（Research report）

QOL, happiness and HbA1c in people with diabetes who had physical symptoms with pleasure

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Abstract

The purpose of this research examined the actual situation of QOL, happiness and HbA1c in people with diabetes who had physical symptoms with pleasure. One hundred and five people with diabetes took part in this research. Their average age was 66.1 years old, the mean HbA1c was 7.1 %. Out of 105 people, 56 participants with physical symptoms were analyzed, where 39 participants out of them had pleasure in their daily life. 56 participants were given WHOQOL-BREF (WHO/QOL-26) questionnaire to evaluate the QOL, and participants were asked to rate on 10-point Likert scales for their happiness. For 39 participants who had pleasure, mean scores of physical, mental and environment domains of QOL, their general QOL and happiness were significantly higher than those who had no pleasure ($P<.05$), and the mean scores of QOL became higher in correlation with happiness. For 17 participants who had no pleasure, there was a significant negative correlation between happiness and HbA1c ($P<.05$). These results suggested to health care providers, it is necessary to advise people with diabetes who had physical symptoms to have some pleasurable activities in their daily life in order to maintain QOL and happiness.

Keywords: physical symptoms, positive emotion, QOL, HbA1c, diabetes

Introduction

Diabetes treatment involves maintaining the patient's blood sugar level as close to normal as possible to prevent the aggravation of the condition. Diabetic complications occur if they cannot control their blood sugar level well. Therefore, patients with diabetes have to pursue self–management such as changing their lifestyle, controlling their daily diet and exercising regularly to control their blood sugar level. However, self-management can be burdensome, frustrating and overwhelming for people with diabetes. Also, the diabetes self-care tasks decrease the quality of life (QOL) of patients (Polonsky, 2000). Lower QOL affects the ability to manage glycated hemoglobin (HbA1c) and other diabetes care activities (Cochran & Conn, 2008). Poor glycemic control may result in a substantial increase in a diabetic patient's risk of developing complications that will lead to poor quality of life (Nitiyanant,Chetthakul, & Sag-A-Kad et al., 2007) . Therefore, it is important to maintain lower HbA1c and better QOL, while conducting self-management activities.

There is an abundance of research on QOL in people with diabetes. Among them, some studies investigated associations between depression, including negative affectivity, QOL and HbA1c (Lustaman, Groot, & Anderson et al., 2000; De Groot, Anderson, & Freedland et al., 2001; Sundaram, Kavvokjian, & Patrick et al., 2007; Suchram, Baan, & Pouwer, 2009; Andereoulakis, Hyphantis, & Kandylis et al., 2012). Previous studies have suggested that depression had a negative impact on the blood sugar level and QOL among people with diabetes (Van der Does, Neeling

& Snoek,1996; De Groot, Anderson, & Freedland et al., 2001; Ciechanowski, Katon, & Russo, 2000; Lustaman, Groot, & Anderson et al., 2000; Schram, Baan, & Power, 2009). According to Van der Does, Neeling and Snoek, et al. (1996), Higher HbA1c levels were significantly associated with depression. For depression and QOL, Schram, Baan, and Power (2009) repotted diabetic individuals with depressive symptoms had a severely lower diabetes specific quality of life. So, the depressive symptoms were most strongly negatively associated with role function and social function of HRQOL. In contrast, positive affectivity is also likely to be as significant to health as negative affectivity (Moskowitz, Epel, & Acree, 2008). According to Robertson, Stanley, and Naik et al. (2012), positive affect may explain improvement in health-related quality of life (HRQOL). They reviewed the relationship between positive emotional health (well-being, positive affect and resilience) and diabetes care, and pointed out that three aspects of positive emotional health were linked to diabetes outcomes and self-management. For the positive affect, Laura, Lydia, and Andrew et al. (2019) found a protective physiological pathway linked daily happiness with better health in people with diabetes. On the other hand, happiness was not significantly associated with a lower risk of mortality in diabetes. However, an optimistic and enjoyable life did not show such a result (Moskowitz, Epel, & Acree, 2008). Positive emotion may also relieve the physical and mental burden caused by self-management those diabetic patients have to maintain every day, as stated by Folkman and Moskowitz (2000) who asserted that a positive affect may prevent patients from depression and distress. Pressman and Cohen (2005) also reported a positive affect can ease severe symptoms. According to Lawton (2000) who studied QOL extensively in elderly people, pleasurable experiences may offset the distress or pain caused by poor health.

Our study revealed that the physical symptoms and mental burden of dietary self-management and worsening of disease clearly decreased the QOL of people with diabetes (Adachi, 2008). We compared the QOL of people with diabetes who had and did not have pleasure among people with diabetes who were suffering from physical symptoms based on the concept by Lawton (Adachi, Hisamatsu, & Iinuma, 2016).

The purpose of this research to further examined the actual situation of QOL, happiness and HbA1c in people with diabetes who had physical symptoms with pleasure by using data of the same people in 2016 (Adachi, Hisamatsu, & Iinuma).

We tested three hypotheses as follows. Hypothesis I. The mean scores of their general QOL, some domains of QOL and happiness are significantly higher than those who have no pleasure. Hypothesis II. There is a significant positive correlation between happiness and psychological domain of QOL among people with diabetes who have pleasure. Hypothesis III. There is a significant negative correlation between HbA1c and happiness among people with diabetes who have no pleasure.

The results are expected to provide evidence of the importance of having pleasure for people with diabetes who had physical symptoms, and who have to maintain their self-management activities. Furthermore, if positive affectivity is found to be significantly related to HbA1c as a health outcome, it can be extremely useful in educational support for diabetic self-management activities.

I. Operational Definition

There are many types of positive affectivity, such as pleasure and happiness. As for the definition of pleasure, Johnson (2009) stated, "The aspect of pleasure, as it relates to positive

functioning, describes a niche of how we interpret and understand positive functioning. For example, a state of gratification implies a more sensate or physical pleasure, whereas a source of delight or joy implies an emotional state." Based on the definitions above, we defined pleasure as a positive emotion, and that the source of pleasure is joy and fun. Regarding the definition of happiness, Diener (2000), who is a leading figure in the field of the study of happiness and subjective well-being (SWB) stated, "it is common sense to combine the frequency and intensity of pleasant emotions." From some results of several previous studies in happiness, moreover, he suggested, "feeling pleasant emotions most of the time and infrequently experiencing unpleasant emotions, even if the pleasant emotions are only mild, is sufficient for high reports of happiness." Thus, there is a positive correlation between happiness and pleasure. The continuity of positive affectivity for happiness is more prolonged, and positive affectivity for happiness is stronger than that for pleasure. We defined happiness and SWB are mutually interrelated-they are similar words, not synonym. and there is positive relation between happiness and pleasure, and the source of happiness is pleasure.

QOL is another concept that is sometimes used interchangeably with happiness (Abir, Jaclene, & Wagdy, 2008). The World Health Organization Quality of Life Group defined QOL as "individuals' perception of their position in life in the context of their culture and value system and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, and their relationships to the salient features of their environment." (World Health Organization Quality of Life Group 1998) Therefore, QOL is more wide-ranging than happiness.

II. Methods

1. Participants

The participants were 105 people with diabetes aged 26-71 who had no mental or cognitive problems. They had been undergoing diabetic treatment at the outpatient department of a regional medical care support hospital in a Japanese regional city.

2. Instruments and structural interviews

The evaluation of QOL in diabetes was measured by the WHOQOL-BREF (WHO/QOL-26; Japanese ver; 1997) questionnaire that was composed of means of overall health status (OHS), four subscales of physical, psychological, social relationship, and environment, and means of overall QOL (OQOL). Each of the questions is scored on a scale of 1 to 5 points. A higher score means a better QOL.

By using structural interviews, the participants were asked to answer whether they were presently having physical symptoms and pleasure in their daily life or not. All the questions were answered objectively by the participants themselves. In the case of one having physical symptoms, pleasure, they were asked to rate the level of them on a 5-point Likert scale (from 1 [few] to 5 [many]). The higher the score on the scale, the degree of physical symptoms and pleasure became higher. In the case of one having physical symptoms, pleasure presently, they were asked to answer which type of physical symptoms, pleasure they had. Furthermore, all participants were asked to rate their present happiness on a 10-point Likert scale (from 1 [very unhappy] to 10 [very happy]). The higher the score on the scale, the higher the degree of happiness.

3. Procedures

This research was approved by the Ethics Committee of School of Medicine, Gifu University

(23-89). The participants were required to complete the WHO/QOL-26 questionnaire and then were structural interviewed. Both of the questionnaire and structural interviews were carried out in the counseling room of the hospital individually before undergoing a medical examination after they had signed the informed consent form. The survey was conducted from April 2014 to September 2015.

4. Statistical Analysis

The participants with some physical symptoms were divided into two groups, one group of people with diabetes who had pleasure and the other group who had no pleasure in daily life. The chi-square test, t-test and Pearson's correlation coefficient were used. Statistical significance was set *a priori* at 0.05.

III. Results

One hundred and five people with diabetes took part in this research (type 1: n=11, type 2: n=93, other: n=1). Their average age was 61.82 (SD=10.09) years old, the mean HbA1c was 7.18 (SD=1.03) and the mean duration of diabetes was 11.3 0(SD=9.23) years. Out of 105 people, 56 participants had one or more of the physical symptoms such as joint pain, back pain, knee pain, vision problems, lower limb edema, numbness in the legs, etc. 56 ppeople with diabetes who had physical symptoms were analyzed. The participants' characteristics are summarized in Table 1.

People with diabetes who had physical symptoms (n=56) were divided into two groups of whether they had pleasure in their daily life or not. The group that had one or more of the pleasures such as traveling, knitting, fishing, backyard vegetable gardening, etc. consisted of 39 participants. Their average age was 62.38 (SD=10.50) years old, the mean HbA1c was 7.26 (SD=1.01) and the mean duration of diabetes was 10.87 (SD=9.30) years. The other group that had no pleasure consisted of 17 participants. Their average age was 62.94 (SD=6.63) years old, the mean HbA1c was 7.26 (SD=1.04) and the mean duration of diabetes was 12.00 (SD=8.15) years. $\chi 2$-test did not show any significant differences between two groups on diabetes type and treatment type. However, there was significant difference between two groups on major complications (6.15, P<.05), the number of patients who had major complications was significant lager of patients who had pleasurable experiences in their daily life than that of those without.

As shown in Table2, there were significant differences between the groups on physical, psychological, environment and OQOL, mean scores of participants who had pleasure in their daily life were significantly higher than those without pleasure.

Table 1
Characteristics of people with diabetes who had physical symptoms

Characteristics	Participant with pleasure (n=39)	Participant without pleasure (n=17)
	$M \pm SD$ n (%)	$M \pm SD$ n (%)
Patient's age and sex		
Mrean of age(years)	62.38±10.50	62.94±6.63
Sex		
male	18 (46.15)	10 (58.82)
female	21 (53.84)	7 (41.17)
Diabtes type		
Type 1 (n=7)	5 (12.82)	2 (11.76)
Type 2 (n=48)	33 (84.61)	15 (88.23)
other (n=1)	1 (2.56)	0 (0.00)
Treatment type		
Insulin injection (n=24)	16 (41.02)	8 (47.05)
Diet, Oral medication and Exercise (n=32)	23 (58.97)	9 (52.94)
Meanof HbA1c%	7.26±1.01	7.26±1.04
Mean duration of diabetes (years)	10.87±9.30	12.00±8.15
Major Complications (n=42)		
yes (20)	10 (25.64)	10 (58.82) *
No (36)	29 (74.35)	7 (41.17)

* : p<.05

Mean score of happiness in patients who had pleasure was significantly higher than those without pleasure.

Table 3 displays, for 39 participants who had pleasure, there was a significant correlation among happiness and psychological, social relationship, environment, OQOL. However, there was no significant correlation between happiness and HbA1c. For 17 participants who had no pleasure, there was a significant correlation between happiness and OQOL. In addition, there was a significant negative correlation between happiness and HbA1c ($r=-.601$, $P<.05$), the degree of physical symptoms ($r=-.506$, $P<.05$).

Table 2
Mean scores of QOL and happiness, physical symptoms and HbA1c for pople with diabetes who had physical symptoms

Domains	Participant with pleasure (*n*=39)	Participant without pleasure (*n*=17)
	M(±SD)	*M(±SD)*
WHO/QOL-26		
physical	3.50 (0.48)	3.12 (0.32) **
psychological	3.38 (0.56)	3.06 (0.53) *
social relationship	3.38 (0.56)	3.43 (0.51)
environment	3.36 (0.48)	3.13 (0.30) *
OHS	2.73 (0.71)	2.56 (0.56)
OQOL	3.34 (0.42)	3.10 (0.27) *
happiness	6.87 (1.58)	5.47 (1.81) **
physical symptoms	3.13 (1.36)	3.50 (1.44)
HbA1c	7.26 (1.01)	7.26 (1.04)

* ： p<.05　 ** ： p<.01

Table 3
Correlation coefficients between happiness and WHO/QOL-26, physical symptoms and HbA1c for people with diabetes who had physical symptoms

Domains	Participant with pleasure (n=39)	Participant without pleasure (n=17)
WHO/QOL-26		
physical	0.17	0.42
psychological	0.402 *	0.274
social relationship	0.378 *	0.13
environment	0.355 *	0.341
OHS	0.051	0.406
OQOL	0.373 *	0.519 *
physical symptoms	-0.029	-0.506
HbA1c	-0.311	-0.601

* ： p<.05

IV. Discussion

The importance for people with diabetes who had physical symptoms to have pleasure in their daily life as they maintain self-management was examined.

For QOL and happiness of people with diabetes who had pleasure, HypothesesI. and II. were also supported. The environment domain of QOL showed that the mean scores in participants who had pleasure were significantly higher than those without pleasure, and as the environment domains improved, happiness increased through pleasure. Thus, a good environment enables pleasurable activity in their daily life and can help people with diabetes to feel better. W. Bani-Issa (2011) also reported the environment domains buffer or decrease the perceived burden of diabetes. Next, regarding people with diabetes who had pleasure, there was no correlation between happiness and HbA1c, which was in contrast to those who had no such pleasure. Therefore, Hypothesis III was supported. Poor blood glucose control will worsen their medical condition, possibly producing negative emotions such as worry or distress. Some previous researches pointed out that there was a significant correlation between poor blood glucose control and depression Lustaman, Groot, & Anderson et al., 2000).

Therefore, there may be an obvious negative correlation between HbA1c and happiness. However, among the people with diabetes who had physical symptoms, for those who had pleasure, there was no correlation between happiness and HbA1c. As a positive affect reduced a negative affect such as depression etc. (Folkmans & Moskowitz, 2000), it is suggested that anxiety about poor blood sugar control can be buffered by pleasure. In addition, for people with diabetes who had physical symptoms, those who had no pleasure obvious negative correlation between the degree of physical symptoms and happiness, which was contrast to those had pleasure.

We results suggest that when health care providers instruct people with diabetes with physical symptoms, two important facts must be provided: First, QOL and happiness were significantly higher for those who had pleasure in their daily life. Moreover, there was no significant correlation between happiness and HbA1c. In contrast, for those who have no pleasure, happiness decreased when HbA1c increased. If they had pleasure, poor blood glucose control may not have affected happiness. And the higher the degree of physical symptoms, happiness became lower in patients who had no pleasure. According to Adachi, Hisamatsu, and Iinuma (2016), the higher the degree of physical symptoms, the degree of pain and discomfort, and the restrictions on daily activities became greater. Therefore, even if there are some restrictions in their daily life due to physical symptoms, these people with diabetes should not refrain from having pleasure. Second, it is important for people with diabetes to maintain their diabetic self-management. Self-management activities may certainly cause limitations to enjoying pleasurable activities (Polonsky, 2000). Nevertheless, people with diabetes must be reassured that health care providers will always support them by helping them to include pleasurable activities in their self-management program.

V. Conclusion

For people with diabetes who had physical symptoms, those who had pleasure in their daily life showed a significantly higher degree of happiness and QOL than those without. Also, it is notable that there was a significant correlation among happiness and psychological, social relationship, environment in QOL. Moreover, there was no significant correlation between happiness and HbA1c. In contrast, for those who have no pleasure, happiness decreased when HbA1c increased. In addition, the higher the degree of physical symptoms, happiness became lower in patients who had no pleasure. Therefore, it is necessary to provide more educational care for people with diabetes that show physical symptoms, so they can keep on their diabetic self-management, while still being able to have some pleasurable activities in their daily life.

VI.

Limitations

This research has some limitations. First, for participant characteristics, there was no information about their BMI to assess the state of their diabetic control (Japan Diabetes Society, 2018-2019).[10] . Second, the degree of happiness was based on a single-item. Due to the limitations of single-item global evaluation, it is necessary to measure the subjective experience of happiness itself using the single factor scale such as Japanese version of the 4-item Subjective Happiness Scale (Shimai, Otake, & Ikemi et al, 2005). This scale can measure both cognitive evaluation and levels of affect.

Third, the degree of inconvenience caused by physical symptoms was not measured, although positive affectivity can ease severe symptoms (Pressman and Cohen, 2005).

Even if their physical symptoms become more painful, their happiness and QOL might not decrease if they have pleasure in their daily life. Finally, the number of research participants were relatively small to generalize the results. In a future study, we need to analyze the correlations among positive emotion, self-management activities and HbA1c, including basic characteristics of people with diabetes such as age and gender by using covariance structure analysis.

Acknowledgments

Conflict of Interest

We declare no conflicts of interest associated with this manuscript.

References

Abir K.B., Jaclene A.Z., Wagdy E.N. (2008). Happiness: Theoretical and Empirical Considerations. *Nursing Forum*, 43(1), 12-23.

Adachi H. (2008). Analysis of the factors affects the evaluation of HRQOL in outpatients with diabetes. *Journal of Japan Academy of Nursing Science*, 28(4), 8-16.

Adachi H., Hisamatsu K., Iinuma N. (2016). The difference in the evaluation of QOL between the diabetic outpatients with physical symptoms who have pleasure in their daily lives and those who do not. *Journal of Japan Academy of Diabetes Education and Nursing*, 20(2), 175-181.

Andereoulakis E., Hyphantis T., Kandylis D., Iacovides A. (2012). Depression in diabetes mellitus: a comprehensive review. *Hippokratia*, 16(3), 205-214.

Ciechanowski P.S., Katon W.J., Russo J.E. (2000). Depression and diabetes impact of depressive symptoms on adherence, function, and costs. *Archives of Internal Medicine*, 160(27), 3278-3285.

Cochran J., Conn V.S. (2008). Meta-analysis of quality of life outcomes following diabetes self-management training. *The Diabetes Educator*, 34(5), 815-823.

De Groot M., Anderson R., Freedland K.E, et al. (2001). Association of depression and diabetes complications: A meta-analysis. *Psychosomatic Medicine*, 63, 619-630.

Diner E. D. (2000). Subjective well-being, the science of happiness and a proposal for a national index. *American Psychologist*, 55(1), 34-43.

Folkman S., Moskowitz J.T. (2000). Positive affect and the other side of coping. *American Psychologist*, 55(6), 647-654.

Japan Diabetes Society (2018-2019). (2019). *Treatment Guide for Diabetes*, 29. Tokyo: Bunkoudou.

Johnson D. (2009). Pleasure. In Shane J(Eds), *The encyclopedia of positive psychology* (pp.704-707). Wiley & sons, ltd Pub.

Laura P., Lydia P., Ruth A.H., Andrew S. (2019). Happiness and inflammatory responses to acute stress in people with type 2 diabetes. *Annals of Behavioral Medicine*, 53, 309-320.

Lawton P.M. (2000). Gerontechnological interventions and the health and quality of life of older people. In Butler R. N & Jasmin C (Eds), *Longevity on Quality of Life, Opportunities and Challenges* (pp.121-129, Kluwer Academic/ Plenum Pub.

Lustaman P.J., Groot M.D., Anderson R.J., et al. (2000). Depression and poor glycemic control: A meta-analytic review of the literature. *Diabetes Care*, 23 (7), 934-942.

Moskowitz J.T., Epel E.S., Acree M. (2008). Positive affect uniquely predicts lower risk of mortality in people with diabetes. *Health Psychology*, 27, S73-S82.

Nitiyanant W., Chetthakul T., Sang-A-kad P., et al. (2007). A survey study on diabetes management and complication status in primary care setting in Thailand. *Journal of the Medical Association of Thailand*, 90, 65-71.

Polonsky W.H. (2000). Understanding and assessing diabetes - specific quality of life. *Diabetes Spectrum*, 13, 36-41.

Pressman S.D., Cohen S. (2005). Does positive affect influence health? *Psychological Bulletin*, 131(6), 925-971.

Robertson S.M., Stanley M.A., Cully J.A., et al. (2012). Review Article, Positive emotional health and diabetes care: Concepts, measurement, and clinical implications. *Psychosomatics*, 53(1), 1-12.

Shimai S, Otake K, Utsuki N., et al. (2005). Development of a Japanese version of the subjective happiness scale (SHS), and examination of its validity and reliability. *Japanese Journal of Public Health*, 51(10), 845-853.

Suchram M.T., Baan C.A., Pouwer F. (2009). Depression and quality of life in patients with diabetes: A systematic review from the European depression in diabetes (EDID) research consortium. *Current Diabetes Reviews*, 5, 112-119.

Sundaram M., Kavookjian J., Patrick J.H., et al. (2007). Quality of life, health status and clinical outcomes in type2 diabetes patients. *Quality of Life Research*, 16, 165-177.

Van der Does F.E., de Neeling J.N, Snoek F.J, et al. (1996). Symptoms and well-being in relation to glycemic control in typeIIdiabetes. *Diabetes Care*, 19, 204-210.

W, Bani-Iissa. (2011). Evaluation of the health-related quality of life of emirate people with diabetes: Integration of sociodemographic and disease-related variable. *Eastern Mediterranean Health Journal*, 17(11), 825-830.

WHO QOL 26 Japanese version (1997). Translated by Miyako Tazaki and Yoshibumi Nakane.

The WHOQOL Group. (1998). The world health organization quality of life assessment (WHOQOL): development and general psychometric properties. *Social Science Medicine*, 46(12), 1569-1585.

身体的症状があり楽しみのある糖尿病患者の QOL，幸福感と HbA1c について

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抄　録

　身体的症状があり楽しみのある糖尿病の人々の QOL，幸福感と HbA1c の実態を調査した．参加した 105 人の平均年齢は 66.1 歳，平均 HbA1c は 7.1% であった．身体的症状のある 56 人を分析の対象とした．56 人の内，39 人は生活の中で楽しみを持っていた．QOL を評価する WHOQOL-BREF（WHO/QOL-26）質問紙を与え，そして幸福感を 10 点尺度で尋ねた．楽しみのある 39 人に関して，QOL の身体的，心理的，環境的領域，全般的な QOL と幸福感の平均は楽しみのない者よりも有意に高かった（$P<0.05$）．QOL が高くなるほど，幸福感も高くなった．楽しみのない 17 人に関して，幸福感と HbA1c との間に有意な負の関係があった（$P<0.05$）．結果は，医療提供者に QOL と幸福感の維持に，身体的症状のある糖尿病の人々に生活の中で楽しい行動をするよう助言する必要性を示唆した．

キーワード：身体的症状，肯定的感情，QOL，HbA1c，糖尿病