

# Personal Attributions, Emotion Managements, Social Supports, and Diabetes Knowledge in Diabetes Self-care Adherence

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## Abstract

**Introduction:** Diabetes has become a global epidemic and no country is spared from its negative impacts on their people, healthcare expenditure, national productivity, and quality of life. Malaysia, a country located in the diabetes hotspot, is experiencing a rapid growth in diabetic population. Such growth has already exceeded the estimation made by the World Health Organisation (WHO). The demands stemmed from diabetes have caused huge financial burden to the Malaysian healthcare system. Furthermore, the overall glycaemic control is ranked as suboptimal indicating that diabetes is not well-controlled in Malaysia as well as challenging the effectiveness of its existing diabetes self-management education.

**Aims & Objectives:** Obtaining a deeper understanding of patients' attitudes towards diabetes management would help in improving the effectiveness of the existing diabetes education and management. Based on Self-Determination Theory, this study explored the participants' psychosocial aspects by examining the strength of each predictor in their self-care activities.

**Methods:** This was a cross-sectional study. Eleven scales were used in this survey (which included emotion management, personal attributions, social supports and diabetes knowledge). Purposive sampling was adopted among 187 adults living with Type 2 diabetes in Peninsula Malaysia through various healthcare entities.

**Results:** Pearson's correlation analysis showed significant association between the 10 variables and diabetes self-care adherence; multiple regression analysis indicated that self-efficacy, anxiety, and optimism were the useful predictors, accounting to 13.9% unique contribution to the variance of self-care index. Besides, diabetes knowledge and social supports were not predictive of self-care activities.

**Conclusion:** The findings highlighted the role of competency-based self-care mastery training and mental health elements in the diabetes education and management could achieve desired adherence

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to physician's advice and better management of the disease. Desired adherence can be achieved without good level of diabetes knowledge and social supports amongst adult diabetics.

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**Key words:** Self-care adherence, personal attributions, emotion managements, social supports, diabetes knowledge, type 2 diabetes, Peninsula Malaysia

## **Introduction**

Diabetes is a metabolic disorder with no known cure. It is a condition where the body's blood glucose level is high as the pancreas cannot produce insulin or the body cannot use the insulin that is produced well. Persistent hyperglycemia, if unattended, will inflict other complications in heart, nerves, kidneys and eyes over time.

Diabetes has become a global burden of disease affecting every country in the world. In 2013, the International Diabetes Federation (IDF) reported that there were more than 382 million individuals with diabetes, and this figure is inevitably to reach 592 million within a couple decades if immediate and effective actions were not taken. By the same token, diabetes has caused 5.1 million deaths in year 2013. The efforts of maximizing healthy life expectancy are counterproductive if the diabetes population continues to expand uncontrollably. The global prevalence of diabetes points out the Western Pacific region where Malaysia is situated, as the region with the most rapid growth in diabetic population.<sup>1</sup>

Indeed, Malaysia is experiencing a steady rise in chronic diseases throughout its population of 27.17 million. As a matter of fact, the diabetic population in Malaysia is expanding faster and larger. The World Health Organisation (WHO) estimated Malaysia would have 2.48 million diabetics by year 2030;<sup>2</sup> however, the Ministry of Health Malaysia disclosed that at least 2.6 million adults in the country already have diabetes, based on the 2011 National Health and Morbidity Survey. There was an increase of 31% in the prevalence of diabetes within a span of 5 years from 2006 to 2011 amongst Malaysians aged 30 years and older.<sup>3</sup> All these statistics are reiterating the fact that diabetes is not well-controlled in Malaysia.

Today, chronic diseases such as diabetes, high blood pressure, and heart diseases are not only a health problem but also an economic issue. The high cost of NCD management drains the healthcare system and slows down workforce productivity; patients at work suffer from frequent fatigue, lower productivity, and higher absenteeism due to medical reasons. In view of the increasing prevalence of diabetes, this research was carried out to explore the disease management of those living with this disease from the psychosocial perspectives.

Fortunately, diabetes is manageable. Its complications can be reduced or even prevented if a proper disease management regimen is abided by the patients and if their management skills are improved.<sup>4,5</sup> However, many diabetic individuals find the self-care regimen challenging, complex and demanding<sup>6</sup> when they are instructed to make certain changes in daily lives especially in terms of food consumption and physical activity<sup>7</sup> on top of their medications. For most, adherence to these self-care activities is more difficult than coping with the diagnosis of diabetes.<sup>8</sup> The effects of barriers in blood glucose normalization are evident among the Malaysian diabetes population. The glycaemic control in Malaysian is ranked as suboptimal<sup>8</sup> as the researchers found that either more than half of their sampling population reported a glycosylated hemoglobin Type A1C (HbA1c)

higher than 6.5%<sup>10,11</sup> or only 38% of them managed to achieve satisfactorily glycaemic control with a HbA1c lower than 7.5%.<sup>12,13</sup>

What happens to a patient after the medical consultations? What are the factors that affect the patients' ability and motivation to take personal responsibility to monitor their health? In the past, most Malaysian studies were focused on investigating self-efficacy, healthcare provider supports, and diabetes knowledge of patients in relation to adherent behaviours. Other factors such as emotion regulations, personality, and social supports were not given equal emphasis. Thus, this study intends a holistic approach to examine the psychosocial factors, both positively and negatively associated with diabetes self-management. The results of this study will provide a more accurate understanding of the factors that promote and hinder self-management, specifically in Peninsula Malaysia; and hence, revise and improve the effectiveness in its existing diabetes education programs.

Optimal diabetes care that potentially slows down or completely avoids complications requires full co-operation from the patients. The huge financial burden on public healthcare services as reported in many countries could be reduced if patients improve on their self-management adherence. Hence, a body of research has been conducted to answer questions related to diabetes self-management behaviors. The findings of these studies have identified self-efficacy, locus of control, problem-solving skill, optimism, depression, anxiety, distress, social supports, healthcare provider support, and diabetes knowledge are the known factors frequently related to self-care adherence. These factors can be grouped into four main themes, namely personal attributions, emotion management, social support, and knowledge of diabetes.

Previous research has shown that personal characteristics like self-efficacy,<sup>14</sup> internal locus of control,<sup>15</sup> problem-solving ability,<sup>16,17</sup> and optimistic personality<sup>18,19</sup> are advantageous to self-care adherence. Diabetic patients who have higher self-efficacy are observed to engage in foot care, monitor diet, and practise self-care activities more often.<sup>20</sup> It is also noted that the relationship between self-efficacy and diabetes literacy is reciprocal and significant to glycaemic controls.<sup>21</sup> Problem-solving ability and internal locus of control are two other personal constructs playing a determining role in diabetes management. Patients who strive to take control of their health are inclined to approach the demands of diabetes regimen and the variations of their blood glucose with knowledge, flexibility, creativity<sup>22</sup> and effectiveness.<sup>17</sup> In addition, optimism is another health-promoting attribution, identified by past research,<sup>19</sup> claiming that optimistic patients tend to have better adaption to chronic disease.<sup>18</sup> However, the advantages of optimism would sometimes depend on how controllable the disease is.<sup>23</sup>

Humans are emotional beings. Most diabetic individuals are not only responsible for their own self-care routine but regulating the feelings that associate with the disease as well. Poor emotion management, such as allowing oneself to get depressed,<sup>24</sup> distressed<sup>25</sup> or anxiety-stricken<sup>26</sup> tends to obstruct optimal control over health condition. Feeling depressed<sup>27</sup> and anxiety are frequently detected among diabetic individuals at various stages of psychological adjustment to diabetes<sup>28</sup> because the presence of anxiety is often led to incapacity to control the disease and a personal failure in disease management. On the other hand, a study completed by Skinner and Hampson<sup>26</sup> did not show any significant association between anxiety and diabetes cares, as compared to depression, family and peer support. However, another research team argues that overcoming one's depression and anxiety can have a profound positive effect on diabetes education and self-management.<sup>29</sup> Diabetes and distress are influencing one another either directly or indirectly. Stress may interfere with self-care adherence and undermine metabolic control.<sup>25</sup> Further, poor self-care interferes with general functioning; and hence, aggravating other stressors. The

intrusiveness of self-care regimen functions like a constant reminder of one's illness that causes the elevation of psychological distress.<sup>30</sup>

From the perspective of social support, patients who live with a chronic disease are in need of strong support from family and healthcare providers.<sup>31</sup> It is evident that family support in various forms<sup>32</sup> and regular interaction with healthcare providers increase the motivation of self-management in the patients.<sup>33</sup> Spousal support is equally as important, if not more, in the management of the disease.<sup>34,35</sup> Patients experience less stress and better in marital interactions when spouses extend support.<sup>35</sup> Motivation coming from physicians is another form of social support that can help increase self-management and adherence to clinical care.<sup>4</sup> A well-structured, progressive, and regular diabetes intervention can successfully improve the self-efficacy in diabetes care and blood normalization. A Malaysian study reported significant reduction in HbA1c, fasting blood glucose, and cholesterol levels among the participants who signed up for a pharmacist-managed diabetes medication therapy adherence program after eight regular sessions.<sup>36</sup> Similar and positive outcomes were found in another group of Malaysian diabetic participants upon completion of a 12-week monthly self-care training.<sup>21</sup> Friends and peers play a vital role in well-being and self-management as well. Encouraging, understanding and helpful friends increase the motivation and competence in their diabetic friends to engage more in adherent activities.<sup>37</sup> According to Schiotz et al.,<sup>38</sup> when an individual meets their friends often and has a strong social support they tend to engage in more self-management behaviors, have higher patient activation levels, lower emotional distress and increased positive assessment of care.

Knowledge of diabetes and how to care for the disease is vitally important in maintaining good level of adherence. Informed patients who have knowledge about the disease and its complications, effects of the medications, and appropriate self-care regimen are observed to be more compliant to treatment and lifestyle changes.<sup>39,37,7</sup> Research also found that knowledgeable patients displayed better attitudes in self-care.<sup>40</sup> By the same token, insufficient understanding of the disease and care has always been found as one of the top barriers of prudent adherence.<sup>41,42</sup> In fact, Tan and Magerey<sup>43</sup> pointed out that inadequate diabetes knowledge is the main factor for sub-optimal blood glucose control among their Malaysian participants. Informed by several past research conducted in Malaysia, such low health literacy could be contributed by reasons such as patients received no or minimum diabetes education after the diagnosis,<sup>39,37</sup> poor comprehension of medical advice or medication knowledge,<sup>43,11</sup> age,<sup>43,9,11</sup> and low education level.<sup>43,9</sup> Nevertheless, Ng and colleagues challenged the above findings by showing no relationship between KAP (knowledge, attitude and practice) and blood glucose control in their study conducted in an urban area in Malaysia.<sup>13</sup>

Collectively, past research from different parts of the world have identified the abovementioned variables as established factors closely related to self-care adherence. Are these factors equivalently significant and efficacious amongst the Malaysian diabetic population in influencing their adherent behaviors? To answer the question, this study is designed to bring these known factors to come under the same scope for investigation; and hence, two main research objectives were developed to determine (1) the relevance of patients' personal attributions, emotion management abilities, social supports, and diabetes knowledge in relating to diabetes self-care adherence; and (2) the strength of each predicting variable contributing to diabetes self-management.

The approach of the current study is mainly based on the Self-Determination Theory (SDT), a theory of motivation initially introduced by Deci and Ryan to be adapted for academic research related to human psychology. Ryan<sup>44</sup> describes SDT as "a macro-theory of human motivation, personality development, and well-being. The theory focuses especially on volitional or self-determined behavior and the social; and, cultural conditions that promote it. SDT also postulates a

set of basic and universal psychological needs for autonomy, competence and relatedness, the fulfillment of which is considered necessary and essential to vital, healthy human functioning regardless of culture or stage of development". It means people experience increased vitality, higher self-motivation, and better well-being when these needs are fulfilled. Past research have proven that diabetes patients are more motivated to achieve optimal control and assume responsibility of self-management when they demonstrate a satisfactory level of attitude (locus of control, self-efficacy, problem-solving skill, and optimism), emotion management (depression, anxiety, and distress), receive sufficient social supports (family and healthcare providers) as well as staying competent in acquiring and utilizing diabetes related knowledge/information.

The Conceptualized Framework has two scopes that correspond to the research objectives.

Scope 1: Analyze the relevance psychosocial factors in diabetes self-management that include personal attribution, emotion management, interpersonal relationship and diabetes knowledge.

Personal Attribution entails four variables: diabetes self-efficacy, internal health locus of control, problem-solving skills, and optimism of the participants. Past research shows that individuals with such traits are more effective in their disease management routines.

In terms of Emotion Management, it was observed that participants with higher control on their emotions are better in adhering self-care regimen. In contrary, those who allow themselves to get depressed, distressed or anxiety-stricken face more challenges in following the routine.

The third component examines how a participant's interpersonal relationships affect their health management by looking at the support they receive from their social circles and health care providers.

The last component attempts to understand the relationship between diabetes knowledge and the self-care adherence. It is believed that better knowledge of diabetes encourages self-management adherence in participants.

Scope 2: Analyzes the predictive strengths of these 10 factors in contributing to self-care compliances; thus, identify the useful factors to be included in the diabetes educational programs to promote optimal blood glucose control.

Figure 1 is the conceptualized diagram that shows the predicted relationships among the core variables as predictors of adherence.

## **Methods**

### ***Study Design and Participants***

Based on the formula  $N \geq 50 + 8m$  (where  $m$  is the number of independent variables) proposed by Green<sup>45</sup> for testing multiple correlation, 187 Malaysians with Type 2 diabetes were invited to complete a survey consisting of 11 measurement scales along with a demographics sheet. Participants were mainly recruited through the referral of doctors, diabetes nurses, pharmacists and acquaintances after their visits to the healthcare providers. The participants could opt to answer the questionnaire on their own or to have a structured interview by the researchers for those who were less educated. Prior to answering the questionnaire, the participants granted their consent to

participate by signing a consent form prepared by the researchers. The targeted participants were Malaysians aged 20 years and above who have been diagnosed with Type 2 diabetes for three months or longer and practice self-management (See Table 1 for the demographic characteristics of the participants). Procedures of sampling were approved by Monash University Human Research Ethics Committee (CF12/3382 - 2012001623), and Clinical Research Committee of Sunway Medical Center (003/2012/ER).

### **Research Tools**

A total of 11 scales adopted for use in the study. These scales are validated, have good reliability alphas, relatively short as compared with other scales measuring the same constructs; and, permissions for using the scales are granted by the original authors.

The Diabetes Self-Efficacy Scale (DSES) is designed to measure diabetes-related psychological self-efficacy.<sup>46</sup> The DSES has good internal consistency reliability with Cronbach's alpha of .83. Higher total score indicates higher level of self-efficacy. To measure the internal locus of control of health-related behaviors, the subscale- internality of health locus of control in Multidimensional Health Locus of Control Scale (MHLC)<sup>47</sup> was adopted. Higher scores reflect externality. The internal consistency reliability using Cronbach's alpha ranged from .67 to .77 for all three dimensions. The Problem-Solving Inventory (PSI) developed by Heppner and Petersen<sup>48</sup> is an instrument designed to measure individuals' evaluation on their problem-solving abilities. The three subscales in PSI are problem-solving confidence, approach-avoidance style, and personal control. Lower scores reflect greater perceived problem-solving abilities. The PSI has good to excellent internal consistency, with alphas ranging from .72 to .85 on the subscales and .90 for the total measure; excellent stability with two-week test-retest correlations for the subscales and total measure that range from .83 to .89. The Revised Life Orientation Test (LOT-R) which measures dispositional optimism.<sup>49</sup> Higher score in the LOT-R reflects higher optimism. The Cronbach's alpha value for this scale is .78. Its test-retest reliability ranged from .56 to .79 in the interval of 4 months to 28 months. It also has a range of -.36 to .95 for its validity. To measure depression, the Major Depression Inventory (MDI) was used. It is a brief depression inventory with the Cronbach's alpha of 0.89, and the correlation between the MDI and the depression subscale of the SCL-90 was .79.<sup>50</sup> The Clinical Anxiety Scale (CAS)<sup>51</sup> was developed to assess the participants' level of anxiety for living and dealing with diabetes on daily basis. Higher scores indicate higher level of anxiety. The CAS is reported to have an excellent internal consistency of .94 coefficient alpha as well as good stability of .64 to .74 with two-week test-retest correlations. To measure the distress experienced by diabetics, the Diabetes Distress Scale (DDS)<sup>52</sup> was adopted. This scale consists of four subscales, namely emotional burden, physician-related distress, regimen-related distress, and interpersonal distress. The internal validity of the DDS and the four subscales was adequate with Cronbach's alpha bigger than .87. Higher scores indicate higher level of distress. To measure social support, Multidimensional Scale of Perceived Social Support (MSPSS)<sup>53</sup> was used to assess perceived social support from three sources: family, friends, and significant other. The MSPSS has excellent internal consistency, with alphas of .91 for the total scale and .90 to .95 for the subscales. Higher scores reflect higher perceived support. Modified Health Care Climate Questionnaire (HCCQ-6)<sup>54</sup> is developed to assess patients' perceptions of the degree of autonomy supportiveness of their formal health care providers. The HCCQ-6 is the shorter version of its original HCCQ-15. The Cronbach alpha for HCCQ-6 was reported as .80, and it is correlated .91 with the full version indicating that the modified scale was an adequate version of HCCQ-15. In order to understand the relationship between patients' level of knowledge on diabetes and their self-management behaviors, the Diabetes Knowledge Test<sup>55</sup> was adopted. The test has two

components: a 14-item general test and a 9-item insulin-use subscale. The coefficient alpha for general test and the insulin-use subscale indicate that both are reliable with alpha higher than .70. This study is intended to understand diabetics in the broader sense and not specifically targeting insulin-dependent participants; hence, only the general test subscale in this test battery was used. Lastly, to measure the level of adherent behavior, the Summary of Diabetes Self-Care Activities Measure (SDSCA)- a brief self-report questionnaire of diabetes weekly care activities that includes items about general diet, specific diet, exercise, blood glucose testing, foot care, and smoking, was adopted.<sup>56</sup> Higher scores reflects better adherence to self-care activities.

All the 11 scales adopted in this study were originally developed and based on the American samples. Thus, it was necessary to conduct a reliability analysis to ascertain their suitability when used in the Malaysian context. In order to administer to the Malaysian multilingual population, the survey instrument was also translated into Malay language and Mandarin. A pilot test was conducted to validate the translations prior to the main data collection.

## Results

To answer Research Question 1, a Pearson's correlation was performed to examine the relationships between self-care activities in diabetes and all of the psychosocial factors evaluated in this study which are self-efficacy, internal locus of control, problem-solving ability, optimism, depressed feelings, anxiety, distress, social support, healthcare provider support, and knowledge in diabetes self-care within the sample. Results showed that there were highly significant relationships between self-care activities and self-efficacy,  $r(187) = .50, p = .001$ ; internal locus of control,  $r(187) = .34, p = .001$ ; problem-solving ability,  $r(187) = -.34, p = .001$ ; optimism,  $r(187) = .36, p = .001$ ; depressed feelings,  $r(187) = -.33, p = .001$ ; anxiety,  $r(187) = -.26, p = .001$ ; diabetes distress,  $r(187) = -.22, p = .001$ ; multidimensional social support,  $r(187) = .27, p = .001$ ; healthcare provider support,  $r(187) = .23, p = .001$ ; and diabetes knowledge,  $r(187) = .28, p = .001$ . It means high level of self-care adherence is strongly associated with high level of self-efficacy, internal locus of control, problem-solving ability, optimism, social support, healthcare provider support, knowledge in diabetes; and, low level of depressed feelings, anxiety, and distress. (Table 2 and 3)

In attempts to identify the strength of each predictor in contributing to self-care adherence, a standard multiple regression- Enter method was utilized to answer Research Question 2. For evaluation of assumptions, an analysis was performed using IBM SPSS Regression and Explore functions. The outcome has led to the reduction of outliers, improvement of linearity and improvement of homoscedasticity of residuals. The outcome of evaluation of assumptions has led to reducing the outliers and improves linearity and homoscedasticity of residuals. No missing data was found. Tests of normality were conducted to examine the normal distribution of data. A small violation of positive skewness was detected in two IVs, depressed feelings and healthcare provider support, with the absolute  $z$  value of 4.46 and 3.74 respectively; slightly bigger than 3.29 proposed by Kim.<sup>57</sup> Transformation of scores for these two IVs was not performed because the discrepancies are tolerable; and, skewness is very common in social science scales when the testing involves human as participants with big sample size.<sup>58</sup> The predictors were consisted of 10 strength indices while the outcome variable was the self-care activities. The linear combination of predictors was significantly related to the self-care index,  $F(10, 176) = 8.08, p = .001$ . The multiple correlation coefficient was .32, indicating that approximately 32% of the variance of the self-care index in the sample can be accounted for by the linear combination of psychosocial measures. In Table 3, indices to indicate the relative strength of the individual predictors are presented. All bivariate correlations between the psychosocial measures and the self-care index were significant. Further,

the multiple regression analysis indicated that the useful predictors are self-efficacy, anxiety, and optimism; account for a total 13.9% unique contribution to the variance of the self-care index, while the other seven variables contribute only an additional 2.4%. (Table 4)

## **Discussion**

The main purpose of this study was to investigate the trends of the predictors as well as to identify their strengths in predicting self-care adherence.

There were 10 variables being tested for the initial exploratory analysis to answer Research Question 1. A significant association was observed between all 10 variables and diabetes self-care activities. The variables include diabetes self-efficacy, internal locus of control, problem-solving ability, optimism, depressed feelings, anxiety, distress, social support, healthcare provider support, and diabetes knowledge. Clearly, each psychosocial component, namely personal attributions, emotion management, social support, and diabetes knowledge, has a unique role in determining self-care adherent behaviors.

Part of the findings of the present investigation are in line with numerous studies that were carried out previously.<sup>24,20,38,7</sup> It indicates that good mental health state has a positive impact on diabetes cares. Individuals with good mental health are psychologically and socially engaged, incline to face their physical illness with positive attitudes and are more driven to involve in health benefiting activities. In addition, the findings also lend support to SDT by showing that participants who are more autonomous, competent, and socially interactive demonstrate higher self-care compliance than those who are not.

In finding the answers for Research Questions 2 subsequently, the multiple regression analysis was carried out to examine the unique predictive power of these factors over self-management. The findings pointed out self-efficacy, anxiety, and optimism are useful predictors, indicating that gaining expertise and confidence in actualising self-management routine is certainly an essential quality in achieving and maintaining optimal blood glucose control. This finding not only supports the fact that self-efficacy is the best predictor for health behavior,<sup>59</sup> it also echoes a statement made by Lorig and Holman that enhanced self-efficacy is one of the mechanisms for health improvement.<sup>60</sup> Another significant predictor listed under the personal attributions is optimism. The optimistic outlook on life is found to have a protective effect on self-care for diabetes; and, thus being optimistic can be a value added. Likewise, emotion regulations should also be given adequate attention. Anxiety, the third significant predictor, can be toxic and potentially ruin desired adherence if the feeling is overwhelming and hence draining the motivation to fight the health treat. Therefore, keeping anxiety at bay would further reinforce optimal adherence.

Different from several past studies, the social support component is not predictive of the adherent behaviours significantly. It is speculated that the participants of this study are predominantly mature adults with 97% of them are older than 30 years of age. They are more autonomous, self-regulating and less dependent on the emotional support from external sources such as family, friends and healthcare providers to carry out the care activities as compared to younger diabetics (such as adolescents). In addition, the regression analysis also pointed out that diabetes knowledge did not predict self-care activities. It also means having detailed knowledge about the illness does not trigger much self-care actions. This finding shed lights to our understanding that perhaps desired adherence can be achieved by abiding to the self-care routine and attitudinal change with or without a high level of diabetes knowledge.



Good mental health which comprises of several psychosocial factors is essentially slowing down the deterioration of diabetes and other cardiovascular diseases.<sup>61</sup> Thus, it is important to include mental health elements into the content of healthcare education. Diabetes care providers should assist the patients to develop effective methods of coping with stress and anxiety, addressing concerns and worries as well as strengthening positive thinking skills on top of giving medical advices.

By knowing that diabetes self-efficacy is the most important quality in promoting good diabetes self-care, the diabetes education programs should be gearing towards competency-based in training the patients to master and be proficient in their daily diabetes care activities.<sup>29</sup> It is worth taking note that assimilation of health advice and self-care information may be extremely thin at the point of diagnosis,<sup>43,62</sup> and therefore, refresher courses and information update sessions can be conducted by various diabetes care entities to motivate and to reinforce the importance of blood glucose normalization and healthy living amongst the patients at regular intervals.

A few aspects of this present investigation were identified for improvements. Demographic items such as the geographical distance to healthcare facilities, the use of alternative medicine and the severity of diabetes should be added in order to gain a more thorough understanding of the participants. Also, more diverse diabetic communities including participants from East Malaysia should be included for the study in order to obtain a more representative sample of the community.

In the future, a more wholesome intervention approach which integrates psychosocial aspects, particularly personal attributions, emotion management, social supports, and diabetes knowledge should be made available to improve the effectiveness of the diabetes self-care education. Apart from that, gender differences in terms of promoters and barriers to self-management can also be examined as indicated by previous research.<sup>63,43</sup> As Malaysia is a multicultural country, cultural influence on care adherence can be investigated as well.

## **Conclusions**

Diabetes mellitus is regarded as the initial cause of numerous other health complications such as diseases of heart, kidney, and eyes. Without proper medical attention and prudent self-care from the patients, the disease can potentially impair future quality of life as well as cause increased costs to the health care system. The conventional diabetes self-care regimen which includes blood glucose monitoring, diet, exercise, medication, and foot care places huge responsibility on the patients. Thus, it is vitally important to understand the psychosocial determinants to achieve optimal self-care adherence; and hence, sustaining a functional life with quality. The initial analyses of this study suggest that patients' personal attributions, emotion management, social supports, and diabetes knowledge positively influence the adherence. And, self-efficacy, managed anxiety, and optimism turned out to be the strongest predictors of self-care compliance. Such findings should be included in the diabetes education programs in the future. In this way hopefully we will be able to improve the adherence of diabetes patients going forward.

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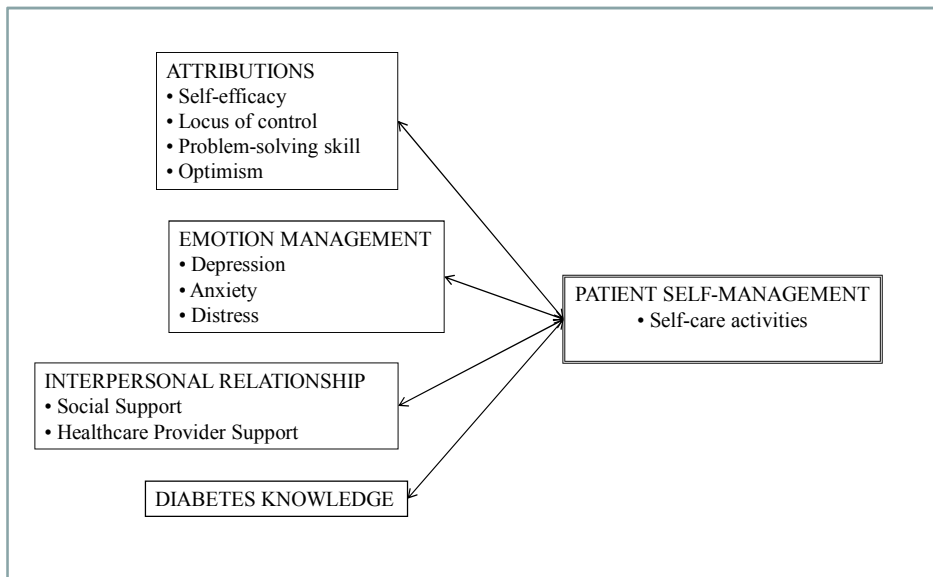
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**Figure1:** Conceptualized Diagram of the Study

**Table 1:** Demographic Characteristics of Participants (N =187)

Characteristics		n (%)
<b>Age (years)</b>	Range	23-81
	Mean (S.D.)	52.5 ( $\pm$ 11.7)
	< 30	5 (2.7)
	30 - 60	133 (71.10)
<b>Gender</b>	> 60	49 (26.2)
	Male	89 (47.6)
<b>Ethnicity</b>	Female	98 (52.4)
	Malay	92 (49.2)
	Chinese	72 (38.5)
<b>Education</b>	Indian	23 (12.3)
	Primary School	39 (20.9)
	Secondary School	85 (45.5)
	Pre-U / Diploma	26 (13.9)
	Degree & higher	20 (10.7)
<b>Residential Area</b>	Others	17 (9.1)
	Married	135 (72.2)
	Divorced	12 (6.4)
	Widowed	12 (6.4)
	Northern Peninsula	9 (4.8)
	Central Peninsula	91 (48.7)
<b>Occupational Status</b>	Southern Peninsula	9 (4.8)
	Eastern Coast	78 (41.7)
	Homemaker	57 (30.5)
	Business owner	28 (15.0)
	Professional	16 (8.6)
	Administrator	18 (9.6)
	Sales/Service	23 (12.3)
<b>Family History of Diabetes</b>	Retiree/Other	45 (24.0)
	No	56 (29.9)
<b>Diabetes-related Complications</b>	Yes	131 (70.1)
	No	97 (51.9)
<b>Healthcare Provider</b>	Yes	90 (48.1)
	Public	129 (69.0)
	Private	58 (31.0)
<b>Living with Diabetes</b>	< 3 years	52 (27.8)
	4 – 10 years	83 (44.4)
	> 10 years	52 (27.8)

**Table 2:** Means and Standard Deviations for Diabetes Self-care Activities and Psychosocial Predictor Variables

Variable	M	SD
Self-care Activities	32.1	11.4
Predictor variable		
1. Self-efficacy	6.0	1.9
2. Internal control	25.1	5.2
3. Problem-solving skill	102.7	19.1
4. Optimism	15.1	4.1
5. Depressed feelings	14.7	10.6
6. Anxiety	28.4	17.3
7. Distress	2.4	1.0
8. Social Support	5.0	1.1
9. Health provider support	5.0	1.2
10. Knowledge in diabetes	7.5	3.0

**Table 3:** Inter-correlations between Diabetes Self-care Activities and Psychosocial Predictor Variables

No	Items	1	2	3	4	5	6	7	8	9	10
1	Self-care activities	-									
2	Self-efficacy	.50**	-								
3	Internal control	.34**	.47**	-							
4	Problem-solving skill	-.34**	-.53**	-.52**	-						
5	Optimism	.36**	.42**	.46**	-.60**	-					
6	Depressed feelings	-.33**	-.54**	-.34**	.50**	-.45**	-				
7	Anxiety	-.26**	-.60**	-.37**	.61**	-.53**	.71**	-			
8	Distress	-.22**	-.48**	-.32**	.45**	-.38**	.60**	.59*	-		
9	Social support	.27**	.47**	.40**	-.46**	.52**	-.47**	-.45**	-.37**	-	
10	Health provider support	.23**	.33**	.19**	-.28**	.29**	-.26**	-.19**	-.20**	.37*	-
11	Diabetes knowledge	.28**	.56**	.42**	-.47**	.36**	-.54**	-.59**	-.44**	.46**	.14*

Note. \* $p < .05$ , \*\* $p < .01$

**Table 4:** Regression Analysis Summary for Psychosocial Variables Predicting Diabetes Self-care Activities

Variable	B	SE B	$\beta$	<i>t</i>	<i>p</i>
Self-efficacy	2.78	.55	.46	5.05	.000
Internal control	.19	.17	.09	1.13	.262
Problem-solving skill	-.03	.06	-.04	-.45	.654
Optimism	.58	.24	.21	2.41	.017
Depressed feelings	-.18	.10	-.17	-1.75	.082
Anxiety	.15	.07	.23	2.09	.038
Distress	.91	.99	.08	.92	.359
Social support	-.68	.87	-.06	-.77	.440
Health provider support	.27	.68	.03	.40	.688
Knowledge in diabetes	-.02	.33	.01	-.07	.944

Note.  $R^2 = .32$  ( $N = 187$ ,  $p < .001$ ).