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# Effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey

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**Keywords**: Health Literacy, Patient Empowerment, Self-Care Behavior, Diabetes Management

**Word Count**: 3661

## Abstract

**Objective:** This study aimed to assess the impact of health literacy and patient empowerment on self-care behavior in patients in metropolitan Turkish diabetes centers. The conceptual background is provided by the psychological health empowerment model, which holds that health literacy without patient empowerment comes down to wasting health resources, while empowerment without health literacy can lead to dangerous or suboptimal health behavior.

**Design, Setting and Participants:** A cross- sectional study was conducted with 167 diabetes patients over the age of 18 from one of two diabetes clinics in a major Turkish City. Self-administered questionnaires were distributed to eligible outpatients who had an appointment in one of two diabetes clinics in a major Turkish city. Health literacy was measured by a newly translated Turkish version of S-TOFHLA and the Chew et al. (2004) self- report scale. Patient empowerment was measured by a 12-item scale based on Spreitzer's (1995) conceptualization of psychological empowerment in the workplace. Self-care behavior was measured by SDSCA (Toolbert et al. 1994).

**Results:** Two subscales of empowerment, impact and self-determination, predicted self-reported frequency of self-care behaviors. Neither health literacy nor diabetes knowledge had an effect on self-care behaviors.

**Conclusion**: Health literacy might be more effective in clinical decisions while empowerment might exert a stronger influence on habitual health behaviors.

**Keywords**: Health Literacy, Patient Empowerment, Self-Care Behavior, Diabetes Management

**Strength and Limitations of the Study**

- This is the first study in Turkey trying to get evidence about effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey.
- Sample of the study is not representative of the Turkish population.

## 1. Background

Health literacy has increasingly been recognized as a factor in health behaviors, health care and health itself. Research shows that low or inadequate health literacy is associated with poor adherence to medical regimens, poor understanding of health issues, a lack of knowledge about medical care and conditions, poorer comprehension of medical information, low understanding and use of preventive services, poorer overall health status, and earlier death (Pleasant 2011:43; Berkman et al. Williams et al.1998). Furthermore, individuals with chronic diseases (e.g., diabetes, high blood pressure, and heart disease) and limited health literacy have less understanding of their disease and experience more negative outcomes than individuals with higher health literacy (Gazmararian et al. 2003; Schilinger et al. 2002; Spandorfer et al. 1995, Williams et al. 1998; Kalichman et al. 1998; Baker et al. 1997; Kalichman and Rompa 2000). Based on such findings, a high level of health literacy is expected to have beneficial effects on people's health.

Health literacy is defined as the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan and Parker introduction in Selden et al. 2000). The definition highlights the fact that health literacy is ability. The hope that by increasing health literacy, beneficial consequences for people's health are achieved rests on the assumption that this ability is used when people make decisions about health-related behaviors. But ability and behavior need not completely agree. One can have an ability to make sound health decisions but still prefer to leave decisions to health care providers. As one can choose not to use one's ability, one can also claim to have a say in medical decisions when one's health literacy is actually too low for that. This raises the question of how the ability called health literacy translates into behavior and decisions.

One way to approach this question is to include health empowerment into the picture. Health empowerment is defined as the subjective feelings of power, control, and self-esteem that make the patient value autonomy and thus interest in and desire to participate in healthcare decisions. In this vein,

patient empowerment is volitional (Kalichman et al. 2000; Baker et al. 1999; Kalichman et al.2000). According to Spreitzer (1995), empowerment at the workplace has four dimensions: *meaningfulness* (or relevance), capturing the value of activities, judged in relation to an individual's own ideal of life; *self-efficacy* (or competence), the belief in one's capabilities to produce, by one's actions, the outcomes one desires; *self-determination* (or choice), the idea that one's decisions and choices are one's own, and not imposed by others; and finally *impact*, the notion that one can make a difference in the scheme of things. This concept was transferred to health empowerment, and an operationalization of the concept into a 12-item scale (3 items by 4 dimensions) was successfully used in research (Schulz and Nakamoto 2013; Camerini and Schulz 2012).

According to the health empowerment model (Schulz and Nakamoto 2013), best outcomes will be achieved when the competence-based factor of health literacy coincides with the volitional factor of health empowerment. The model assumes that health literacy without empowerment comes down to a waste of resources: a person's actual ability to contribute to health protection and health care is not used because one does not think one can do much in this respect. And vice versa, the model also holds that high empowerment without sufficient literacy may entice people to detrimental health behaviors: one claims to play an autonomous role in one's own health care but lacks the ability to know or learn what to do.

This article aims at contributing to studying the role of empowerment and health literacy together. It does so using data from a survey of Turkish diabetes patients, which was primarily conducted to produce evidence of the reliability and validity of two health literacy measures translated from the original English into Turkish (Eyüboğlu and Schulz, 2015). The present analysis set out to test three hypotheses:

Hypothesis 1: The higher the patient's health literacy, the more self-care behaviors will s/he show.

Hypothesis 2: The higher the patient's health empowerment, the more self-care behaviors will s/he show.

Hypothesis 3: Most self-care behaviors will be shown by patients with both a high level of literacy and a high level of empowerment.

Hypothesis 3 states an interaction effect of health literacy and empowerment, which of course can be tested only when Hypotheses 1 and 2 are confirmed.

## 2. Methods

### Sampling and procedure

Data were collected between May 30th and November 25th 2013 from outpatients who had an appointment in one of two diabetes clinics in a major Turkish City. Self-administered paper-pencil questionnaires were distributed to outpatients who had been diagnosed with type 1 or type 2 diabetes, and were 18 years or older. Patients were excluded if they had a severely impaired vision (20 patients).

Two collaborators trained in confidentiality, recruitment and data collection procedures distributed and collected the questionnaires. They explained the purpose of the study to the patients, and after obtaining oral consent, they asked the patients to fill in the questionnaire before their meeting with their doctor. Some patients were permitted to answer the questionnaire after seeing the doctor.

### Measures

Two measures were employed for health literacy, First, the reading section of the Short Test of Functional Health Literacy in Adults (S-TOFHLA; Rudd and Keller 2009:243) and second, a set of four screening questions asking matters of respondents' self-perception. Both measures were translated into Turkish for the purposes of this study, which also produced evidence for the reliability and validity (Eyüboğlu and Schulz, 2015). S-TOFHLA is one of the most widely used tests of functional literacy due to its strong reliability and validity data in English. Also it was translated and validated in several languages such as Spanish (Baker et al. 1999), Chinese (Cantonese; Tang et al. 2007) Brazilian Portuguese (Carthery et al. 2009), Serbian (Vranes et al. 2009) and Hebrew (Baron- Epel et al. 2007). The reading comprehension part of S-TOFHLA includes two sections with altogether 36 gaps which have to be filled with the right words in a selection of four formulations. The first section is a text, written for the 4th grade level, on getting prepared for an upper gastrointestinal examination, the other is about patient rights and responsibilities, written for the 10th grade level.

The S-TOFHLA questionnaire is to be operated with a 7-minute time limit, which, however, was not enforced for 135 of the 302 persons originally in the sample. To ensure comparability, all analyses here

are reported for the sub-sample who had the 7-minute limit enforced (n = 167). Mistaking the questionnaire as a test, many participants wished to complete the measure beyond the 7-minute limit.

They were allowed to do so, but the items completed after the 7-minute limit were, as a rule, not noted and not counted for the S-TOFHLA score.

The perception-based screening measure was composed of these items:

(1) How often do you have someone help you read hospital materials?

(2) How confident are you filling out medical forms by yourself?

(3) How often do you have problems learning about your medical condition because of difficulty understanding written information?

(4) How often do you have problems understanding what is told to you about your medical condition?

A total score for the S-TOFLHA was formed by summing up the correct answers. It can run theoretically from 0 to 36, and the distribution covered that total range. For the screening measure, the answer options were 1 = Never to 5 = Always. The second item was reversed and an average score computed for every respondent. Table 1 shows the means and other descriptive information on these and other variables in the study.

Health empowerment was measured by 12 items, three for each of the four dimensions (meaningfulness, self-efficacy, self-determination, impact). The items were factor analyzed and two subscales emerged, one composed of three items on the dimension of impact, the other, composed of three items, on self-determination. Patients were asked to answer the questions on a 7-point Likert scale (1 = Strongly disagree, 7 = Strongly agree).

Self-care behaviors were measured by the Summary of Diabetes Self-Care Activities Measure (Toolbert et al., 1994), which is a brief self-report questionnaire of diabetes self-management. In this study, a revised version of SDSCA was used including items assessing the following aspects of the diabetes regimen: general diet (2 items), specific diet (2 items), exercise (2 items), blood-glucose testing

(2 items), foot care (2 items), and smoking (2 items). The questionnaire inquired, for each of the 12 items, on how many days a week a particular behavior was performed. Answers ranged from 0 to 7. Two items concern smoking behavior and were relevant to smokers only and therefore excluded from the analysis.A composite score based on all 10 items was computed. General diabetes knowledge was measured with 6 true/false items; the number of correct answers was summed up, ranging from 0 to 6.

**Table 1: Overview of variables**

| | Range | M | SD | Skew-ness | Kurt-osis | α |
|---|---|---|---|---|---|---|
| Self-perceived frequency of self-care behaviors, composite score | 0-7 | 3.7 | 1.39 | -0.17 | -.34 | .76 |
| Health literacy, S-TOFHLA | 0-36 | 17.3 | 11.24 | 0.85 | -1.37 | NA |
| Health literacy, screening scale | 1.25-5.00 | 4.1 | 0.72 | -0.89 | 0.85 | .75 |
| Diabetes knowledge | 0-6 | 3.6 | 1.19 | -0.56 | 0.51 | NA |
| Health empowerment: impact | 1.5-7.0 | 5.6 | 1.18 | -1.01 | 0.93 | .81 |
| Health empowerment: self-determination | 1.0-7.0 | 5.0 | 1.48 | -0.43 | -0.53 | .70 |

N = 167

The present study was conducted in collaboration with TUBITAK (Scientific and Technological Research Council of Turkey) and also approved by a committee from this institution.

Data Analysis

The hypotheses were tested in three steps. First bivariate correlations were computed (Pearson's r). Secondly a linear regression model was computed with the composite self-care behaviors score as dependent and the measures for health literacy, empowerment, and knowledge as independent variables. Thirdly similar models were computed for each of the five individual self-care behaviors. Tests for significance were 1-tailed.

## 3.Results

The sample is diverse and spreads well across gender, age groups, education groups and income. Table 2 shows the distribution of these variables, showing that women were overrepresented.

**Table 2: Socio-demographic characteristics of sample**

| | (*n* = 167) | | (*n* = 167) |
|---|---|---|---|
| Age – mean (SD) | 51.6 (14.24) | Marital status – % married | 79.6 |
| Gender – female | 65.3% | *Income in Turkish Lira (%)* | |
| *Education (%)* | | < 775 | 8.4 |
| <5$^{th}$ grade (elementary school) | 8.4 | 776–1500 | 24.0 |
| 6$^{th}$–8$^{th}$ grade (secondary school) | 9.0 | 1501–2500 | 27.5 |
| 9$^{th}$–11$^{th}$ grade (High school) | 41.9 | >2500 | 37.7 |
| University | 40.7 | | |

The measured variables distribute mostly around means somewhat on the positive side of the scales, that is towards frequent self-care behavior, high literacy, high knowledge and high empowerment. Aside from the more or less normal distribution around the mean, some of them show a modal value (or a second modal) at the extreme positive end. Table 2 shows the details of the distributions. As skewness and kurtosis were within the acceptable range, we decided the use of Pearson's r and linear regression modeling was justified.

Bivariate correlations show strong relationships between empowerment and frequency of self-care behaviors, as hypothesized. The correlations between health literacy and self-care behaviors, however, did not reach significance. The hypothesis pertaining to health literacy was thus not supported. Table 3 gives the correlation coefficients in overview.

In addition, Table 3 reveals some more interesting relationships. The two measures of health literacy and respectively the two measures of health empowerment were strongly or very strongly related. Secondly, the perception-based screening measure of health literacy was correlated with both empowerment measures, that is the two independent variables were related, but only for the screening

measure. The performance-based S-TOFHLA was not related to either of the two empowerment measures. Thirdly, diabetes knowledge (similar to health literacy) was unrelated to frequency of self-care behaviors, and there was a relationship between knowledge and the screening literacy indicator. Fourthly, and interestingly, diabetes knowledge and the empowerment dimensions of impact and self-determination were correlated.

This means, for the possible relationships between the independent and the dependent variables, that empowerment was related to outcomes, while health literacy and knowledge were not. For relationships among independent variables, we can see that the performance-based word understanding part of S-TOFHLA was related only to the other, perception-based measure of health literacy and unrelated to knowledge or empowerment. The perception-based measure, in turn, was related to knowledge and empowerment. Surprisingly, diabetes knowledge turned out to be more highly correlated with empowerment than with literacy.

**Table 3: Bivariate correlations**

| | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 1 Self-perceived frequency of self-care behaviors, composite score | .01 | .06 | .11 | .39 *** | .30 *** |
| 2 Health literacy, S-TOFHLA | | .32 *** | .05 | .02 | .08 |
| 3 Health literacy, screening scale | | | .16 * | .31 *** | .21 ** |
| 4 Diabetes knowledge | | | | .31*** | .18 * |
| 5 Health empowerment: impact | | | | | .53 *** |
| 6 Health empowerment: self-determination | | | | | |

Note: coefficients are Pearson's r. #p < .10, *p < .05, **p < .01, ***p < .001; 1-tailed tests

The final step in the analyses is stepwise linear regression models to assess the relative contributions of literacy, empowerment and knowledge to self-care behavior in diabetes patients. The first regression model uses the composite score of self-reported frequency of self-care behavior as dependent variable and is shown in some detail in Table 4. The result is straightforwardly clear: no independent variable has an effect on outcome beyond the effect of the impact dimension of health empowerment. It is

especially clear that health literacy and knowledge have no independent effect on the frequency of self-care behavior.

**Table 4: Stepwise regression of composite score of frequency of self-care behavior**

| | Model 1<br>b | Model 2<br>b | Model 3<br>b |
|---|---|---|---|
| Block 1 | | | |
| Health empowerment: impact | .336 *** | .343 *** | .367 *** |
| Health empowerment: self-determination | .117 | .117 | .121 |
| $R^2$ | (.168) | | |
| Block 2 | | | |
| Diabetes knowledge | | -.024 | -.017 |
| Change in $R^2$ | | (.001) | |
| Block 3 | | | |
| Health literacy, S-TOFHLA | | | .002 |
| Health literacy, screening scale | | | -.089 |
| Change in $R^2$ | | | (.007) |

Dependent variable is the Self-perceived frequency of self-care behaviors, composite score. #p < .10, *p < .05, **p < .01, ***p < .001

Table 5 shows results from similar regressions with the self-perceived frequency of single self-care behaviors as dependent variables, but shows only the final Model 3 in each case. There are only few findings that deviate from the results for the composite score. For the frequency of following the demands of a diabetes-specific dieting behavior, the predictive power of the empowerment dimension of impact becomes weaker but is still significant, and there is a marginally significant but negative effect of the screening measure of health literacy, suggesting that patients with a self-perception indicating high literacy tend to be less careful in following specific dieting advice. Measuring blood sugar and foot care are not predicted by any of the independent variables, except a marginally significant effect of the empowerment dimension of impact on foot care behavior. By and large, these regressions confirm the result obtained by regressing the composite score on the independent variables.

**Table 5: Stepwise regression of frequency of five different self-care behaviors**

| | General dieting | Specific dieting | Exercise | Measuring blood sugar | Foot care |
|---|---|---|---|---|---|
| Block 1 | | | | | |
| Health empowerment: impact | .508 *** | .205 * | .263 *** | .135 | .171# |
| Health empowerment: self-determination | -.034 | .109 | .199* | .068 | .099 |
| $R^2$ | (.241) | (.053) | (.134) | (.031) | (.038) |
| Block 2 | | | | | |
| Diabetes knowledge | -.006 | .006 | -.033 | .049 | -.057 |
| Change in $R^2$ | (.000) | (.000) | (.001) | (.001) | (.003) |
| Block 3 | | | | | |
| Health literacy, S-TOFHLA | .002 | -.072 | .063 | -.131 | .110 |
| Health literacy, screening scale | .006 | -.149# | -.108 | -.040 | -.104 |
| Change in $R^2$ | (.000) | (.032 | (.010) | (.022) | (.015) |

#p < .10, *p < .05, **p < .01, ***p < .001

## 4. Results and Discussion

The most important result is that Hypothesis 2 was confirmed: health empowerment, and in particular its dimensions of impact and self-determination are significant predictors of the self-perceived frequency of self-care behavior in Turkish diabetes patients, though self-determination has no effect beyond impact. Hypothesis 1, though, which stated a similar role for health literacy, could not be supported at all. And because of that, Hypothesis 3 could not be pursued in the analysis, and nothing can be said about an interaction effect of health literacy and empowerment on self-care behavior.

This result could indicate that diabetes self-care behaviors are so easily understood or so well related to patients in the two clinics that health literacy makes no difference. In other words people with low levels of health literacy show these behaviors as frequently as patients with higher levels of literacy because they understand them as well as other patients. And that level of understanding could mean that the advice is so simple that it does not require higher cognitive abilities to be understood, or that it is explained so well that the limits of lower levels of health literacy are overcome. The opposite could also be true: self-care advice is so complicated or so badly communicated that even patients with high levels of health literacy do not get it. The high level of compliance with self-care advice, however, speaks against this interpretation.

That impact as one dimension of health empowerment should be related with self-care behavior suggests that one's behavior goes along with the subjective impression that it matters. This is not necessarily evidence of an effect of the impression (i.e. empowerment) on the behavior. It might just be the other way round and the causal direction be reversed. Some patients trying out the dieting and exercise advice they are given will find that the advice is good for them, while others might not experience such benefits. The former would come to believe that their behavior matters, while the latter would not draw such conclusions. The correlation between impact and self-care behavior might be created by people doing it because they believe in it, but it might as well be created by people generalizing their experience with dieting and exercise behavior to the conclusion that their habits in this respect do matter. Rather than seeing the correlation as evidence of an effect of high empowerment on healthy behaviors, one can see it as the consequence of positive experience with healthy behaviors which might have changed one's assessment of one's empowerment, respectively of its dimension that attributes beneficial consequences to one's own behavior.

The other dimension of empowerment in the study, self-determination or choice, aims at the subjective impression that one is free to choose among various behavioral alternatives. That this impression was hardly related to self-care behaviors in the regression analyses might have to do with the high demands that a chronic disease such as diabetes puts on patients. The impression that one has a choice in dealing with diabetes might very well clash with patients' experience of the demands and restrictions. Patients will get more advice the more severe their condition becomes, and some will just be more sensitive than others to the restrictions that go along with advice. An objectively or subjectively high amount of

advice can easily be perceived as restricting one's choice, while at the same time the advice is followed, but not out of a sense of choice but of duty, or experience, or a sense of compliance. A large amount of advice might thus have differential effects on behavior and one's sense of choice. This would mitigate the possible relationship between sense of choice and beneficial self-care behaviors.

Measuring blood glucose levels and foot care were found to be less predictable than general and specific dieting and exercise. This might be explained by an effect of necessity on frequency of behavior. At a certain level of severity, the diabetes condition requires frequent measuring of glucose levels, and bad experience might entice patients to examine their feet regularly. In as much as medical necessity impacts the frequency of these two behaviors the potential for an effect of a volitional factor such as empowerment will be reduced. Something similar might be at work with the reduced influence on specific dieting compared to general dieting: following specific dieting advice might be more often dictated by medical necessity than following general advice.

The differential impact of empowerment and health literacy found in this study highlights a difference in outcomes that might be related with the two factors. Health literacy aims at the ability to understand medical subjects in order that patients can take a higher share in decision-making, mostly in decisions about therapy. It might therefore be strongly linked to outcomes that have to do with medical decision-making. Empowerment on the other hand, aiming at factors such as self-perceived choice, perceived self-efficacy and the self-assessed consequences of health behavior, seems much better suited to explain habitual behavior. The outcome in this study, diabetes self-care, belongs to habitual behaviors. This could explain why empowerment had an effect on this outcome and health literacy had none.

Knowledge was found to be more strongly related to empowerment than to health literacy. This is a surprising result because knowledge is often conceived of as a dimension of health (Schulz and Nakamoto 2013), and some very common measures of health literacy such as the REALM (Davis et al.1993) can be interpreted as knowledge tests. This could arise from a particular quality of the illness. Since it chronically affects people's life, diabetes self-care requires to consider both metabolic and life style factors. So, patients make many diabetes-related choices in their daily life which enable them to find out the healthiest options by experience. Knowledge obtained in that way may change the

motivational skills of patients in a positive way. The way patients get informed about their illnesses by experience, which may be the most common among diabetes patients, could motivate people to become more empowered.

The perception-based screening question was more strongly linked with the other independent variables of knowledge and empowerment than the performance-based newly translated S-TOFHLA. Correlation between these variables, though not the focus of this study, is expected. That the Turkish translation of S-TOFHLA produces no correlation with knowledge, empowerment or outcomes casts some doubt on the validity of the instrument. Demonstrating this validity actually was a purpose of this study, and evidence of construct validity was found by correlating the measure with known predictors of health literacy (Williams et al. 1998; Gazmararian et al. 2003; Schillinger et al. 2002; Arnold et al. 2001). The lack of correlations in the analysis reported in this article calls for putting the measure to the test again.

**4.1 Conclusion**

Findings of this study suggest that empowerment affects habitual self-management behaviors. Patients with chronic conditions may need motivational skills more badly than reading skills to manage their diseases.

**4.2 Acknowledgement**

This research study obtained written consent of Turkish Diabetes Foundation's ethical committee. The authors thank the Lugano University Institute of Communication and Health and TUBITAK(Scientific and Technological Research Council of Turkey) for funding this research. Also the authors are so thankful for the Turkish Diabetes Foundation's kind support during the data collection process.

**Competing Interests**
None declared

**Data Sharing Statement**
There is no additional data. All the data is shared in this original study.

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**Contributors:** Both authors of the article designed this study. Ezgi Eyüboğlu arranged meeting with the diabetes patients and conducted the questionnaire. Peter Schulz carried out the data analyses and reported initial findings. Both authors contributed to the discussion and conclusion part.

STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | √1 | √(*a*) Indicate the study's design with a commonly used term in the title or the abstract |
| | | √ (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | | |
| Background/rationale | √2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | √3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | | |
| Study design | √4 | Present key elements of study design early in the paper |
| Setting | √5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | √6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>√*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case |
| Variables | √7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | √8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | √9 | Describe any efforts to address potential sources of bias |
| Study size | √10 | Explain how the study size was arrived at |
| Quantitative variables | √11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | √12 | √ (*a*) Describe all statistical methods, including those used to control for confounding |
| | | √ (*b*) Describe any methods used to examine subgroups and interactions |
| | | √ (*c*) Explain how missing data were addressed |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>√*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy |
| | | (*e*) Describe any sensitivity analyses |

Continued on next page

| | | |
|---|---|---|
| **Results** | | |
| Participants | √13* | √ (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
| | | √ (b) Give reasons for non-participation at each stage |
| | | (c) Consider use of a flow diagram |
| Descriptive data | √14* | √ (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
| | | √ (b) Indicate number of participants with missing data for each variable of interest |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount) |
| Outcome data | √15* | *Cohort study*—Report numbers of outcome events or summary measures over time |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure |
| | | √*Cross-sectional study*—Report numbers of outcome events or summary measures |
| Main results | √16 | √ (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| | | √ (*b*) Report category boundaries when continuous variables were categorized |
| | | √ (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | √17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses |
| **Discussion** | | |
| Key results | √18 | Summarise key results with reference to study objectives |
| Limitations | √19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | √20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | √21 | Discuss the generalisability (external validity) of the study results |
| **Other information** | | |
| Funding | √22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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# Effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey

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# Effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey

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**Keywords**: Health Literacy, Patient Empowerment, Self-Care Behavior, Diabetes Management

**Abstract**

**Objective:** This study aimed to assess the impact of health literacy and patient empowerment on self-care behavior in patients in metropolitan Turkish diabetes centers. The conceptual background is provided by the psychological health empowerment model, which holds that health literacy without patient empowerment comes down to wasting health resources, while empowerment without health literacy can lead to dangerous or suboptimal health behavior.

**Design, Setting and Participants:** A cross- sectional study was conducted with 167 diabetes patients over the age of 18 from one of two diabetes clinics in a major Turkish City. Self-administered questionnaires were distributed to eligible outpatients who had an appointment in one of the clinics. Health literacy was measured by a newly translated Turkish version of S-TOFHLA and the Chew self- report scale. Patient empowerment was measured by a 12-item scale based on Spreitzer's conceptualization of psychological empowerment in the workplace. Self-care behavior was measured by SDSCA. Level of diabetes knowledge was measured by Diabetes Knowledge Test.

**Results:** Two subscales of empowerment, impact and self-determination, predicted self-reported frequency of self-care behaviors. Neither health literacy nor diabetes knowledge had an effect on self-care behaviors.

**Conclusion**: Health literacy might be more effective in clinical decisions while empowerment might exert a stronger influence on habitual health behaviors.

**Word Count**:4060

**Strength and Limitations of the Study**

- This is the first study in Turkey trying to get evidence about effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey.
- Sample of the study is not representative of the Turkish population.

## 1. Background

Health literacy has increasingly been recognized as a factor in health behaviors, health care and health itself. Research shows that low or inadequate health literacy is associated with poor adherence to medical regimens, poor understanding of health issues, a lack of knowledge about medical care and conditions, poorer comprehension of medical information, low understanding and use of preventive services, poorer overall health status, and earlier death[1-3]. Furthermore, individuals with chronic diseases (e.g., diabetes, high blood pressure, and heart disease) and limited health literacy have less understanding of their disease and experience more negative outcomes than individuals with higher health literacy.[4-10] Based on such findings, a high level of health literacy is expected to have beneficial effects on people's health.

Health literacy is defined as the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions[11]". The definition highlights the fact that health literacy is ability. The hope that by increasing health literacy, beneficial consequences for people's health are achieved rests on the assumption that this ability is used when people make decisions about health- related behaviors. But ability is not always implemented as behavior. One can have an ability to make sound health decisions but still prefer to leave decisions to health care providers. As one can choose not to use one's ability, one can also claim to have a say in medical decisions when one's health literacy is actually too low for that. This raises the question of how the ability called health literacy translates into behavior and decisions.

One way to approach this question is to add health empowerment to the picture. Health empowerment is defined as the subjective feelings of power, control, and self-esteem that make the patient value autonomy—and thus interest in and desire to participate in healthcare decisions. In this vein, patient empowerment is volitional[12,13]. According to Spreitzer"[14] empowerment at the workplace has four dimensions: *meaningfulness* (or relevance), capturing the value of activities, judged in relation to an individual's own ideal of life; *self-efficacy* (or competence), the belief in one's capabilities to produce, by one's actions, the outcomes one desires; *self-determination* (or choice), the idea that

one's decisions and choices are one's own, and not imposed by others; and finally *impact*, the notion that one can make a difference in the scheme of things. This concept was transferred to health empowerment, and an operationalization of the concept into a 12-item scale (3 items by 4 dimensions) was successfully used in research.[12,13]

According to the health empowerment model[12], best outcomes will be achieved when the competence-based factor of health literacy coincides with the volitional factor of health empowerment. The model assumes that health literacy without empowerment comes down to a waste of resources: a person's actual ability to contribute to health protection and health care is not used because one does not think one can do much in this respect. And vice versa, the model also holds that high empowerment without sufficient literacy may entice people to detrimental health behaviors: one claims to play an autonomous role in one's own health care but lacks the ability to know or learn what to do.

This article aims at contributing to studying the role of empowerment and health literacy together. It does so using data from a survey of Turkish diabetes patients, which was primarily conducted to produce evidence of the reliability and validity of two health literacy measures translated from the original English into Turkish[15]. The present analysis set out to test three hypotheses:

Hypothesis 1: The higher the patient's health literacy, the more appropriate self-care behaviors will s/he show.

Hypothesis 2: The higher the patient's health empowerment, the more appropriate self-care behaviors will s/he show.

Hypothesis 3: Most appropriate self-care behaviors will be shown by patients with both a high level of literacy and a high level of empowerment.

Hypothesis 3 states an interaction effect of health literacy and empowerment, which of course can be tested only when Hypotheses 1 and 2 are confirmed.

## 2. Methods

Sampling and procedure

Data were collected between May 30th and November 25th 2013 from outpatients who had an appointment in one of two diabetes clinics in a major Turkish City. Self-administered paper-pencil questionnaires were distributed to outpatients who had been diagnosed with type 1 or type 2 diabetes, and were 18 years or older. Patients were excluded if they had a severely impaired vision (20 patients). We approached 321 patients, 19 of whom refused to participate, leaving a sample of 302 at a

response rate of 94%. Due to an irregularity in the application of one of the measures, 135 respondents had to be excluded from the analyses in this study, setting its sample at 167 patients.

Two collaborators trained in confidentiality, recruitment and data collection procedures distributed and collected the questionnaires. They explained the purpose of the study to the patients, and after obtaining oral consent, they asked the patients to fill in the questionnaire before their meeting with their doctor. Some patients were permitted to answer the questionnaire after seeing the doctor.

Measures

Two measures were employed for health literacy, First, the reading section of the Short Test of Functional Health Literacy in Adults[16] (S-TOFHLA); and second, a set of four screening questions asking matters of respondents' self-perception. S-TOFHLA is one of the most widely used tests of functional literacy due to its strong reliability and validity data in English. Also it was translated and validated in several languages such as Spanish[9], Chinese, [17] Brazilian Portuguese[18], Serbian[19] and Hebrew[20]. The reading comprehension part of S-TOFHLA includes two texts with altogether 36 gaps and, for each gap, a selection of four formulations to fill it. The first section is a text, written for the 4$^{th}$ grade level, on getting prepared for an upper gastrointestinal examination, the other is about patient rights and responsibilities, written for the 10$^{th}$ grade level.

The S-TOFHLA[9] questionnaire is to be operated with a 7-minute time limit, which, however, was not enforced for 135 of the 302 persons originally in the sample. To ensure comparability, all analyses here are reported for the sub-sample who had the 7-minute limit enforced (n = 167).

Mistaking the questionnaire as a test, many participants wished to complete the measure beyond the 7-minute limit. They were allowed to do so, but the items completed after the 7-minute limit were, as a rule, not noted and not counted for the S-TOFHLA score.

The perception-based screening measure was composed of these items:

(1) How often do you have someone help you read hospital materials?

(2) How confident are you filling out medical forms by yourself?

(3) How often do you have problems learning about your medical condition because of difficulty understanding written information?

(4) How often do you have problems understanding what is told to you about your medical condition?

A total score for the S-TOFLHA was formed by summing up the correct answers. It can run theoretically from 0 to 36, and the distribution covered that total range. For the screening measure, the

answer options were 1 = Never to 5 = Always. The second item was reversed and an average score computed for every respondent. Table 1 shows the means and other descriptive information on these and other variables in the study.

Health empowerment was measured by 12 the Psychological Health Empowerment scale[12-13] with 12 items, three for each of the four dimensions (meaningfulness, self-efficacy, self-determination, impact). This measurement was adapted to the field of health from Spreitzer's[14] conceptualization of psychological empowerment in the workplace. Patients were asked to answer the questions on a 7-point Likert scale (1 = Strongly disagree, 7 = Strongly agree).The items were factor analyzed and two subscales emerged, one composed of three items on the dimension of impact, the other, composed of three items on self-determination.

Self-care behaviors were measured by the Summary of Diabetes Self-Care Activities Measure[21], which is a brief self-report questionnaire of diabetes self-management. In this study, a revised version of SDSCA was used including items assessing the following aspects of the diabetes regimen: general diet (2 items), specific diet (2 items), exercise (2 items), blood-glucose testing (2 items), foot care (2 items), and smoking (2 items). The questionnaire inquired, for each of the 12 items, on how many days a week a particular behavior was performed. Answers ranged from 0 to 7. Two items concern smoking behavior and were relevant to smokers only and therefore excluded from the analysis. A composite score based on all 10 items was computed. General diabetes knowledge was measured with 6 true/false items; the number of correct answers was summed up, ranging from 0 to 6.

Diabetes knowledge was measured by the Diabetes Knowledge Test[22], which consists of ten statements regarding Type 1 and Type 2 Diabetes and the answer options 'yes', 'no' and 'don't know'.

The original English version of the S-TOFHLA[9], Chew[23], the Health Empowerment Scale,[12-13], the Diabetes Knowledge Test[22] and the Summary of Diabetes Self-Care Activities Measure[21] were translated by a philologist and native speaker of Turkish. Owing to differences in language structure, some of the gaps in the S-TOFHLA reading material had to be shifted to different places in the text. The translation was done with the aim in view that an average patient able to understand basic expressions would also be able to comprehend the text. Technical terms and any kind of jargons were avoided. Back translation was carried out by another philologist fluent in English to see whether differences between the original English and the Turkish version would arise. Besides, cultural adaptation was taken into consideration during the whole translation process. The translation excluded

the four numeracy items of the original S-TOFHLA. A pre-test with 120 participants, using cognitive interviewing, necessitated a few revisions. Table 1 shows the reliability of the measures in comparison with the original values.

**Table 1: Cronbach's alpha of the Measures**

| Measurements | Present Study | Original |
|---|---|---|
| S-TOFHLA | .81 | .98 |
| Summary of Diabetes Self-Care Activities Measure | .71 | .80 |
| Psychological Empowerment Scale | .87 | .71 |
| Diabetes Knowledge Scale | .74 | .89 |

The present study was conducted in collaboration with TUBITAK (Scientific and Technological Research Council of Turkey) and also approved by a committee from this institution.

Data Analysis

The hypotheses were tested in three steps. First bivariate correlations were computed (Pearson's r). Secondly a linear regression model was computed with the composite self-care behaviors score as dependent and the measures for health literacy, empowerment, and knowledge as independent variables. Thirdly similar models were computed for each of the five individual self-care behaviors. Tests for significance were 1-tailed.

## 3.Results

The sample is diverse and spreads well across gender, age groups, education groups and income. Table 2 shows the distribution of these variables, showing that women were overrepresented.

**Table 2: Socio-demographic characteristics of sample**

| | (*n* = 167) | | (*n* = 167) |
|---|---|---|---|
| Age – mean (SD) | 51.6 (14.24) | Marital status – % married | 79.6 |
| Gender – female | 65.3% | *Income in Turkish Lira (%)* | |
| *Education (%)* | | < 775 | 8.4 |
| <5$^{th}$ grade (elementary school) | 8.4 | 776–1500 | 24.0 |
| 6$^{th}$–8$^{th}$ grade (secondary school) | 9.0 | 1501–2500 | 27.5 |
| 9$^{th}$–11$^{th}$ grade (High school) | 41.9 | >2500 | 37.7 |
| University | 40.7 | | |

The measured variables distribute mostly around means somewhat on the positive side of the scales, that is towards frequent self-care behavior, high literacy, high knowledge and high empowerment. Aside from the more or less normal distribution around the mean, some of them show a modal value (or a second modal) at the extreme positive end. Table 3 shows the details of the distributions. As skewness and kurtosis were within the acceptable range, we decided the use of Pearson's r and linear regression modeling was justified.

**Table 3: Overview of variables**

| | Range | M | SD | Skew-ness | Kurt-osis | α |
|---|---|---|---|---|---|---|
| Self-perceived frequency of self-care behaviors, composite score | 0-7 | 3.7 | 1.39 | -0.17 | -.34 | .76 |
| Health literacy, S-TOFHLA | 0-36 | 17.3 | 11.24 | 0.85 | -1.37 | NA |
| Health literacy, screening scale | 1.25-5.00 | 4.1 | 0.72 | -0.89 | 0.85 | .75 |
| Diabetes knowledge | 0-6 | 3.6 | 1.19 | -0.56 | 0.51 | NA |
| Health empowerment: impact | 1.5-7.0 | 5.6 | 1.18 | -1.01 | 0.93 | .81 |
| Health empowerment: self-determination | 1.0-7.0 | 5.0 | 1.48 | -0.43 | -0.53 | .70 |

N = 167

Bivariate correlations show comparatively strong relationships between empowerment and frequency of self-care behaviors, as hypothesized. The correlations between health literacy and self-care behaviors, however, did not reach significance. Hypothesis 2, pertaining to patient empowerment, was thus confirmed, while Hypothesis 1, pertaining to health literacy was thus not supported. Table 4 gives the correlation coefficients in overview.

In addition, Table 4 reveals some more interesting relationships. The two measures of health literacy were relatively strongly related, and so were the two measures of health empowerment. Secondly, the screening measure of health literacy was correlated with both empowerment measures, but S-TOFHLA was not related to either. That means the two independent variables were related, but only for the screening measure of health literacy. Thirdly, diabetes knowledge (similar to health literacy) was unrelated to frequency of self- care behaviors, and there was a relationship between knowledge and the screening literacy indicator. Fourthly, and interestingly, diabetes knowledge and the empowerment dimensions of impact and self- determination were correlated.

**Table 4: Bivariate correlations**

| | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 1 Self-perceived frequency of self-care behaviors, composite score | .01 | .06 | .11 | .39 *** | .30 *** |
| 2 Health literacy, S-TOFHLA | | .32 *** | .05 | .02 | .08 |
| 3 Health literacy, screening scale | | | .16 * | .31 *** | .21 ** |
| 4 Diabetes knowledge | | | | .31*** | .18 * |
| 5 Health empowerment: impact | | | | | .53 *** |
| 6 Health empowerment: self-determination | | | | | |

Note: coefficients are Pearson's r. #p < .10, *p < .05, **p < .01, ***p < .001; 1-tailed tests

The final step in the analyses is linear regression models, controlled for gender, age and education (not shown), to assess the relative contributions of literacy, empowerment and knowledge to self-care

behavior in diabetes patients. The first regression model uses the composite score of self-reported frequency of self-care behavior as dependent variable and is shown in the first column in Table 5. The result is straightforwardly clear: no independent variable has an effect on outcome beyond the effect of the impact dimension of health empowerment. It is especially clear that health literacy and knowledge have no independent effect on the frequency of self- care behavior. Therefore, no interaction terms were entered into the regression analysis, as the bivariate correlations had already suggested.

Table 5 shows results from similar regressions with the self-perceived frequency of single self-care behaviors as dependent variables. There are only few findings that deviate from the results for the composite score. For the frequency of following the demands of a diabetes-specific dieting behavior, the predictive power of the empowerment dimension of impact becomes weaker but is still marginally significant. Measuring blood sugar and foot care are not predicted by any of the independent variables. By and large, these regressions confirm the result obtained by regressing the composite score on the independent variables.

**Table 5: Regression of frequency of self-care behaviors**

| | Frequency of self-care behaviors, composite score | General dieting | Specific dieting | Exercise | Measuring blood sugar | Foot care |
|---|---|---|---|---|---|---|
| Health empowerment: impact | .278** | .424*** | .169# | .239** | .062 | .120 |
| Health empowerment: self-determination | .151# | .017 | .127 | .187* | .080 | .132 |
| Diabetes knowledge | .019 | .003 | .053 | -.046 | .086 | -.036 |
| Health literacy, S-TOFHLA | .045 | -.042 | -.023 | .096 | -.061 | .138 |
| Health literacy, screening scale | -.041 | .023 | -.107 | -.113 | -.002 | -.058 |
| $R^2$ | (.20) | (.22) | (.09) | (.17) | (.12) | (.10) |

#p < .10, *p < .05, **p < .01, ***p < .001

## 4. Discussion

The most important result is that Hypothesis 2 was confirmed: health empowerment, and in particular its dimensions of impact and self-determination are significant predictors of the self-perceived frequency of self-care behavior in Turkish diabetes patients, though self-determination has no effect beyond impact. Hypothesis 1, though, which stated a similar role for health literacy, could not be supported at all. And because of that, Hypothesis 3 could not be pursued in the analysis, and nothing can be said about an interaction effect of health literacy and empowerment on self-care behavior.

This result could indicate that diabetes self-care behaviors are so easily understood or so well related to patients in the two clinics that health literacy makes no difference. In other words people with low levels of health literacy show these behaviors as frequently as patients with higher levels of literacy because they understand them as well as other patients. And that level of understanding could mean that the advice is so simple that it does not require higher cognitive abilities to be understood, or that it is explained so well that the limits of lower levels of health literacy are overcome. The opposite could also be true: self-care advice is so complicated or so badly communicated that even patients with high levels of health literacy do not get it. The high level of compliance with self-care advice, however, speaks against this interpretation.

Looking next at the dimensions of health empowerment that were shown to be related with self-care behavior, the influence of the dimension of impact suggests that one's behavior goes along with the subjective impression that it matters. This is not necessarily evidence of an effect of the impression (i.e. empowerment) on the behavior. It might just be the other way round and the causal direction be reversed. Some patients trying out the dieting and exercise advice they are given will find that the advice is good for them, while others might not experience such benefits. The former would come to believe that their behavior matters, while the latter would not draw such conclusions. The correlation between impact and self-care behavior might be created by people doing it because they believe in it, but it might as well be created by people generalizing their experience with dieting and exercise behavior to the conclusion that their habits in this respect do matter. Rather than seeing the correlation as evidence of an effect of high empowerment on healthy behaviors, one can see it as the consequence of positive experience with healthy behaviors which might have changed one's

assessment of one's empowerment, respectively of its dimension that attributes beneficial consequences to one's own behavior.

The other dimension of empowerment in the study, self-determination or choice, aims at the subjective impression that one is free to choose among various behavioral alternatives. That this impression was hardly related to self-care behaviors in the regression analyses might have to do with the high demands that a chronic disease such as diabetes puts on patients. The impression that one has a choice in dealing with diabetes might very well clash with patients' experience of the demands and restrictions. Patients will get more advice the more severe their condition becomes, and some will just be more sensitive than others to the restrictions that go along with advice. An objectively or subjectively high amount of advice can easily be perceived as restricting one's choice, while at the same time the advice is followed, but not out of a sense of choice but of duty, or experience, or a sense of compliance. A large amount of advice might thus have differential effects on behavior and one's sense of choice. This would mitigate the possible relationship between sense of choice and beneficial self-care behaviors.

Looking at the different aspects of self-care, measuring blood glucose levels and foot care were found to be less predictable than general and specific dieting and exercise. This might be explained by an effect of necessity on frequency of behavior. At a certain level of severity, the diabetes condition requires frequent measuring of glucose levels, and bad experience might entice patients to examine their feet regularly. In as much as medical necessity impacts the frequency of these two behaviors the potential for an effect of a volitional factor such as empowerment will be reduced. Something similar might be at work with the reduced influence on specific dieting compared to general dieting: following specific dieting advice might be more often dictated by medical necessity than following general advice.

The differential impact of empowerment and health literacy found in this study highlights a difference in outcomes that might be related with the two factors. Health literacy aims at the ability to understand medical subjects in order that patients can take a higher share in decision-making, mostly in decisions about therapy. It might therefore be strongly linked to outcomes that have to do with medical decision-making. Empowerment on the other hand, aiming at factors such as self-perceived choice, perceived

self-efficacy and the self-assessed consequences of health behavior, seems much better suited to explain habitual behavior. The outcome in this study, diabetes self-care, belongs to habitual behaviors. This could explain why empowerment had an effect on this outcome and health literacy had none.

Knowledge was found to be more strongly related to empowerment than to health literacy. This is a surprising result because knowledge is often conceived of as a dimension of health literacy[17], and some very common measures of health literacy such as the REALM[24] can be interpreted as knowledge tests. This could arise from a particular quality of the illness. Since it chronically affects people's life, diabetes self-care requires to consider both metabolic and life style factors. So, patients make many diabetes-related choices in their daily life which enable them to find out the healthiest options by experience. Knowledge obtained in that way may change the motivational skills of patients in a positive way. The way patients get informed about their illnesses by experience, which may be the most common among diabetes patients, could motivate people to become more empowered.

The perception-based screening question was more strongly linked with the other independent variables of knowledge and empowerment than the performance-based newly translated S-TOFHLA. Correlation between these variables, though not the focus of this study, is expected. That the Turkish translation of S-TOFHLA produces no correlation with knowledge, empowerment or outcomes might make one question the validity of the instrument. An earlier study,[1] however, which was based on the same dataset as the present article, found broad evidence of construct validity by correlating the measure with known predictors of health literacy[3-5,25]. The lack of correlations in the analysis reported in this article calls for putting the measure to the test again having another look into this matter, based on new data.

This study was motivated by presenting empirical evidence for a key feature of the health empowerment model: the necessity of both high health literacy and high empowerment for reaching a beneficial level of patient involvement in healthcare decisions and behaviors. The study found, though, that for diabetes self-care, health literacy did not matter much, while empowerment did. This suggests that patients with the desire to get involved do not necessarily have to show higher levels of health literacy to avoid risking to make mistakes. The role of dangerous self-managers, conceived in the

model as persons with high empowerment and low literacy, appears to be contingent on conditions, which need to be conceptually and empirically studied in more depth.

That type 1 and type 2 diabetes patients' self-care behavior was measured with the same items and scales counts among the limitations of this study. The self-care behaviors in question apply, in one form or another, to both groups of patients, but in detail different recommendations may be made to them. Therefore similar behaviors might be right for some and wrong for other patients. A more specified consideration is necessary.

### 4.1 Conclusion

Findings of this study suggest that empowerment affects habitual self-management behaviors. Patients with chronic conditions may need motivational skills more badly than reading skills to manage their diseases.

### 4.2 Acknowledgement

This research study obtained written consent of Turkish Diabetes Foundation's ethical committee. The authors thank the Lugano University Institute of Communication and Health and TUBITAK(Scientific and Technological Research Council of Turkey) for funding this research. Also the authors are so thankful for the Turkish Diabetes Foundation's kind support during the data collection process.

**Contributors:** Both authors of the article designed this study. Ezgi Eyüboğlu arranged meeting with the diabetes patients and conducted the questionnaire. Peter Schulz carried out the data analyses and reported initial findings. Both authors contributed to the discussion and conclusion part.

**Data sharing:** No additional data available.

**Competing interests:** None.

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STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | √1 | √(*a*) Indicate the study's design with a commonly used term in the title or the abstract |
| | | √ (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | | |
| Background/rationale | √2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | √3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | | |
| Study design | √4 | Present key elements of study design early in the paper |
| Setting | √5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | √6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>√*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case |
| Variables | √7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | √8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | √9 | Describe any efforts to address potential sources of bias |
| Study size | √10 | Explain how the study size was arrived at |
| Quantitative variables | √11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | √12 | √ (*a*) Describe all statistical methods, including those used to control for confounding |
| | | √ (*b*) Describe any methods used to examine subgroups and interactions |
| | | √ (*c*) Explain how missing data were addressed |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>√*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy |
| | | (*e*) Describe any sensitivity analyses |

Continued on next page

| | | |
|---|---|---|
| **Results** | | |
| Participants | √13* | √ (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
| | | √ (b) Give reasons for non-participation at each stage |
| | | (c) Consider use of a flow diagram |
| Descriptive data | √14* | √ (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
| | | √ (b) Indicate number of participants with missing data for each variable of interest |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount) |
| Outcome data | √15* | *Cohort study*—Report numbers of outcome events or summary measures over time |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure |
| | | √*Cross-sectional study*—Report numbers of outcome events or summary measures |
| Main results | √16 | √ (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| | | √ (*b*) Report category boundaries when continuous variables were categorized |
| | | √ (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | √17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses |
| **Discussion** | | |
| Key results | √18 | Summarise key results with reference to study objectives |
| Limitations | √19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | √20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | √21 | Discuss the generalisability (external validity) of the study results |
| **Other information** | | |
| Funding | √22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

# Do health literacy and patient empowerment affect self-care behavior? A survey study among Turkish diabetes patients

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| | |

# Do health literacy and patient empowerment affect self-care behavior? A survey study among Turkish diabetes patients

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**Keywords**: Health Literacy, Patient Empowerment, Self-Care Behavior, Diabetes Management

**Abstract**

**Objective:** This study aimed to assess the impact of health literacy and patient empowerment on diabetes self- care behavior in patients in metropolitan Turkish diabetes centers. The conceptual background is provided by the psychological health empowerment model, which holds that health literacy without patient empowerment comes down to wasting health resources, while empowerment without health literacy can lead to dangerous or suboptimal health behavior.

**Design, Setting and Participants:** A cross- sectional study was conducted with 167 patients over the age of 18 from one of two diabetes clinics in a major Turkish City. Self-administered questionnaires were distributed to eligible outpatients who had an appointment in one of the clinics. Health literacy was measured by a newly translated Turkish version of S-TOFHLA and the Chew self- report scale. Patient empowerment was measured by a 12-item scale based on Spreitzer's conceptualization of psychological empowerment in the workplace. Self-care behavior was measured by SDSCA. Level of diabetes knowledge was measured by Diabetes Knowledge Test.

**Results:** Two subscales of empowerment, impact and self-determination, predicted self-reported frequency of self-care behaviors. Neither health literacy nor diabetes knowledge had an effect on self-care behaviors.

**Conclusion**: Health literacy might be more effective in clinical decisions while empowerment might exert a stronger influence on habitual health behaviors.

**Word Count**:4060

**Strength and Limitations of the Study**

- This is the first study in Turkey trying to get evidence about effect of health literacy and patient empowerment on self-care behavior in diabetes patients in Turkey.
- Sample is not representative of the population of Turkish diabetes patients.

## 1. Background

Health literacy has increasingly been recognized as a factor in health behaviors, health care and health itself. Research shows that low or inadequate health literacy is associated with poor adherence to medical regimens, poor understanding of health issues, a lack of knowledge about medical care and conditions, poorer comprehension of medical information, low understanding and use of preventive services, poorer overall health status, and earlier death[1-3]. Furthermore, individuals with chronic diseases (e.g., diabetes, high blood pressure, and heart disease) and limited health literacy have less understanding of their disease and experience more negative outcomes than individuals with higher health literacy.[4-10]

Health literacy is defined as the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions[11]". The definition highlights the fact that health literacy is ability, but ability is not always implemented as behavior. One can have an ability to make sound health decisions but still prefer to leave decisions to health care providers. As some people may choose not to use their ability, others who do not have this ability may still claim to have a say in medical decisions.

This claim is sometimes captured in the concept of health empowerment.[12] It is defined as the subjective feelings of power, control, and self-esteem that make the patient value autonomy—and thus interest in and desire to participate in healthcare decisions. In this vein, patient empowerment is volitional[12,13]. According to Spreitzer"[14] empowerment at the workplace has four dimensions: *meaningfulness* (or relevance), capturing the value of activities, judged in relation to an individual's own ideal of life; *self-efficacy* (or competence), the belief in one's capabilities to produce, by one's actions, the outcomes one desires; *self-determination* (or choice), the idea that one's decisions and choices are one's own, and not imposed by others; and finally *impact*, the notion that one can make a difference in the scheme of things. This concept was transferred to health empowerment, and an operationalization of the concept into a 12-item scale (3 items by 4 dimensions) was successfully used in research.[12,13]

According to the health empowerment model[12], best outcomes will be achieved when the competence-based factor of health literacy coincides with the volitional factor of health empowerment. The model assumes that health literacy without empowerment comes down to a waste of resources: a person's actual ability to contribute to health protection and health care is not used because one does not think one can do much in this respect. And vice versa, the model also holds that high empowerment without sufficient literacy may entice people to detrimental health behaviors: one claims to play an autonomous role in one's own health care but lacks the ability to know or learn what to do.

This article aims at contributing to studying the role of empowerment and health literacy together. It does so using data from a survey of Turkish diabetes patients, which was primarily conducted to produce evidence of the reliability and validity of two health literacy measures translated from the original English into Turkish[15]. The present analysis set out to test three hypotheses:

Hypothesis 1: The higher the patient's health literacy, the more appropriate self-care behaviors will s/he show.

Hypothesis 2: The higher the patient's health empowerment, the more appropriate self-care behaviors will s/he show.

Hypothesis 3: Most appropriate self-care behaviors will be shown by patients with both a high level of literacy and a high level of empowerment.

Hypothesis 3 states an interaction effect of health literacy and empowerment, which of course can be tested only when Hypotheses 1 and 2 are confirmed.

## 2. Methods

Sampling and procedure

Data were collected between May 30th and November 25th 2013 from outpatients who had an appointment in one of two diabetes clinics in a major Turkish City. Self-administered paper-pencil questionnaires were distributed to outpatients who had been diagnosed with type 1 or type 2 diabetes, and were 18 years or older. Patients were excluded if they had a severely impaired vision (20 patients). We approached 321 patients, 19 of whom refused to participate, leaving a sample of 302 at a response rate of 94%. Due to an irregularity in the application of one of the measures, 135 respondents had to be excluded from the analyses in this study, setting its sample at 167 patients.

Two collaborators trained in confidentiality, recruitment and data collection procedures distributed and collected the questionnaires. They explained the purpose of the study to the patients, and after obtaining

oral consent, they asked the patients to fill in the questionnaire before their meeting with their doctor. Some patients were permitted to answer the questionnaire after seeing the doctor.

Measures

Two measures were employed for health literacy, First, the reading section of the Short Test of Functional Health Literacy in Adults[16] (S-TOFHLA); and second, a set of four screening questions asking matters of respondents' self-perception. S-TOFHLA is one of the most widely used tests of functional literacy due to its strong reliability and validity data in English. Also it was translated and validated in several languages such as Spanish[9], Chinese, [17] Brazilian Portuguese[18], Serbian[19] and Hebrew[20]. The reading comprehension part of S-TOFHLA includes two texts with altogether 36 gaps and, for each gap, a selection of four formulations to fill it. The first section is a text, written for the 4$^{th}$ grade level, on getting prepared for an upper gastrointestinal examination, the other is about patient rights and responsibilities, written for the 10$^{th}$ grade level.

The S-TOFHLA[9] questionnaire is to be operated with a 7-minute time limit, which, however, was not enforced for 135 of the 302 persons originally in the sample. To ensure comparability, all analyses here are reported for the sub-sample who had the 7-minute limit enforced (n = 167).

Mistaking the questionnaire as a test, many participants wished to complete the measure beyond the 7-minute limit. They were allowed to do so, but the items completed after the 7-minute limit were, as a rule, not noted and not counted for the S-TOFHLA score.

The perception-based screening measure was composed of these items:

(1) How often do you have someone help you read hospital materials?

(2) How confident are you filling out medical forms by yourself?

(3) How often do you have problems learning about your medical condition because of difficulty understanding written information?

(4) How often do you have problems understanding what is told to you about your medical condition?

A total score for the S-TOFLHA was formed by summing up the correct answers. It can run theoretically from 0 to 36, and the distribution covered that total range. For the screening measure, the answer options were 1 = Never to 5 = Always. The second item was reversed and an average score computed for every respondent. Table 1 shows the means and other descriptive information on these and other variables in the study.

Health empowerment was measured by 12 the Psychological Health Empowerment scale[12-13] with 12 items, three for each of the four dimensions (meaningfulness, self-efficacy, self-determination, impact). This measurement was adapted to the field of health from Spreitzer's[14] conceptualization of psychological empowerment in the workplace. Patients were asked to answer the questions on a 7-point Likert scale (1 = Strongly disagree, 7 = Strongly agree).The items were factor analyzed and two subscales emerged, one composed of three items on the dimension of impact, the other, composed of three items on self-determination.

Self-care behaviors were measured by the Summary of Diabetes Self-Care Activities Measure (SDSCA)[21], which is a brief self-report questionnaire of diabetes self-management. In this study, a version of SDSCA was used that included items assessing five aspects of the diabetes regimen: general diet (2 items), specific diet (2 items), exercise (2 items), blood-glucose testing (2 items), and foot care (2 items). Two further items concern smoking behavior were relevant to smokers only and therefore excluded from the analysis.. The questionnaire inquired, for each item, on how many days a week a particular behavior was performed. Answers ranged from 0 to 7. A composite score based on all 10 items was computed. General diabetes knowledge was measured with 6 true/false items; the number of correct answers was summed up, ranging from 0 to 6.

Diabetes knowledge was measured by the Diabetes Knowledge Test[22], which consists of ten statements regarding Type 1 and Type 2 Diabetes and the answer options 'yes', 'no' and 'don't know'.

The original English version of the S-TOFHLA[9], Chew[23], the Health Empowerment Scale,[12-13], the Diabetes Knowledge Test[22] and the Summary of Diabetes Self-Care Activities Measure[21] were translated by a philologist and native speaker of Turkish. Owing to differences in language structure, some of the gaps in the S-TOFHLA reading material had to be shifted to different places in the text. The translation was done with the aim in view that an average patient able to understand basic expressions would also be able to comprehend the text. Technical terms and any kind of jargons were avoided. Back translation was carried out by another philologist fluent in English to see whether differences between the original English and the Turkish version would arise. Besides, cultural adaptation was taken into consideration during the whole translation process. The translation excluded the four numeracy items of the original S-TOFHLA. A pre-test was conducted with 120 participants which was independent from main sample. By using cognitive interviewing, the pretest necessitated a few revisions. Table 1 shows the reliability of the measures in comparison with the original values.

**Table 1: Cronbach's alpha of the Measures**

| Measurements | Present Study | Original |
|---|---|---|
| S-TOFHLA | .81 | .98 |
| Summary of Diabetes Self-Care Activities Measure | .71 | .80 |
| Psychological Empowerment Scale | .87 | .71 |
| Diabetes Knowledge Scale | .74 | .89 |

The present study was conducted in collaboration with TUBITAK (Scientific and Technological Research Council of Turkey) and also approved by a committee from this institution.

Data Analysis

The hypotheses were tested in three steps. First bivariate correlations were computed (Pearson's r). Secondly a linear regression model was computed with the composite self-care behaviors score as dependent and the measures for health literacy, empowerment, and knowledge as independent variables. Thirdly similar models were computed for each of the five individual self-care behaviors. Tests for significance were 1-tailed.

**3.Results**

The sample is diverse and spreads well across gender, age groups, education groups and income. Table 2 shows the distribution of these variables, showing that women were overrepresented.

**Table 2: Socio-demographic characteristics of sample**

| | (*n* = 167) | | (*n* = 167) |
|---|---|---|---|
| Age – mean (SD) | 51.6 (14.24) | Marital status – % married | 79.6 |
| Gender – female | 65.3% | *Income in Turkish Lira (%)* | |
| *Education (%)* | | < 775 | 8.4 |
| <5$^{th}$ grade (elementary school) | 8.4 | 776–1500 | 24.0 |
| 6$^{th}$–8$^{th}$ grade (secondary school) | 9.0 | 1501–2500 | 27.5 |
| 9$^{th}$–11$^{th}$ grade (High school) | 41.9 | >2500 | 37.7 |
| University | 40.7 | | |

The measured variables distribute mostly around means somewhat on the positive side of the scales, that is towards frequent self-care behavior, high literacy, high knowledge and high empowerment. Aside from the more or less normal distribution around the mean, some of the measures show a modal value (or a second modal) at the extreme positive end. Table 3 shows the details of the distributions. As skewness and kurtosis were within the acceptable range, we decided the use of Pearson's r and linear regression modeling was justified.

**Table 3: Overview of variables**

| | Range | M | SD | Skew-ness | Kurt-osis | α |
|---|---|---|---|---|---|---|
| Self-perceived frequency of self-care behaviors, composite score | 0-7 | 3.7 | 1.39 | -0.17 | -.34 | .76 |
| Health literacy, S-TOFHLA | 0-36 | 17.3 | 11.24 | 0.85 | -1.37 | NA |
| Health literacy, screening scale | 1.25-5.00 | 4.1 | 0.72 | -0.89 | 0.85 | .75 |
| Diabetes knowledge | 0-6 | 3.6 | 1.19 | -0.56 | 0.51 | NA |
| Health empowerment: impact | 1.5-7.0 | 5.6 | 1.18 | -1.01 | 0.93 | .81 |
| Health empowerment: self-determination | 1.0-7.0 | 5.0 | 1.48 | -0.43 | -0.53 | .70 |

N = 167

Bivariate correlations show moderate relationships between empowerment and frequency of self-care behaviors, as hypothesized. The correlations between health literacy and self-care behaviors, however, did not reach significance. Hypothesis 2, pertaining to patient empowerment, was thus confirmed, while Hypothesis 1, pertaining to health literacy was not supported. Table 4 gives the correlation coefficients in overview.

In addition, Table 4 reveals that he two measures of health literacy were relatively strongly related, and so were the two measures of health empowerment. Secondly, the screening measure of health literacy was correlated with both empowerment measures, but S-TOFHLA was not related to either. That means the two independent variables were related, but only for the screening measure of health literacy. Thirdly, diabetes knowledge (similar to health literacy) was unrelated to frequency of self- care

behaviors, and there was a relationship between knowledge and the screening literacy indicator. Fourthly, diabetes knowledge and the empowerment dimensions of impact and self- determination were correlated.

**Table 4: Bivariate correlations**

| | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 1 Self-perceived frequency of self-care behaviors, composite score | .01 | .06 | .11 | .39 *** | .30 *** |
| 2 Health literacy, S-TOFHLA | | .32 *** | .05 | .02 | .08 |
| 3 Health literacy, screening scale | | | .16 * | .31 *** | .21 ** |
| 4 Diabetes knowledge | | | | .31*** | .18 * |
| 5 Health empowerment: impact | | | | | .53 *** |
| 6 Health empowerment: self-determination | | | | | |

Note: coefficients are Pearson's r. #p < .10, *p < .05, **p < .01, ***p < .001; 1-tailed tests

The final step in the analyses is linear regression models, controlled for gender, age and education (not shown), to assess the relative contributions of literacy, empowerment and knowledge to self-care behavior in diabetes patients. The first regression model uses the composite score of self-reported frequency of self-care behavior as dependent variable and is shown in the first column in Table 5. The result is straightforwardly clear: no independent variable has an effect on outcome beyond the effect of the impact dimension of health empowerment. It is especially clear that health literacy and knowledge have no independent effect on the frequency of self- care behavior. Therefore, no interaction terms were entered into the regression analysis, as the bivariate correlations had already suggested.

Table 5 shows results from similar regressions with the self-perceived frequency of single self-care behaviors as dependent variables. There are only few findings that deviate from the results for the composite score. For the frequency of following the demands of a diabetes-specific dieting behavior, the predictive power of the empowerment dimension of impact becomes weaker but is still marginally significant. Measuring blood sugar and foot care are not predicted by any of the

independent variables. By and large, these regressions confirm the result obtained by regressing the composite score on the independent variables.

**Table 5: Regression of frequency of self-care behaviors**

| | Frequency of self-care behaviors, composite score | General dieting | Specific dieting | Exercise | Measuring blood sugar | Foot care |
|---|---|---|---|---|---|---|
| Health empowerment: impact | .278** | .424*** | .169# | .239** | .062 | .120 |
| Health empowerment: self-determination | .151# | .017 | .127 | .187* | .080 | .132 |
| Diabetes knowledge | .019 | .003 | .053 | -.046 | .086 | -.036 |
| Health literacy, S-TOFHLA | .045 | -.042 | -.023 | .096 | -.061 | .138 |
| Health literacy, screening scale | -.041 | .023 | -.107 | -.113 | -.002 | -.058 |
| $R^2$ | (.20) | (.22) | (.09) | (.17) | (.12) | (.10) |

#p < .10, *p < .05, **p < .01, ***p < .001

## 4. Discussion

The most important result is that Hypothesis 2 was confirmed: health empowerment, and in particular its dimensions of impact and self-determination are significant predictors of the self-perceived frequency of self-care behavior in Turkish diabetes patients, though self-determination has no effect beyond impact. Hypothesis 1, though, which stated a similar role for health literacy, could not be supported at all. And because of that, Hypothesis 3 could not be pursued in the analysis, and nothing can be said about an interaction effect of health literacy and empowerment on self-care behavior.

This result could indicate that diabetes self-care behaviors are so easily understood by patients or so well related to patients that health literacy makes no difference. In other words, it does not require higher cognitive abilities to understand the advice or instructions given by healthcare professionals on self-care, or that self-care behavior is explained so well that the limits of lower levels of health

literacy are overcome. The opposite could also be true: self-care advice is so complicated or so badly communicated that even patients with high levels of health literacy do not get it. The high level of compliance with self-care advice, however, speaks against this interpretation.

Next, the influence of the empowerment dimension of impact suggests that frequent self-care behavior goes along with the subjective impression that it matters. This is not necessarily evidence of an effect of the impression (i.e. empowerment) on the behavior. It might just be the other way round and the causal direction be reversed. Some patients trying out the dieting and exercise advice they are given will find that the advice is good for them, while others might not experience such benefits. The former would come to believe that their behavior matters, while the latter would not draw such conclusions. Rather than seeing self-care behavior as consequence of empowerment (as the study design had assumed), this interpretation conceives of empowerment as a consequence of experience, at least as far as the dimension of impact is concerned.

The other dimension of empowerment in the study, self-determination or choice, aims at the subjective impression that one is free to choose among various behavioral alternatives. That this impression was hardly related to self-care behaviors in the regression analyses might have to do with the high demands that a chronic disease such as diabetes puts on patients. The impression that one has a choice in dealing with diabetes might very well clash with patients' experience of the demands and restrictions. Patients will get more advice the more severe their condition becomes[24,25], and some will just be more sensitive than others to the restrictions that go along with advice. An objectively or subjectively high amount of advice can easily be perceived as restricting one's choice [26-27] while at the same time the advice is followed, but not out of a sense of choice but of duty, or experience, or a sense of compliance. A large amount of advice might thus have differential effects on behavior and one's sense of choice. This would mitigate the possible relationship between sense of choice and beneficial self-care behaviors.

Looking at the different aspects of self-care, measuring blood glucose levels and foot care were found to be less predictable than general and specific dieting and exercise. This might be explained by an effect of necessity on frequency of behavior. At a certain level of severity, the diabetes condition requires frequent measuring of glucose levels[28-30] and bad experience might entice patients to examine

their feet regularly[30]. In as much as medical necessity impacts the frequency of these two behaviors the potential for an effect of a volitional factor such as empowerment will be reduced. Something similar might be at work with the reduced influence on specific dieting compared to general dieting: following specific dieting advice might be more often dictated by medical necessity than following general advice.

The differential impact of empowerment and health literacy found in this study highlights a difference in outcomes that might be related with the two factors. Health literacy aims at the ability to understand medical subjects in order that patients can take a higher share in decision-making, mostly in decisions about therapy. It might therefore be strongly linked to outcomes that have to do with medical decision-making. Empowerment on the other hand, aiming at factors such as self-perceived choice, perceived self-efficacy and the self-assessed consequences of health behavior, seems much better suited to explain habitual behavior. The outcome in this study, diabetes self-care, belongs to habitual behaviors. This could explain why empowerment had an effect on this outcome and health literacy had none.

Knowledge was found to be more strongly related to empowerment than to health literacy. This is a surprising result because knowledge is often conceived of as a dimension of health literacy[17], and some very common measures of health literacy such as the REALM[31] can be interpreted as knowledge tests. This could arise from a particular quality of the illness. Since it chronically affects people's life, diabetes self-care requires to consider both metabolic and life style factors. So, patients make many diabetes-related choices in their daily lives that that enable them to find out the healthiest options by experience. Knowledge obtained in that way may change the motivational skills of patients in a positive way. The way patients get informed about their illnesses by experience, which may be the most common among diabetes patients, could motivate people to become more empowered.

The perception-based screening question was more strongly linked with the other independent variables of knowledge and empowerment than the performance-based S-TOFHLA. Correlation between these variables, though not the focus of this study, is expected. That the Turkish translation of S-TOFHLA produces no correlation with knowledge, empowerment or outcomes might make one question the validity of the instrument. An earlier study,[15] however, which was based on the same dataset as the present article, found broad evidence of construct validity by correlating the measure with known predictors of health literacy[3-5,32]. The lack of correlations in the analysis reported in this article

calls for putting the measure to the test again and having another look into this matter, based on new data.

This study was motivated by presenting empirical evidence for a key feature of the health empowerment model: the necessity of both high health literacy and high empowerment for reaching a beneficial level of patient involvement in healthcare decisions and behaviors. The study found, though, that for diabetes self-care, health literacy did not matter much, while empowerment did. This suggests that patients with the desire to get involved do not necessarily have to show higher levels of health literacy to avoid risking to make mistakes. The role of dangerous self-managers, conceived in the model as persons with high empowerment and low literacy, appears to be contingent on conditions, which need to be conceptually and empirically studied in more depth.

That type 1 and type 2 diabetes patients' self-care behavior was measured with the same items and scales counts among the limitations of this study. The self-care behaviors in question apply, in one form or another, to both groups of patients, but in detail different recommendations may be made to them. Therefore similar behaviors might be right for some and wrong for other patients. A more specified consideration is necessary. In addition, it cannot be completely ruled out that leaving out the smoking items from the SDSCA would not affect the psychometric properties of the measure.

### 4.1 Conclusion

Findings of this study suggest that empowerment affects habitual self-management behaviors. Patients with chronic conditions may need motivational skills more badly than reading skills to manage their diseases.

### 4.2 Acknowledgement

This research study obtained written consent of Turkish Diabetes Foundation's ethical committee. The authors thank the Lugano University Institute of Communication and Health and TUBITAK(Scientific and Technological Research Council of Turkey) for funding this research. Also the authors are so thankful for the Turkish Diabetes Foundation's kind support during the data collection process.

**Contributors:** Both authors of the article designed this study. Ezgi Eyüboğlu arranged meeting with the diabetes patients and conducted the questionnaire. Peter Schulz carried out the data analyses and reported initial findings. Both authors contributed to the discussion and conclusion part.

**Data sharing:** No additional data available.

**Competing interests:** None.

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STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | √1 | √(*a*) Indicate the study's design with a commonly used term in the title or the abstract |
| | | √ (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | | |
| Background/rationale | √2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | √3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | | |
| Study design | √4 | Present key elements of study design early in the paper |
| Setting | √5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | √6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>√*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case |
| Variables | √7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | √8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | √9 | Describe any efforts to address potential sources of bias |
| Study size | √10 | Explain how the study size was arrived at |
| Quantitative variables | √11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | √12 | √ (*a*) Describe all statistical methods, including those used to control for confounding |
| | | √ (*b*) Describe any methods used to examine subgroups and interactions |
| | | √ (*c*) Explain how missing data were addressed |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>√*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy |
| | | (*e*) Describe any sensitivity analyses |

Continued on next page

| | | |
|---|---|---|
| **Results** | | |
| Participants | √13* | √ (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
| | | √ (b) Give reasons for non-participation at each stage |
| | | (c) Consider use of a flow diagram |
| Descriptive data | √14* | √ (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
| | | √ (b) Indicate number of participants with missing data for each variable of interest |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount) |
| Outcome data | √15* | *Cohort study*—Report numbers of outcome events or summary measures over time |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure |
| | | √*Cross-sectional study*—Report numbers of outcome events or summary measures |
| Main results | √16 | √ (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| | | √ (*b*) Report category boundaries when continuous variables were categorized |
| | | √ (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | √17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses |
| **Discussion** | | |
| Key results | √18 | Summarise key results with reference to study objectives |
| Limitations | √19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | √20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | √21 | Discuss the generalisability (external validity) of the study results |
| **Other information** | | |
| Funding | √22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.