Association between Grit Scales and adherence to regular hospital visits among Japanese patients with type 2 diabetes: Prospective observational study

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ABSTRACT

This study examined the association between Grit Scales and adherence to a schedule of regular hospital visits among Japanese type 2 diabetes patients. Patients with type 2 diabetes who visited the outpatient clinic as new patients comprised the study's participants. Self-administered Short Grit Scale data were obtained from 122 patients at the first consultation and were then observed for 1 year. As the results, 21 participants failed to attend the hospital. In a logistic regression analysis, the Grit Scale as a continuous variable was positively associated with adherence to regular clinical visits. Its odds ratio and 95% confidential interval was 9.68 and 2.87–32.65 (*P* = 0.0003). In conclusion, it is likely that the Grit Scale is closely associated with adherence to regular hospital visits among Japanese type 2 diabetes patients.

INTRODUCTION

The goal for patients with diabetes is to secure years of healthy life by controlling the disorder and thereby maintaining a quality of life equivalent to that of their healthy counterparts. To achieve this objective, the continuation of regular treatment for diabetes is critical for such patients. Patients who neglected regular visits for treatment of diabetes experienced poorer glycemic control[1,2], which could ultimately lead to the development of complications[3]. Therefore, it would be beneficial to find prognostic factors for poor adherence to such a clinical schedule in the future, although various factors are related to adherence[4].

Recently, the concept of grit – guts, resilience, initiative and tenacity – which is represented by the "perseverance and passion for long-term goals"[5,6], has been drawing much attention in various fields, such as human resources development, in companies and corporations worldwide. Indeed, one cohort study recently explored whether the Grit Scale scores were associated with adherence to treatment and biomarker levels in patients with type 2 diabetes[7]. However, adherence to regular clinic visits was not investigated in that study, and it remains

unclear even now how the concept of grit can be utilized in diabetes care.

In the present prospective observational study, under the hypothesis that the diabetes patient's grit could serve as an effective measure of good adherence to regular visit schedules, data of the self-administered Short Grit Scale scores (Grit-S)[6] from new outpatients with type 2 diabetes were obtained and used to assess the impact on subsequent adherence to regular clinic visits for 1 year.

MATERIALS AND METHODS

Patients eligible for the present study were those diagnosed with type 2 diabetes who visited the diabetes outpatient clinic at Kawasaki Medical School Hospital, Okayama, Japan, for the first time and agreed to undergo a Grit-S questionnaire between 2017 and 2019. The exclusion criteria included undergoing hemodialysis, bedridden conditions, nursing home residence, blindness, amputated lower limbs, diagnosis of cancer and pregnancy or potential pregnancy. Among the total of 144 patients, 22 were excluded because of insufficient information in the questionnaires, being diagnosed as having diabetes other than type 2 during examination or being referred to a different local

clinic. All participants were prospectively observed for at least 1 year. The grit for each participant was calculated using the Grit-S[6] at the initial visit to the hospital.

When participants continued consultation with the attending physician for 1 year, they were categorized as the "good adherence group." Other participants were categorized as the "poor adherence group." That is, poor adherence was defined as failure to attend follow-up appointments without any contact after 1 year. To clarify the significance of Grit-S as a predictor of adherence to clinic visits, the scales were divided into tertiles based on subject number (39 in low, 40 in middle and 43 in high tertiles). Numerical and tertile-specific odds ratios for adherence were estimated with logistic regression models after adjustment for age or sex. Statistical analyses were carried out using JMP software (version 13.2 for Windows, SAS Institute).

The ethics committee of the Kawasaki Medical School approved the study protocol on 16 November 2017 (No. 2918), on 28 February 2019 (No. 2918-1) and on 18 December 2020 (No. 2918-2). Information pertaining to the study was provided to the public via the internet, instead of informed consent being obtained from each individual participant.

RESULTS

Table 1 shows the clinical characteristics of participants at the first visit who were categorized as the good and poor adherence group based on the adherence to regular hospital visits. There were no differences in various parameters including glycated hemoglobin and body mass index between good and poor adherence groups after adjustment for age and sex. Grit-S was significantly higher in the good adherence group ($P = 0.0002$), and the good adherence group was older compared with the poor adherence group ($P = 0.02$). In a logistic regression analyses, Grit-S as a continuous variable was positively associated with adherence to regular clinical visits. Its odds ratio and 95% confidential interval was 9.68 and 2.87–32.65 ($P = 0.0003$). In addition, Grit-S was positively associated with adherence to regular clinical visits after adjustment for age, sex, medication, occupation or distances from home to the hospital.

Furthermore, as shown in Figure 1, favorable adherence to regular visit was observed in the middle and high tertiles of Grit-S compared with the low tertile. The odds ratios for favorable adherence to regular visits in the middle and high tertiles in comparison with the low tertile were 5.63 (95% confidential interval 1.66–19.01; $P = 0.005$) and 12.81 (95% confidential interval 2.70–60.91; $P = 0.001$), respectively. These data suggest that the Grit-S is associated with adherence to regular hospital visits (Figure 1). Additionally, there was no difference in glycated hemoglobin levels among the tertiles at any visit point after adjustment for age or sex, suggesting that the Grit-S is not well associated with glycemic control.

DISCUSSION

The present observational prospective study clarified a significant association between patients' Grit-S and adherence to
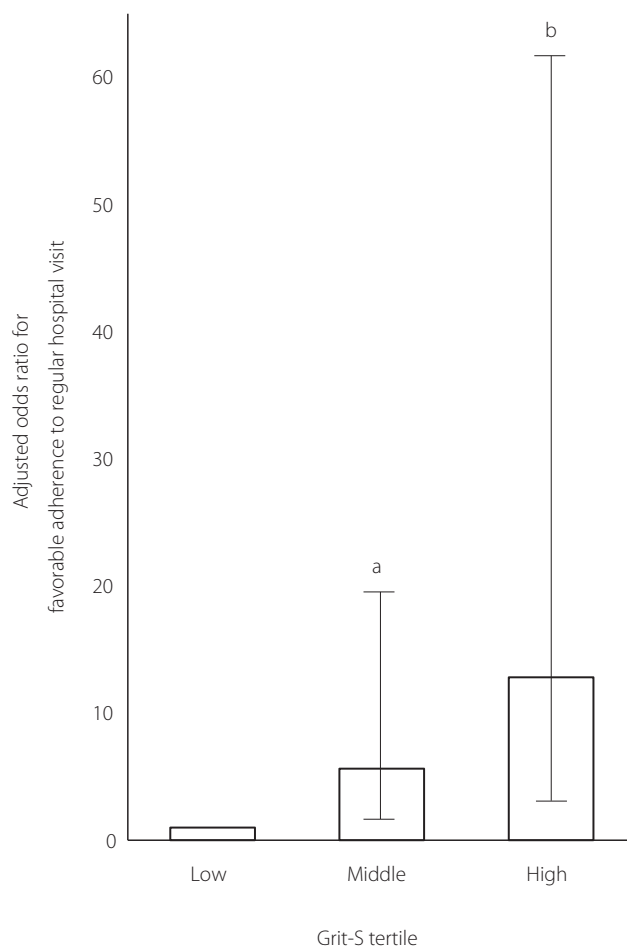

FIGURE 1 | Odds ratios for favorable adherence to regular clinical visits among low, middle and high tertiles of the Grit Scale (Grit-S). [a]$P = 0.005$ and [b]$P = 0.001$ compared with the low tertile.

regular clinical visits among Japanese patients with type 2 diabetes. These results suggest the importance of assessment of patient grit in the prevention of dropout from regular clinical visits for type 2 diabetes.

It was reported that the role of grit was positively associated with college student health, specifically in relation to healthcare management skills and quality of life among students with and without chronic medical conditions[8,9]. In addition, grit was more positively correlated with moderate- and high-intensity transtheoretical model stages than low stages[10]. Similarly, participants with middle and high tertiles of Grit-S in the present study were found to have the potential to continue long-term challenges for diabetes, because they were at certain transtheoretical model stages, compared with participants with low Grit-S.

In the present study, 21 (17.2%) participants were categorized as poor adherence to hospital visits. Different reports have shown that figure to widely range (from 8 to 40%) in

Table 1 | Clinical characteristics of study participants at the first consultation

	All participants	Good adherence group	Poor adherence group
Male/female (n)	78/44	63/38	15/6
Age (years)	56.1 ± 12.3	57.3 ± 12.1*	50.2 ± 12.0
Duration of diabetes (years)	4.4 ± 5.8	4.5 ± 5.9	4.1 ± 5.7
BMI (kg/m^2)	28.1 ± 6.3	27.7 ± 6.3	29.8 ± 6.4
SBP (mmHg)	138 ± 21	139 ± 22	136 ± 15
DBP (mmHg)	85 ± 14	85 ± 15	85 ± 14
HbA1c (%)	8.4 ± 2.0	8.4 ± 2.0	8.3 ± 2.1
LDL-C (mg/dL)	122 ± 36	122 ± 37	120 ± 28
TG (mg/dL)	197 ± 169	196 ± 172	204 ± 158
HDL-C (mg/dL)	50.5 ± 1.3	50.3 ± 1.5	51.4 ± 2.6
eGFR (mL/min/1.73 m^2)	85.5 ± 25.0	83.4 ± 25.3	95.2 ± 21.2
Medication for diabetes (%)	34 (27.9)	27 (26.7)	7 (33.3)
Medication for hypertension (%)	27 (22.1)	23 (22.8)	4 (19.1)
Medication for dyslipidemia (%)	21 (17.2)	19 (18.8)	2 (9.5)
Occupation			
Administrative officer	23	18	5
Manual worker	23	22	1
Housewife/retired	20/13	18/12	2/1
Unemployed/part-time worker	14/29	8/23	6/6
Distance from home to the hospital (km)	17.8 ± 2.1	18.1 ± 2.3	16.4 ± 4.9
Grit-S	2.99 ± 0.47	3.07 ± 0.42**	2.62 ± 0.54

Data are shown as the mean ± standard deviation. BMI, body mass index; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; Grit-S, Short Grit Scale; HbA1c, glycated hemoglobin; LDL-C, low-density lipoprotein cholesterol; SBP, systolic blood pressure; TG, triglycerides. *P = 0.020 compared with the poor adherence group after adjustment for gender. **P = 0.0002 compared with the poor adherence group after adjustment for age and sex.

Japan[11,12], although there was somewhat of a difference in the diagnosis of poor adherence between the studies. With that in mind, it might be difficult to quantitatively assess poor adherence. In either case, adherence to diabetes medication protocols remains an ongoing problem, because poor adherence remains a barrier to achieving optimum health outcomes in patients with type 2 diabetes. Accordingly, the initial medical examination for type 2 diabetes might be crucial in preventing patients from dropping out of treatment regimens. The results of the present study imply that patients with low Grit-S, presumably a suitable indicator for poor adherence to regular clinical visit schedules, should be considered as a surrogate for a high risk of dropping out of a type 2 diabetes treatment regimens.

The present study had several limitations. First, it was of an observational design, not interventional, with a limited duration, participant population and event frequency. In addition, the participants of the present study were recruited from the initial visit at a single hospital and mostly had letters of referral from family doctors, which limited the generalizability of the results. Second, there are many factors related to adherence, such as income, educational background, family structure and so on, all of which were not considered in the present study. Third, as all participants in this study were Japanese individuals covered under Japan's national healthcare system, the results of this study might not be applicable to different healthcare systems in

other countries. Further prospective study is required to clarify the precise relationships between grit and management of type 2 diabetes on a larger scale.

In conclusion, it is likely that the Grit-S is closely associated with adherence to regular hospital visits and would be useful to estimate patients with type 2 diabetes at high risk of dropping out. This examination carried out at the initial visit would help to establish a program more effectively for maintaining diabetes treatment in Japanese patients with type 2 diabetes.

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