 2010; 27:73–93. [PubMed: 20176917]

Jaser SS, White LE. Coping and resilience in adolescents with type 1 diabetes. Child: Care, Health and Development. 2011; 37:335–342.

Kanner S, Hamrin V, Grey M. Depression in adolescents with diabetes. Journal of Child and Adolescent Psychiatric Nursing. 2003; 16(1):15–24. [PubMed: 12790304]

Kovacs M, Goldston D, Obrosky DS, et al. Psychiatric disorders in youths with IDDM: Rates and risk factors. Diabetes Care. 1997; 20:36–44. [PubMed: 9028691]

Kraemer HC, Mintz J, Noda A, et al. Caution regarding the use of pilot studies to guide power calculations for study proposals. Archives of General Psychiatry. 2006; 63:484–489. [PubMed: 16651505]

Lawrence JM, Standiford DA, Loots B, et al. Prevalence and correlates of depressed mood among youth with diabetes: The SEARCH for Diabetes in Youth Study. Pediatrics. 2006; 117:1348–1358. [PubMed: 16585333]

Leichter SB, See Y. Problems that extend visit time and cost in diabetes care: 1. How depression may affect the efficacy and cost of care of diabetic patients. Clinical Diabetes. 2005; 23:53–54.

Major B, Richards C, Cooper ML, et al. Personal resilience, cognitive appraisals, and coping: An integrative model of adjustment to abortion. Journal of Personality and Social Psychology. 1998; 74:735–752. [PubMed: 9523416]

Masten AS. Ordinary magic: Resilience processes in development. American Psychologist. 2001; 56:227–238. [PubMed: 11315249]

Masten AS, Garmezy N, Tellegen A, et al. Competence and stress in school children: The moderating effects of individual and family qualities. Journal of Child Psychology and Psychiatry. 1988; 29:745–764. [PubMed: 3235488]

Meevissen YM, Peters ML, Alberts HJ. Become more optimistic by imagining a best possible self: Effects of a two week intervention. Journal of Behavior Therapy and Experimental Psychiatry. 2011; 42(3):371–378. [PubMed: 21450262]

Min JA, Yoon S, Lee CU, et al. Psychological resilience contributes to low emotional distress in cancer patients. Support Care in Cancer. 2013; 21(9):2469–2476.

Nouwen A, Urquhart Law G, Hussain S, et al. Comparison of the role of self-efficacy and illness representations in relation to dietary self-care and diabetes distress in adolescents with type 1 diabetes. Psychology & Health. 2009; 24:1071–1084. [PubMed: 20205046]

Perfect MM, Jaramillo E. Relations between resiliency, diabetes-related quality of life, and disease markers to school-related outcomes in adolescents with diabetes. School Psychology Quarterly. 2012; 27:29–40. [PubMed: 22582934]

Petitti DB, Klingensmith GJ, Bell RA, et al. Glycemic control in youth with diabetes: The SEARCH for diabetes in Youth Study. The Journal of Pediatrics. 2009; 155(5):668–672. [PubMed: 19643434]

Rew L, Horner SD. Youth resilience framework for reducing health-risk behaviors in adolescents. Journal of Pediatric Nursing. 2003; 18:379–388. [PubMed: 15058534]

Rose M, Fliege H, Hildenbrandt M, et al. The network of psychological variables in patients with diabetes and their importance for quality of life and metabolic control. Diabetes Care. 2002; 25:35–42. [PubMed: 11772898]

Rosenberg, M. Conceiving the Self. New York: Basic Books; 1979.

Rutter M. Resilience in the face of adversity: Prospective factors and resistance to psychiatric disorder. British Journal of Psychiatry. 1985; 147:598–611. [PubMed: 3830321]

Sawyer SM, Drew S, Yeo MS, et al. Adolescents with a chronic condition: Challenges living, challenges treating. Lancet. 2007; 369(9571):1481–1489. [PubMed: 17467519]

Scheier M, Carver C. Dispositional optimism and physical well-being: The influence of generalized outcome expectancies on health. Journal of Personality. 1987; 55(2):169–210. [PubMed: 3497256]

Shin JI, Chae JH, Min JA, et al. Resilience as a possible predictor for psychological distress in chronic spinal cord injured patients living in the community. Annals of Rehabilitation Medicine. 2012; 36:815–820. [PubMed: 23342314]

Sousa VD, Zauszniewski JA, Musil CM, et al. Relationships among self-care agency, self-efficacy, self-care, and glycemic control. Research and Theory for Nursing Practice. 2005; 19:217–230. [PubMed: 16144240]

Southwick SM, Charney DS. The science of resilience: Implications for the prevention and treatment of depression. Science. 2012; 338:79–82. [PubMed: 23042887]

Spirito A, Stark LJ, Williams C. Development of a brief coping checklist for use with pediatric populations. Journal of Pediatric Psychology. 1988; 13:555–574. [PubMed: 3216277]

Steinhardt MA, Mamerow MM, Brown SA, et al. A resilience intervention in African American adults with type 2 diabetes: A pilot study of efficacy. The Diabetes Educator. 2009; 35:274–284. [PubMed: 19204102]

Varni JW, Burwinkle TM, Jacobs JR, et al. The PedsQL in type 1 and type 2 diabetes: Reliability and validity of the Pediatric Quality of Life Inventory Generic Core Scales and type 1 Diabetes Module. Diabetes Care. 2003; 26(3):631–637. [PubMed: 12610013]

Varni JW, Seid M, Kurtin PS. PedsQL 4.0: Reliability and validity of the Pediatric Quality of Life Inventory Version 4.0 Generic Core Scales in healthy and patient populations. Medical Care. 2001; 39(8):800–812. [PubMed: 11468499]

Varni JW, Seid M, Rode CA. The PedsQL: Measurement model for the pediatric quality of life inventory. Medical Care. 1999; 37(2):126–139. [PubMed: 10024117]

Vedhara K, Nott KH. Psychosocial vulnerability to stress: A study of HIV-positive homosexual men. Journal of Psychosomatic Research. 1996; 41(3):255–267. [PubMed: 8910248]

Ventegodt S, Thegler S, Andreasen T, et al. Self-reported low self-esteem. Intervention and follow-up in a clinical setting. The Scientific World Journal. 2007; 7:299–305. [PubMed: 17334620]

Vitaliano PP, DeWolfe D, Maiuro RD, et al. Appraised changeability of a stressor as a modifier of the relationship of coping and depression: A test of the hypothesis of fit. Journal of Personality and Social Psychology. 1990; 59:582–590. [PubMed: 2231287]

Wagnild GM, Young HM. Development and psychometric evaluation of the resilience scale. Journal of Nursing Measurement. 1993; 1(2):165–178. [PubMed: 7850498]

Weissberg-Benchell J, Antisdel-Lomaglio J. Diabetes-specific emotional distress among adolescents: Feasibility, reliability, and validity of the problem areas in diabetes-teen version. Pediatric Diabetes. 2011; 12:341–344. [PubMed: 21443583]

Weissberg-Benchell J, Glasgow AM, Tynan WD, et al. Adolescent diabetes management and mismanagement. Diabetes Care. 1995; 18:77–82. [PubMed: 7698052]

Welch GW, Jacobson AM, Polonsky WH. The problem areas in diabetes scale: An evaluation of its clinical utility. Diabetes Care. 1997; 20:760–766. [PubMed: 9135939]

Werner EE. High-risk children in young adulthood: A longitudinal study from birth to 32 years. American Journal of Orthopsychiatry. 1989; 59:72–81. [PubMed: 2467566]

Whittemore R, Melkus GD, Grey M. Metabolic control, self-management and psychosocial adjustment in women with type 2 diabetes. Journal of Clinical Nursing. 2005; 14:195–203. [PubMed: 15669928]

Williams R, Alexander DA, Bolsover D, et al. Children, resilience and disasters: Recent evidence that should influence a model of psychosocial care. Current Opinion in Psychiatry. 2008; 21(4):338–344. [PubMed: 18520737]

Yi-Frazier JP, Hilliard M, Cochrane C, et al. The impact of positive psychology on diabetes outcomes: A review. Psychology. 2012; 3:1116–1124.

Yi-Frazier JP, Smith RE, Vitaliano PP, et al. A person-focused analysis of resilience resources and coping in diabetes patients. Stress and Health. 2010; 26(1):51–60. [PubMed: 20526415]

Yi JP, Vitaliano PP, Smith RE, et al. The role of resilience on psychological adjustment and physical health in patients with diabetes. British Journal of Health Psychology. 2008a; 13:311–325. [PubMed: 17535497]

Yi JP, Yi JC, Vitaliano PP, et al. How does anger coping style affect glycemic control in diabetes patients? International Journal of Behavioral Medicine. 2008b; 15:167–172. [PubMed: 18696309]

Table 1

Means (*M*) or percentages and standard deviations (SDs) for combined sample and by resilience group.

Variable	All (*N* = 50)		Low (*n* = 17)	Moderate (*n* = 16)	High (*n* = 17)
	M (or %) ± SD	Range		*M* (or %) ± SD	
Age	15.62 ± 1.66	13.16–18.78	15.26 ± 1.76	15.66 ± 1.78	15.95 ± 1.45
Duration of DM (years)	6.02 ± 3.44	1.05–13.61	6.04 ± 3.39	4.41 ± 2.70	7.51 ± 3.61 *
Sex (% female)	52	–	59	50	47
Race (% Caucasian)	94	–	88	100	94
Education (%less than college graduate)	38	–	35	21	47
Income (% less than US$75,000)	38	–	24	38	53
Insulin regimen (%insulin pump)	58	–	47	50	76

DM: diabetes mellitus.

* $p < .05$

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Table 2

Means (*M*), standard deviations (SDs), and correlation coefficients for the resilience factor (RF) with key variables, overall and stratified by resilience group.

Variable	*M* ± SD	Correlation with RF	Resilience groups			ANOVA
			Low	Moderate	High	*F*
Diabetes-related distress	23.70 ± 17.22	−0.36*	30.96 ± 18.10	22.51 ± 14.69	17.57 ± 16.78	2.82^
A1C	8.53 ± 1.62	−0.15	9.21 ± 2.17	7.82 ± 0.87	8.54 ± 1.28	3.29*
Diabetes QOL	68.87 ± 12.55	0.50***	63.08 ± 10.33	68.31 ± 12.37	75.19 ± 12.40	4.56*
General QOL	82.33 ± 12.29	0.60***	75.70 ± 12.23	80.91 ± 11.85	90.30 ± 8.04	7.90**
Self-care questionnaire	56.08 ± 9.69	0.13	56.25 ± 9.58	54.70 ± 10.57	57.20 ± 9.36	0.27
Coping subscales						
Adaptive coping total	52.67 ± 19.15	0.18	55.39 ± 12.48	42.71 ± 18.23	59.31 ± 22.42	3.73*
Problem solving	1.58 ± 0.93	0.18	1.65 ± 0.93	1.13 ± 0.81	1.94 ± 0.90	3.60*
Social support	1.46 ± 0.95	0.18	1.35 ± 0.79	1.31 ± 0.87	1.71 ± 1.16	0.86
Cognitive restructuring	1.68 ± 0.94	0.31*	1.59 ± 0.80	1.50 ± 0.97	1.94 ± 1.03	1.04
Maladaptive coping total	37.60 ± 16.04	−0.38**	41.96 ± 13.49	40.00 ± 17.04	30.98 ± 16.15	2.38
Self-distraction	1.30 ± 0.89	−0.03	1.24 ± 0.90	1.38 ± 0.81	1.29 ± 0.99	0.10
Social withdrawal	1.06 ± 1.00	−0.37**	1.29 ± 1.10	1.19 ± 1.11	0.71 ± 0.69	1.71
Self-criticism	1.12 ± 0.87	−0.34*	1.41 ± 1.00	0.94 ± 0.77	1.00 ± 0.79	1.49
Blaming others	0.68 ± 0.84	−0.19	0.88 ± 0.78	0.56 ± 0.96	0.59 ± 0.80	0.74
Resignation	1.64 ± 0.96	−0.22	2.00 ± 0.71	1.38 ± 1.02	1.53 ± 1.07	1.98
Wishful thinking	1.42 ± 1.01	−0.42**	1.65 ± 0.93	1.75 ± 1.06	0.88 ± 0.86	4.15*
Adaptive balance score[a]	−1.52 ± 4.20	0.47**	−2.35 ± 3.74	−3.00 ± 3.46	0.71 ± 4.52	4.21*

ANOVA: analysis of variance; A1C: glycated hemoglobin; QOL: quality of life.

[a]Higher adaptive balance scores indicate higher adaptive coping.

*$p < .05$;

**$p < .01$;

***$p < .001$;

$^{\wedge}p < .10$.