



Diabetes and Humor: A Preliminary Investigation

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Diabetes can take a tremendous toll on physical and psychological health. Given the growing evidence of the benefits of humor, this study examined the association between diabetes and humor. The sample consisted of 249 participants: 72.3% with type 1 diabetes, 70.3% female, 89.5% Caucasian, and 70.9% college educated. Participants completed the Humor Styles Questionnaire (HSQ) and were compared with HSQ norms. On the affiliative humor scale, the diabetes group did not differ from the norm ($P > 0.05$), nor did those with type 1 diabetes ($P > 0.05$). Scores of those with type 2 diabetes were lower than the norm ($P < 0.05$). On the self-enhancing humor scale, the diabetes group did not differ from the norm ($P > 0.05$), nor did the subgroups with type 1 diabetes ($P > 0.05$) or type 2 diabetes ($P > 0.05$). The diabetes group was lower than the norm on aggressive humor ($P < 0.01$), as were the subgroups with type 1 diabetes ($P < 0.01$) and type 2 diabetes ($P < 0.05$). The diabetes group was higher than the norm on self-defeating humor ($P < 0.01$), as were the subgroups with type 1 diabetes ($P < 0.01$) and type 2 diabetes ($P < 0.01$). Results suggest that people with either type of diabetes are more inclined toward self-enhancing humor, are less inclined toward aggressive humor, and score higher on self-defeating humor, and those with type 1 diabetes are also inclined toward affiliative humor. Results are discussed relative to the sample being comprised of individuals with good glycemic control (mean A1C $7.06 \pm 1.39\%$). This study offers a preliminary comparison of humor among people with diabetes versus those in a healthy norm group without diabetes.

Diabetes can take a tremendous toll on both physical and psychological health. People with diabetes are two to three times more likely than the general population to die of heart disease or suffer a stroke (1,2), and diabetes is the leading cause of kidney disease (3). People with diabetes are 40% more likely to develop glaucoma, are 60% more likely to develop cataracts, and are at significant risk of retinopathy (1,2). More than half of all people with diabetes have peripheral neuropathy, and individuals with diabetes are at greater risk of peripheral arterial disease and experience higher rates of lower-limb amputation (1,2). Psychologically, people with diabetes experience rates of depression that are 1.5–3 times higher than the general population (4,5), have twice the rate of anxiety (6,7), have 2–2.5 times the rate of eating disorders (8,9), and have 1.5–2.5 times the risk of dementia (10,11).

Humor may serve as an important buffer to these physical and psychological hazards. Humor has been found to boost the immune system, reduce the risk of heart disease, and lower blood pressure. In a randomized trial with a pre-/post-intervention design, Bennett et al. (12) assigned participants to an experimental humor group designed to

precipitate laughter. Those most engaged in laughing were found to have increased natural killer (NK) cell activity associated with immune functioning. Hayashi et al. (13) also found a relationship between laughter and increased NK cell activity specifically with a type 2 diabetes sample. In a large correlational study, Clark et al. (14) found an inverse relationship between coronary heart disease and sense of humor, even when controlling for diabetes. Berk and Tan (15) and Berk et al. (16) studied 20 people with high-risk diabetes. Blood was assessed at baseline and again every 2 months for 12 months. Along with standard medication treatment, the experimental group viewed 30 minutes of self-selected humor each day. The experimental group experienced higher HDL cholesterol levels and lowered inflammatory cytokines. The authors proposed that these changes should lead to cardiovascular protection and a reduced occurrence of myocardial infarction. In a clinical trial, Eshg et al. (17) reported a reduction in blood pressure for chronic renal failure patients in the experimental humor group. The humor group viewed comedy shows for 30 minutes, two times per week for 8 weeks. The authors noted that the most common cause of renal failure in the sample was hyperglycemia. In a pre-/post-intervention design study

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This article contains supplementary materials online at <https://spectrum.diabetesjournals.org/lookup/suppl/doi:10.2337/ds19-0028/-/DC1>.

<https://doi.org/10.2337/ds19-0028>

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with older adults, Ellis et al. (18) reported that laughter yoga lowered blood pressure. Hayashi et al. (13) did a pre-/post-intervention comparison of 23 people with type 2 diabetes and 16 people without diabetes. After participants watched a comedy show, a blood prorenin assay determined that there was a significant drop in prorenin level for the people with diabetes. The authors pointed out that elevated prorenin levels are associated with microvascular damage in diabetic nephropathy and may play a role in cognitive functioning.

Psychologically, humor has been shown to decrease stress and combat depression. Falkenberg et al. (19) conducted a small pre-/post-intervention pilot study using a humor training program with depressed clients. They reported enhanced humor abilities and motivation and reduced depressive symptoms. Crawford and Calabiano (20) conducted a pre-/post-intervention control group study implementing a humor training program. In addition to noting improvements in sense of humor, the authors reported decreases in depression, anxiety, and stress and an overall increase in emotional well-being. In a randomized, placebo-controlled trial, Wellenzohn et al. (21) studied the effects of five humor-based activities. All of the interventions resulted in significant improvements in happiness and short-term reductions in depression. In a randomized pre-/post-intervention design study by Bennett et al. (12), subjects assigned to the laughter group reported a reduction in stress and stress-related arousal. Martin and Dobbin (22) studied 40 college students and found a significant moderating effect of humor on the immunosuppressive effects of stress. Cha and Hong (23) employed a pre-/post-intervention design with a nonequivalent control group and found that laughter therapy had a significant effect on serotonin activation, lessening depression. Ganz and Jacobs (24) compared 50 subjects who attended a humor workshop with 42 control subjects. They found significantly lower levels of anxiety and depression over baseline measures in the experimental group. Ko and Youn (25) studied the effects of laughter therapy on 109 elderly subjects and found a significant reduction in depression for the experimental group. In a pre-/post-intervention design study with older adults, Ellis et al. (18) reported that laughter yoga improved mood and happiness.

Studies on humor often use the concepts humor and laughter interchangeably. Although these concepts are related and do overlap, they are not identical. Laughter is considered a preprogrammed, instinctive, automatic, spontaneous response (26), whereas humor is a global concept that includes laughter, but also cognitive, emotional, and social components. Humor is more inclusive, descriptive, and multidimensional (26–28).

There is evidence that humor can be developed and strengthened (19,29,30). Most notably, McGhee (29) developed a seven-step humor training program that has been effective in elevating measures of humor (19–21). Others have successfully developed their own protocols (12,16,31,32). Several diabetes educators have reported that humor can promote connections, encourage and support diabetes management, galvanize effectiveness, and increase an audience's attention during education programs (33,34).

This review suggests that humor has been a useful tool in addressing many specific medical and psychological complications associated with diabetes. However, an understanding of the overall association between diabetes and humor remains unclear. This study was designed to compare a sample of people with diabetes with a healthy norm group without diabetes on four disparate types of humor. This effort will provide baseline evidence on the humor styles of people living with diabetes and how they compare with the general population. A more comprehensive understanding of this association is an important step toward effective integration of humor in diabetes education and treatment.

Research Design and Methods

Assessing Sense of Humor

As previously noted, sense of humor is a global concept that not only includes laughter, but also cognitive, emotional, and social components (26,27). In response to concerns that the concept of humor is not only multidimensional, but also includes both positive and negative components, Martin et al. (28) developed the Humor Styles Questionnaire (HSQ) (Supplementary Appendix 1). The HSQ posits four dimensions of humor: affiliative, self-enhancing, aggressive, and self-defeating. Two positive dimensions, affiliative and self-enhancing, involve humor that enhances oneself and relationships with others. Two negative dimensions, aggressive and self-defeating, involve humor that enhances self at the expense of others and enhances others at the expense of self, respectively.

The HSQ is a 32-item survey using a 7-point Likert scale. Item anchors are 1) totally disagree and 2) totally agree. Each of the four humor subscales is comprised of eight items. Eleven items are reverse-scored. After reversing the appropriate items, scoring consists of adding the eight item scores per subscale. Scores range from 8 to 56 per subscale, and higher scores reflect increased demonstration of that type of humor. Scores for the full scale range from 32 to 224, and higher scores reflect increased demonstration of humor overall (28).

Reliability of the four scales has been demonstrated by internal consistencies of 0.77–0.81 and test-retest reliabilities of 0.80–0.85 (28). Evidence of construct validity includes theoretically meaningful differential correlations with other measures of sense of humor and associated traits (e.g., self-esteem, psychological well-being, and coping) (28).

Data Collection

Data were collected using announcements distributed through e-mail list-serves, diabetes-related websites and newsletters, and the Fall Community Diabetes Update offered by UCHealth Poudre Valley Hospital, in Ft. Collins, CO. Announcements were e-mailed to a random list of 7,000 University of Northern Colorado (Greeley, CO) and University of Saint Mary (Leavenworth, KS) faculty, staff, and students. Recipients were also asked to forward the announcement to others who might be interested. This random e-mailing was an attempt to include people with diabetes who did not belong to a diabetes-related organization or support network. Additional announcements were posted on the *Taking Control of Your Diabetes* (35) and *Diabetes Daily* (36) websites and were included in the newsletters of those organizations. A link to the survey was also embedded in an article on humor published in both newsletters.

The announcement included a brief description of the study, the inclusion criteria, and assurance that data were confidential and would only be used in aggregate form. The inclusion criteria specified that participants must be at least 18 years of age and have an existing medical diagnosis of either type 1 or type 2 diabetes. The announcement included an embedded, anonymous link to the survey.

The survey included a formal informed consent form, the HSQ, and entry points for general demographic information, including the two most recent A1C values. These two values were averaged to provide an estimate of longer-term glycemic control. The survey was created in Qualtrics (37), an online software survey tool. The institutional review boards at the University of Northern Colorado and the University of Saint Mary approved the study.

Sample

Two hundred and sixty participants returned the survey. Nine participants were eliminated for submitting either blank or incomplete surveys, and another two for not meeting the inclusion criteria. Mean imputation was used with 18 participants who failed to enter all HSQ data points

TABLE 1 Study Demographics

| Variables | Participants |
|---------------------------------------|--------------|
| Diabetes diagnosis | |
| Type 1 diabetes | 180 (72.3) |
| Type 2 diabetes | 69 (27.7) |
| Sex | |
| Female | 175 (70.3) |
| Male | 74 (29.7) |
| Education level | |
| High school/general education diploma | 42 (17.9) |
| Associate's degree | 28 (11.2) |
| Bachelor's degree | 85 (34.1) |
| Master's degree | 73 (29.3) |
| Doctoral degree | 15 (6.0) |
| Professional degree | 6 (2.4) |
| Race | |
| White/Caucasian | 222 (89.5) |
| Black/African American | 4 (1.6) |
| American Indian/Alaska Native | 2 (0.8) |
| Asian | 3 (1.2) |
| Native Hawaiian/Native Islander | 1 (0.4) |
| Hispanic/Latino | 10 (4.0) |
| Other | 6 (2.4) |
| Age, years* | |
| <20 | 7 (2.8) |
| 20–29 | 44 (17.7) |
| 30–39 | 28 (11.3) |
| 40–49 | 30 (12.1) |
| 50–59 | 49 (19.8) |
| 60–69 | 57 (23.0) |
| 70–79 | 30 (12.1) |
| >79 | 3 (1.2) |
| Duration of diabetes, years† | |
| <1–5 | 47 (19.0) |
| 6–10 | 30 (12.2) |
| 11–15 | 27 (10.9) |
| 16–20 | 42 (17.0) |
| 21–25 | 20 (8.1) |
| 26–30 | 17 (6.9) |
| 31–35 | 15 (6.1) |
| 36–40 | 14 (5.7) |
| 41–45 | 9 (3.6) |
| 46–50 | 12 (4.9) |
| 51–55 | 6 (2.4) |
| 56–60 | 5 (2.0) |
| >60 | 3 (1.2) |
| A1C, % | 7.06 ± 1.39 |

Data are *n* (%) except for A1C, which is mean ± SD. *Mean age 49.9 years. †Mean duration of diabetes 21.3 years.

(14 with one data point missing, and 1 each with two, four, five, and seven data points missing). A total of 249 participants were included in the final sample, resulting in a sample size post hoc power of 0.975. Most respondents had type 1 diabetes (72.3%), were female (70.3%), were Caucasian (89.5%), and were college educated (70.9%). The mean A1C was 7.06 ± 1.39% (Table 1). No incentives were offered.

Participants were recruited and data were collected from 1 February to 15 December 2018.

Results

Scores for the four types of humor (affiliative, self-enhancing, aggressive, and self-defeating) were compared with HSQ norms, which were based on a diverse sample ($n = 1,195$) of healthy volunteers ranging in age from 14 to 87 years (mean age 25 years) (28). Two-tailed Student t tests were conducted to determine differences based on style of humor and diabetes (Table 2). There was no significant difference between the overall diabetes group and the HSQ norm on affiliative humor ($P > 0.05$, $df = 1,442$, $t = 0.214$) or on self-enhancing humor ($P > 0.05$, $df = 1,442$, $t = -1.324$). The overall diabetes group was significantly lower on aggressive humor ($P < 0.01$, $df = 1,442$, $t = 1.435$) and significantly higher on self-defeating humor ($P < 0.01$, $df = 1,442$, $t = -5.452$) (Table 2).

Student two-tailed t tests were also conducted to determine how the type 1 and type 2 diabetes subgroups compared with the HSQ norms. The type 1 diabetes subgroup did not differ from the HSQ norm on either affiliative humor ($P > 0.05$, $df = 1,373$, $t = 1.134$) or self-enhancing humor

($P > 0.05$, $df = 1,373$, $t = 1.435$). This subgroup demonstrated less aggressive humor than the HSQ norm ($P < 0.01$, $df = 1,373$, $t = 2.82$) and more self-defeating humor ($P < 0.01$, $df = 1,373$, $t = 4.856$). On all four types of humor, the type 1 diabetes subgroup was consistent with the overall diabetes group.

The type 2 diabetes subgroup did differ from the HSQ norm on affiliative humor ($P < 0.05$, $df = 1,262$, $t = 2.341$), demonstrating less affiliative humor. This subgroup did not differ from the HSQ norm on self-enhancing humor ($P > 0.05$, $df = 1,262$, $t = 0.245$). The type 2 subgroup demonstrated less aggressive humor than the HSQ norm ($P < 0.05$, $df = 1,262$, $t = 2.908$) and more self-defeating humor ($P < 0.01$, $df = 1,262$, $t = 2.899$) (Table 2). Therefore, the type 2 diabetes subgroup was consistent with the overall diabetes group on every humor scale with the exception of affiliative humor.

Discussion

People with diabetes face a myriad of medical risks and complications, all while dealing with a complicated and challenging chronic disease (38). The effects of this predicament are reflected in increased rates of physical (1–3) and psychological (4–11) difficulties. It was suspected that

TABLE 2 Differences Between Diabetes and HSQ Norm Groups by Style of Humor and Type of Diabetes

| | <i>n</i> | Mean | SD | <i>t</i> | df | <i>P</i> |
|-----------------------------|----------|-------|------|----------|-------|----------|
| Affiliative humor | | | | | | |
| Diabetes overall | 249 | 46.29 | 8.34 | 0.214 | 1,442 | 0.83 |
| HSQ norm | 1,195 | 46.40 | 7.17 | | | |
| Type 1 diabetes | 180 | 47.06 | 7.98 | 1.134 | 1,373 | 0.257 |
| HSQ norm | 1,195 | 46.40 | 7.17 | | | |
| Type 2 diabetes | 69 | 44.29 | 8.97 | 2.341 | 1,262 | 0.019 |
| HSQ norm | 1,195 | 46.40 | 7.17 | | | |
| Self-enhancing humor | | | | | | |
| Diabetes overall | 249 | 38.05 | 7.08 | -1.324 | 1,442 | 0.19 |
| HSQ norm | 1,195 | 37.30 | 8.33 | | | |
| Type 1 diabetes | 180 | 38.24 | 7.21 | 1.435 | 1,373 | 0.15 |
| HSQ norm | 1,195 | 37.30 | 8.33 | | | |
| Type 2 diabetes | 69 | 37.55 | 6.76 | 0.245 | 1,262 | 0.81 |
| HSQ norm | 1,195 | 37.30 | 8.33 | | | |
| Aggressive humor | | | | | | |
| Diabetes overall | 249 | 26.47 | 6.59 | 3.449 | 1,442 | 0.0006 |
| HSQ norm | 1,195 | 28.50 | 8.79 | | | |
| Type 1 diabetes | 180 | 26.56 | 6.79 | 2.82 | 1,373 | 0.005 |
| HSQ norm | 1,195 | 28.50 | 8.79 | | | |
| Type 2 diabetes | 69 | 26.25 | 6.00 | 2.098 | 1,262 | 0.036 |
| HSQ norm | 1,195 | 28.50 | 8.79 | | | |
| Self-defeating humor | | | | | | |
| Diabetes overall | 249 | 29.41 | 9.35 | -5.452 | 1,442 | <0.0001 |
| HSQ norm | 1,195 | 25.90 | 9.22 | | | |
| Type 1 diabetes | 180 | 29.48 | 9.22 | 4.856 | 1,373 | 0.0001 |
| HSQ norm | 1,195 | 25.90 | 9.22 | | | |
| Type 2 diabetes | 69 | 29.22 | 9.76 | 2.899 | 1,262 | 0.004 |
| HSQ norm | 1,195 | 25.90 | 9.22 | | | |

diabetes may also affect sense of humor. However, with the exception of the type 2 diabetes group displaying lower levels of affiliative humor, there was no difference between the total diabetes group and the HSQ norm on either affiliative or self-enhancing humor. Further examination of the lower score on affiliative humor for type 2 diabetes is recommended to determine whether there is a true distinction between type 1 and type 2 diabetes on this scale or whether this finding was just a statistical error resulting from the small sample size of participants with type 2 diabetes ($n = 69$). Despite dealing with a life-altering, chronic illness, the overall sample of people with diabetes and the subgroup of those with type 1 diabetes were compatible with HSQ norms on a positive sense of humor. This finding was not expected based on the rates of depression and anxiety in the diabetes population (4–7) and given that positive humor scales are negatively correlated with depression and anxiety (28). This association suggesting that the diabetes sample did not differ from the HSQ norm was a significant finding.

The diabetes group did differ from HSQ norms on both types of negative humor, aggressive and self-defeating. Regardless of type of diabetes, participants with diabetes scored significantly lower than the HSQ norm on aggressive humor. This was an unexpected finding in that the aggressive scale has been negatively correlated with various aspects of health and well-being (28). Given the health challenges of living with diabetes (38), an elevated aggressive humor score was anticipated.

The diabetes group, across types, scored higher than the norm on self-defeating humor. This was an expected finding. The self-defeating scale is unique in that it correlates with psychiatric and somatic concerns and symptomology (28). People with diabetes deal daily with a range of medical and psychological issues, as well as long-term complications (I–II,38).

The discussion of these findings needs to be reviewed relative to diabetes control. A1C is the gold standard for measuring diabetes control (39) and is routinely used in diabetes research (40–45). Although the American Diabetes Association (46) generally recommends an A1C $<7\%$ (with adaptations based on factors such as age and complications), it is recognized that many individuals are not able to achieve such tight glycemic control. The mean A1C in the Diabetes Control and Complications Trial (DCCT) (40) conventional therapy group (9.0%), the DCCT intensive group (7.0%), the DCCT follow-up Epidemiology of Diabetes Interventions and Complications (EDIC) (43) conventional therapy group (8.0%), and the EDIC intensive therapy group (8.0%), are examples. Likewise, a 10-year A1C trajectory study

involving people with type 2 diabetes indicated that the best-controlled group maintained a mean A1C of 7.2%, with the remaining groups having a mean A1C ranging from 8.7 to 9.5% (45). Although Ali et al. (47) reported an increase in glycemic control from 1999 to 2010 (66.6% of the participants achieved an A1C level $\leq 7.0\%$), the mean A1C was still 7.2%. The current study's mean A1C ($7.06 \pm 1.39\%$) suggests a well-controlled diabetes sample that may not be representative of the larger population of all people with diabetes.

Implications

To the best of our understanding, this is the first study to examine the association between humor and diabetes. As such, it provides preliminary groundwork regarding how the humor styles of people with diabetes compare with those of a healthy norm group without diabetes. Our results provide evidence that, with the exception of a small type 2 diabetes subgroup different in affiliative humor, people with diabetes were comparable in positive humor styles and lower on the aggressive humor than the norm. This finding suggests that it is possible to live with a life-altering, chronic illness while maintaining a positive sense of humor and not manifesting it in negative, aggressive humor. This research contributes to the field of knowledge suggesting that humor as a coping strategy may also apply to people with diabetes. Furthermore, humor training programs developed with healthy populations may also be effective with people with diabetes.

The self-defeating humor scale was the only humor scale that negatively differentiated the diabetes group from the HSQ norm. This difference may be of interest to health care professionals while research further examines whether this association is a causative relationship.

Limitations and Future Directions

As with any study involving volunteers, the ability to secure a representative sample for this was challenging. The sample was skewed toward participants with type 1 diabetes who were female, Caucasian, college-educated individuals with good glycemic control. The Internet sampling procedure and reassurance of anonymity made geographic data unavailable. Given the thousands of e-mails sent soliciting participation, the opportunity for recipients to forward the invitation, and announcements made on Web-based sites, a final sample of 249 represents a very low response rate. Reasons for low response rates are multifaceted. It is impossible to know how many people chose not to respond simply because they did not meet the inclusion criteria. In addition, e-mail overload, personal time

restraints, lack of personal incentives to complete the questionnaire, and survey fatigue likely contributed to nonresponses among those who actually read the e-mail invitation and met the inclusion criteria.

All participants were self-selected. It is suspected that people who were interested in and believed they had a good sense of humor may have been more willing to participate. Future research should attempt to control for these factors. A more normative sample with regard to A1C levels should be included. This effort will involve identifying groups not normally associated with diabetes associations or having an interest in participating in research on humor. More rigorous outreach and the use of incentives are suggested. A more normative sample based on type of diabetes, sex, and race should be included and may be accomplished with quota sampling.

Conclusion

Diabetes can take a tremendous toll on physical and psychological health, but it is unknown whether it also affects sense of humor. This study found that, despite dealing with a life-altering, chronic illness, people with diabetes compared favorably with a healthy norm group on most measures of humor. A higher score on the self-defeating humor style was the only scale differentiating the diabetes group in a negative way. Otherwise, the diabetes group was comparable to the norm on affiliative and self-enhancing humor, and lower on aggressive humor. These results provide valuable preliminary information for effectively adapting and implementing humor into diabetes education and treatment programs.

DUALITY OF INTEREST

No potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

D.S.G. wrote the manuscript and researched data. N.D.K. conducted all statistical analyses and reviewed the results and discussion sections. J.B.C. researched data and reviewed/edited the manuscript. D.S.G. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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