



## Factors of Health Promotion Behaviour (HPB) and Elderly Health Diseases in Malaysia

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### Abstract

In Malaysia, the fast decline in fertility and increase in longevity (due to better health care and improved living conditions) have contributed to a rapid aging population growth. The lack of Health promotion behaviours, healthcare knowledge and awareness among the elderly has led to the increase of Non-communicable diseases (NCDs) (such as Diabetes Mellitus, Hypertension, Hypercholesterolemia, Minor Stroke, Kidney Failure and Heart Problem). These illnesses have killed over 1000 elderly people over the years, and the number has significantly increased. Despite several initiatives taken by the government to tackle the issues, a large group of elderly are yet to benefit from the health campaign. Since the aging population is expected to rise in the future, it equally significant for the government to prepare proper measure to tackle the phenomenon in the coming years. This study, therefore, is to investigate the effect of factors of HPB on elderly health disease in Malaysia. The factors of HPB are measured in 6 aspects, namely, healthy eating, exercise, stress management, interpersonal relations, health responsibility and spiritual growth. A set of 520 survey questionnaires was distributed and collected from respondents located in Perak, Malacca, Penang and Selangor. The statistical analysis result is analysed by using SmartPLS Software 3.0. The data analysis implicated that, elderly health disease is significantly affected by the factors of HPB (healthy eating, exercise, Interpersonal relationship and health responsibility). Therefore, findings suggest that adequate policies for HPB programs is necessary to encourage the practices of healthy eating, exercise, good interpersonal relationship and health responsibility, among the elderly.

**Keywords** Health promotion behaviour (HPB) · Healthy eating · Elderly health diseases · Health responsibility · Exercise

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## Introduction

The world's aging population has become one of the most important demographic phenomenon in this twenty-first century. Even though the population of the younger general is more than the elderly population, this relative proportion of the aging people to the younger generation is rapidly on the rise (Cohen 2003). The preparation to tackle the growing aging population has been far more advanced in developed countries than in developing countries (Stewart et al. 2003). In recent years, the large group of advanced countries have been tackling with serious difficulties in financing the inevitable high cost of health care expenditure and formidable tasks, in reforming their health care programs to cope with the coming demographic phenomenon of the aging population (Stewart et al. 2003; Cohen 2003). Interestingly, there has been a grave concern that developed and developing countries will not be able to afford the future health care expenditure of aging societies (Ogawa et al. 2009).

Despite the growing concern to a steady increase in the health care expenditure for elderly individuals averagely around the globe. There are significant measures taken by countries including Japan, Republic of Korea, Taiwan, China, Hong Kong, Thailand and Singapore, to provide stable healthcare services to the growing aging population (United Nations 2017). Nonetheless, many western and developing countries have also established proper healthcare facilities to help provide a better medical services to the elderly people (Ogawa et al. 2009). Even though demographers and other healthcare professionals expect the number of older persons to double to 86.7 million globally by 2050, plans to help provided excellent healthcare services to the elderly is currently undergoing in many parts of the world, with the help of United Nation (UN) (United Nations 2017; Ogawa et al. 2009). According to Wilkinson and Marmot (2003) and Jackson and Senker (2011) the world population will experience an inevitable phenomenon whereby the aging population will increase significantly, and the demand for healthcare services will subsequently increase, due to high level of the life expectancy in some part of the world like the Asia. Indicating an unprecedented rise of the aging population in the near future (Jackson and Senker 2011; Nagel 2005).

In Malaysia, the rapid aging population is as a result of the dramatic decline in fertility and mortality rates in tandem with longer life expectancy (Noor'ain Mohamad Yunusa et al. 2015). As the aging population is growing significantly and the elderly death toll is expected to rise in the future, if measures are not taken into consideration to encourage the practices of HPB among the elderly people, and also improve the healthcare facilities and services, the elderly death toll will increase (Reicherter and Greene 2005; Noor'ain Mohamad Yunusa et al. 2015). Harooni et al. (2014) stated that, health promotion behaviour has become one of the most important criteria for determining how good or bad the human health condition could be. Observing the behaviour of the elderly can be one of the measures in helping to prevent the types of NCDs (such as Diabetes Mellitus, Hypertension, Hypercholesterolemia, Minor Stroke, Kidney Failure and Heart Problem) among the aging population (Lee et al. 2006). Despite the lack of HPB practices, efforts to disseminate a positive health promotion behaviour among elderly people in Malaysia have not been entirely neglected (Noor'ain Mohamad Yunusa et al. 2015; United Nation 2019). Due to the increasing trend of the aging population in Malaysia (8 million, which is 10.21% of the country's population and it has been forecasted to reach 15% of the total population by 2030), the demand for more elderly healthcare expenditure is

subsequently on the rise. However, in an attempt to control the effect of NCDs through medical treatment, the elderly people have more hospital admissions and a longer length of hospital stay than usual (WHO 2018). Consequently, it is estimated that about 40% of the total healthcare expenses came from the elderly patients, which amounted to 9.32 billion annually, and expected to increase in the future since the number of the elderly people is still increasing (Mohamad Yunus et al. 2015; United Nations 2017). As a result of that, there is a great concern of an increase in demand for healthcare services and health promotion activities among the elderly people in the future (Hassali et al. 2012; Noor'ain Mohamad Yunusa et al. 2015; United Nations 2017; United Nation 2019).

Smith et al. (2006) and Jerdén (2007) define Health Promotion Behaviour as “any effective activity undertaken by an individual, regardless of actual or perceived health status, for the purpose of promoting or maintaining a good health status”. However, promoting health promotion behaviour in a multiracial country such as Malaysia could be more challenging. This is because racial and ethnic groups' health behaviours are different. Malaysia exhibits a significant health and economic disparities among its major ethnic groups Malay, Chinese, Indian, and Other-Bumiputera (Tan et al. 2011a). Thus, policies and programs designed to promote healthcare practices may not effectively and equally contribute to reducing NCDs (like Diabetes Mellitus, Hypertension, Hypercholesterolemia, Minor Stroke, Kidney Failure and Heart Problem) among racial and ethnic groups.

This depends on the specific design, targeting, and implementation of these policies on different ethnic groups (National Research Council, & Committee on Population 2004). Winkleby and Cubbin (2004) and Crespo et al. (2000), indicated that unhealthy behaviours differ among ethnicities. Moreover, the prevalence of metabolic syndrome amongst Indians found to be larger compared to other ethnic groups (Tan et al. 2011a). This is because the Indians tend to engage in less physical activities and consume less fruits and vegetables than other ethnic groups (Tan et al. 2011a, 2011b). The authors also pointed out that while education and family history of chronic disease are associated with metabolic syndrome status, differences in socioeconomic attributes do not explain ethnic disparities in metabolic syndrome incidence (Winkleby and Cubbin 2004; Crespo et al. 2000). Despite the steady aging population growth in the recent years, all trends now point towards a rapid demographic transition that is currently taking place as a “silent epidemic” (Hassali et al. 2012; Tengku Aizan 2015). According to Mohamad Yunus et al. (2015) even though Malaysia has developed a better health care system that is envious to most citizen, including foreigners, whereby the majority of the population who live within 3 km of a healthcare facility, directly benefit from the healthcare development (Mohamad Yunus et al. 2015). However, better healthcare facilities are yet to reach some rural areas, for the elderly individuals (Norliza et al. 2014; Mohamad Yunus et al. 2015).

As the life expectancy is steadily rising, the lack of awareness, knowledge, and practices of HPB is subsequently on the rise. Consequently, this has become a matter of concern for the government to continuously provide stable and improved healthcare services for the elderly people (Mohamad Yunus et al. 2015; Tengku Aizan 2015). Hence, studies by Ghani et al. (2015) and Eshkooor et al. (2016) have indicated that, without the practices of HPB, majority of Malaysian elderly will suffer from chronic illnesses such as, type 2 diabetes, chronic heart diseases hypertension, stroke etc. According to the United Nation (2019) averagely, 36.7% of the elderly were diagnosed

with several kinds of diseases (including heart disease, Hypercholesterolemia, hypertension, diabetes, lung cancer, chronic illness etc.) of which they were unaware of their condition (Mohamad Yunus et al. 2015; Shariff et al. 2016). Based on the United Nation's report in Table 1, even though the elderly people are commonly affected with the listed NCDs, diabetes mellitus, hypercholesterolemia, and hypertension are the most common diseases affecting the elderly health. Hence, due to the lack of self-awareness of the importance of regular health screening among elderly in those affected areas, especially those who live in the rural areas (Rashid et al. 2014; Hassali et al. 2012; Tengku Aizan 2015). These illnesses have killed over 1000 people in 4 states (Perak, Malacca, Selangor and Penang) combine, in the recent years (Mohamad Yunus et al. 2015; Wan-Ibrahim and Zainab 2012; NHMS 2018).

Based on the above discussion, this study argued that understanding health promotion behaviour in Malaysia would not be possible unless following questions are answered: What is the relationship between the factors of HPB that influence elderly health diseases (Diabetes Mellitus, Hypertension, Hypercholesterolemia, Minor Stroke, Kidney Failure and Heart Problem) among the elderly people in Malaysia? A rigorous approach towards determining the relationships that exist between HPB with elderly health diseases would contribute to the adequately tailoring programs and policies to achieve a significant healthcare resources for elderly. Therefore, this study aims to examine the relationship between the factors of health promotion behaviour (HPB) and elderly health diseases (like Diabetes Mellitus, Hypertension, Hypercholesterolemia, Minor Stroke, Kidney Failure and Heart Problem) among the elderly group in Malaysia.

## Theoretical Review

This study applied health decision making theory and behaviour changes theory whereby the two theories assist in examining the nature of the elderly health behaviour. Bekker et al. (1999) stressed that, health decision is the decision-making actions based on health behaviour changes that occurs within an individual. In relation to health promotion behaviour, the theory proves that, individuals should be responsible for making productive and efficient decisions to help improve their health condition (Ahmed et al. 2014). In 1985, Ajzen expanded upon the behaviour change theory that

**Table 1** Statistic of elderly health diseases

Diseases	2016 (%)	2017 (%)	2018 (%)
Hypertension	15.2	17.5	26.8
Diabetes Mellitus	32.7	27.4	30.3
Heart Problem	11.6	7.7	15.4
Hypercholesterolemia	23.9	28.2	33.6
Kidney Failure	11.4	11.6	8.4
Minor Stroke	4.7	6.3	10.2

United Nation, (2017) & (2019)

analyses the planned behaviour of individuals' actions. The analyses also emphasises the role of intention in behaviour performance of individuals (Bekker et al. 1999). Behaviour change theory attempts to explain why behaviour of an individual change? It includes environmental, personal and behavioural characteristic as the major factors in the individual behavioural determination (Bekker et al. 1999; Davis et al. 2015; Kauppi 2015). Davis et al. (2015) indicated that theory of behaviour change represents the accumulated knowledge of the mechanisms of action (Mediators and Moderators of change as well as the primary assumptions) about what an individual behaviour is, and what actually influences such behaviour. Kauppi (2015) stressed that the behavioural changes within individuals is significantly as a result of what actually goes on in their thoughts. And that the theory of behaviour change enables the interpretation of why people behave as they do and how the change is possible to achieve.

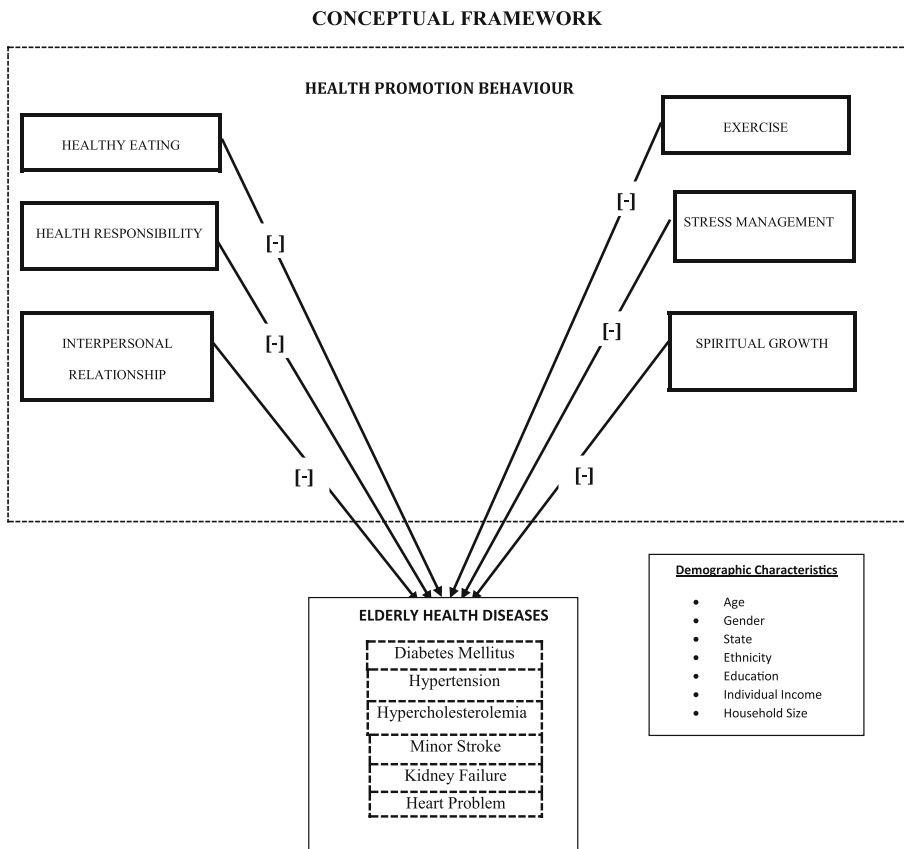
The theory, moreover, helps to evaluate the behaviour change process of individual attempting to do something. Kauppi (2015) and Tones and Green (2004) prompted that, the readiness for behaviour change by an individual is highly influenced by the attitude and personal values. That, no matter how significant the behaviour change factors are, when individuals are not ready to change their behaviour nothing changes. This is because, the behavioural change is not only affected by attitude and personality, but it also influenced by the prevailing culture and environment (Webb et al. 2010). The health decision making and behavioural change theories have been adopted as the focal basis of an individual's behavioural action, in relation to the influence these theories have on the behavioural intention of individual health conditions. Interestingly, this study recognizes the significance of these theories, and for that reason saw it fit to apply these theories in the examination of the relationship between the factors of health promotion behaviour (HPB) and the elderly health diseases (Bekker et al. 1999; Sniehotta et al. 2014; Dotzauer 2018).

## Hypothesis Development

Figure 1 shows the relationship between the independent variables and the dependent variable. The independent variables consist of healthy eating, exercise, stress management, interpersonal relations, health responsibility and spiritual growth (basically classify as reflective variables or constructs), representing the main HPB variables according to (Tomás et al. 2015; Tountas 2009). While the dependent variable is elderly health diseases. Elderly health diseases include diabetes mellitus, hypertension, hypercholesterolemia, minor stroke, kidney failure, and heart problems. According to previous studies (Khan et al. 2017; Basheti et al. 2019; Seangpraw et al. 2019; Cherng et al. 2018), elderly health diseases such as NCDs is negatively related to health promotion behaviours (HPB) which includes, healthy eating, exercise, stress management, interpersonal relations, health responsibility, spiritual growth.

## Healthy Eating and Elderly Health Diseases (NCDs)

Studies (Golinowska et al. 2016; Rogala 2017) have claimed that, excess weight gain results to an imbalance between energy consumed and energy expended. Diabetes



**Fig. 1** Propose conceptual framework

mellitus, hypertension and hypercholesterolemia are better control if the patient manage their intake of food. Less carbohydrate intake, less salt intake (<2300 mg per day), increase fruit and vegetable intake (8–10 servings per day), less fat dairy product, less cholesterol and limited alcohol intake will improve the blood pressure reading and glucose level as well as improved cholesterol level and reducing the weight (Chamberlain et al. 2016). Story et al. (2009), and Rogala (2017) elaborated that, when elderly people are guided through a healthy eating habit, their behaviour toward healthy lifestyle change for the positive. According to Macera (2003) and Centers for Disease Control and Prevention (2011), the condition of elderly health being affected by health disease and healthy eating are negatively related. Hence, elderly people who practice a healthy eating habit such as eating a well-balanced diet meal and avoid drugs usage and alcohol consumption, the less changes of being affected by health diseases (like diabetes). This further explained that, when the elderly improves their healthy eating habit, the probability of being diagnosed with NCDs like diabetes will decrease significantly (Chenary et al. 2016).

Therefore, this Study Hypothesized that Elderly Health Diseases and Healthy Eating Are Negatively Related (H1)

## **Interpersonal Relationship and Elderly Health Elderly Health Diseases (NCDs)**

Good interpersonal relations play an important role to curb some chronic disease. A person with good interpersonal relation will have a good support in the management of their disease (Wu et al. 2016; Wang and Luh 2009). Elderly who are affected by chronic disease like diabetes, hypertension and hypercholesterolemia need to change the lifestyle or behaviour which often not easy (Zhang et al. 2018). Consequently, they became depressed and making it difficult to accept themselves as the way they are (Martire and Helgeson 2017). Studies (Pinto et al. 2016; Martire and Helgeson 2017) have shown that, the diseases are controlled if the partner or family member is giving positive encouragement or participate in the healthy lifestyle. A family member or spouse who has a healthy lifestyle will influence one's behaviour (good relation with doctor). Kornhaber et al. (2016) instigated that interpersonal relations and the condition of elderly health being affected by health disease are negatively related. Thus, elderly people who lack good interpersonal relationship from love ones, eventually lacks the self-awareness to improve their health. Hence, it is significant for health professionals to therapeutically engage with patients to improve health-related outcomes. Because, when the elderly gets to involve in HPB (through social interaction with his or her loved ones), the more likely the elderly practice HPB activities such as exercising to help prevent or decrease the health disease. This, however, indicates that significant relationship between the variables (Lee and Ham 2013).

Therefore, this Study Hypothesized that Elderly Health Diseases and Interpersonal Relationship Are Negatively Related (H2)

## **Stress Management and Elderly Health Elderly Health Diseases (NCDs)**

Papageorgiou et al. (2016) and Mills et al. (2014) indicated that, stress is strongly correlated with anxiety that affect both young and old. Among older individuals, stress results in a poor general health condition (like colds, depression, cardiac event, stroke, suicidal ideation, headaches, pain and sensitivity) (Barzegar et al. 2017). Koval (2016) showed that experience of stress and health promoting behaviours are inversely related. Stating that, elderly who happen to engage in a positive health promoting behaviour such as exercise, recreational activities, social collaboration, etc., turn to reduce their level of stress, and eventually experience a better health condition. Studies (Chiesa and Serretti 2009; Moonmuang 2005) have shown that the condition of elderly health being affected by health diseases and stress management are negatively related. This statement further indicates that, when elderly individuals are encouraged to get involved in the healthy activities (which includes, exercising, healthy eating, all kinds of physical activities), this may help reduce their stress level, which eventually help to avoid or prevent health disease such as hypertension.

Therefore, this Study Hypothesized that Elderly Health Diseases and Stress Management Are Negatively Related (H3)



## Exercise and Elderly Health Elderly Health Diseases (NCDs)

Dey (2017) stressed that, all types of physical activities directly have a significant impact on health status. Exercise is proven to improve blood glucose level and recognise well as an important factor in diabetic control. The longer the exercise is linked to better glucose control (Colberg et al. 2013; Hussein et al. 2015). The recommended exercise is at least 30 min of moderate exercise such as brisk walking at least 5 times in a week. Exercise also prevents the high-risk individual to become diabetic (Hussein et al. 2015). Province et al. (1995), emphasize that, exercise and health promotion behaviours are significantly related. Elderly who are more physically active have less chances of being infected by disease compare to less physically active individuals (Briggs et al. 2016). Letchuman et al. (2010) stated that the condition of elderly health being affected by health diseases and physical activities are negatively related. In a stretch discussion, researchers have discovered that, when the body gets enough practical exercise, the body propels organs to positively react to health diseases. Therefore, the health condition improves significantly by preventing or reducing health disease. Studies (Perry et al. 1987; Story and Neumark-Sztainer 1999; Macera 2003) have shown that, the life expectancy of elderly people increases when they engage in physical activities.

Therefore, this Study Hypothesized that Elderly Health Diseases and Exercise Are Negatively Related (H4)

## Health Responsibility and Elderly Health Elderly Health Diseases (NCDs)

Health responsibility in patient with chronic illness is very important. Good health responsibility leads the person to seek an appropriate medical attention and to discuss it with the professional and adhere to the treatment regime. This behaviour is important to minimize the short and long-term complication and improves the quality of life (Andress 2017; Minkler 1999). A Study of (Low et al. 2016) has shown that the health seeking behaviour is the influence of social circumstances. Hence, a good relationship between patient and social network, level of trust, support and comforting feeling is greatly influenced by the health behaviour. Education level and gender are also the factors influencing the healthy behaviour. The higher the education level, the better exposure to HPB (Andress 2017). Female patient generally has better health responsibility compare to male patient (Mallmann et al. 2015). According to Resnik (2007), the health condition of elderly is being affected by health diseases and health responsibility are negatively related. The findings show that, health responsibility is a key element to a high level healthy wellbeing. Besides that, studies (Low et al. 2016; Basheti et al. 2019) have indicated that inappropriate elderly health behaviours are more likely to result in poor health condition. Basically, the more elderly people are willing to encourage in healthy lifestyle, the less likely to be affected by health disease.

Therefore, this Study Hypothesized that Elderly Health Diseases and Health Responsibility Are Negatively Related (H5)



## Spiritual Growth and Elderly Health Elderly Health Diseases (NCDs)

According to Ensan et al. (2018) and Fournier (2017) the individual spiritual growth is the human ability that enables every individual to react to their physical activities. Moreover, when the spiritual aspect of living a healthy lifestyle is non-existent, an individual cannot practice a good healthy lifestyle through health promotion behaviour (Faull and Hills 2006). Ensan et al. (2018) claimed that, the spiritual growth aspect of a healthy lifestyle is very significant during old age. When an elderly people are aged and weak, they do not only need physical support, but they also need spiritual support (mental stability) to practice a healthy lifestyle. Shaheen et al. (2015) indicated that, the health condition of the elderly is being affected by health diseases and elderly spiritual growth are negatively related when elderly increase their spiritual growth (level of healthcare awareness or consciousness) in health behaviour. Studies (Ensan et al. 2018; Shaheen et al. 2015) conducted are in line with what the health minister of Malaysia, Datuk Seri Dr. Dzulkefly Ahmad where he is planning to recruit professionally trained and accredited spiritual guidance officers to provide spiritual growth to patients apart from providing medical care. Thus, when the elderly people are more aware in avoiding and preventing health disease. Their mental health condition improves because, the elderly mental condition is significantly related to the spiritual growth, and that the elderly spiritual growth is enhanced through productive healthy activities.

Therefore, this Study Hypothesized that Elderly Health Diseases and Spiritual Growth Are Negatively Related (H6)

## Methodology

The target population in this study is Malaysian elderly aged 60 years and above. This research includes all the major ethnicity (such as Malay, Chinese and Indian). The sampling frame chosen are Perak, Pinang, Malacca and Selangor, as it has been recorded as some of the states with older populations (Population and Demographics Ageing Malaysia 2017). This study implemented a primary data collection to enable an effective measurement of the research variables. And adopted De Leeuw (2005) and Walker et al. (1995) questionnaire method of data collection. In order to get an accurate data and minimize bias, the questionnaire is distributed to the respondents face-to-face and the interview will be conducted in the local dialects.

## Research Procedure

This study is assisted by four (4) local students (Malay, Chinese and Indian) residing in the respective locations (Perak, Malacca, Selangor and Penang), so that the assistants can explain very well all parts of the questionnaire to the respondents. Research assistants are being trained by the researchers on how to conduct the survey adequately. The research assistants will be present during all the periods of the surveys to help and guide respondents in conducting the questionnaire adequately and appropriately. According to Iddrisu et al. (2020) finding, which also conducted a similar analysis indicated the implementation of (PLS-SEM), hence, this study applied SmartPLS based Structural Equation Modelling that

involves a variance based method of data analysis. Data collected for a one-round survey and 520 questionnaires are distributed to the respondents and collected. The data collection was conducted in 2018. This study applied a ‘Simple Random Sampling’ method for the questionnaire distribution process. Using Simple Random Sampling allows researchers to conveniently locate interested respondents who are willing to take part in the survey (Kadilar and Cingi 2004; Taherdoost 2016). A compensation of RM10 KFC voucher was given to each participant. And each respondent takes about 5 min to answer each questionnaire.

Perak, Malacca, Penang and Selangor are the chosen area of research data collection, as it has been proven as some of the states with older populations (Population and Demographics Ageing Malaysia 2017). The primary data collected will then be transformed into coding by using SPSS in order to generate an overview of the data preparation. SmartPLS Software 3.0 is initiated because, this study estimates a reflective measurement. Since the dependent variable, elderly health disease is predetermined by diabetes mellitus, hypertension, hypercholesterolemia, minor stroke, heart problem and kidney failure. Whereas, the six independent variables are reflective in nature. This moreover makes it conducive to use Smart PLS for data analysis, in order to measure the variables accordingly. Besides that, SPSS is able to analyse the elderly health disease among the ethnicity.

## Questionnaire Design

The constructed questionnaire includes sixty-nine (69) questions. The questions are categorized into three segments. The section A consists of the demography questions, section B consist of the elderly health diseases (including diabetes mellitus, hypertension, hypercholesterolemia, minor stroke, kidney failure and heart problem) information of the respondents, and section C contains some set questions on the factors of HPB which include healthy eating, exercise, stress management, interpersonal relations, health responsibility, spiritual growth, individual personal factors and elderly perception. The questions in all the sections were adapted from several studies (Vahedian-Shahroodi et al. 2013; Walker et al. 1995; Ministry of Healthcare, and Nutrition 2008; Woringer et al. 2017).

However, for the measurement scale, Ordinal scale and Nominal scale are used in section A and B of a questionnaire to measure the variables. While, Likert scale is used in section C. For example, the measurement of the ethnicity of the respondents in the section A is categorized as “Malay represent 1, Chinese for 2, Indians for 3 and others for 4”. Whereas, the ‘Others’ represent any other race apart from the three major races in the country. Nonetheless, in section B (Elderly health diseases information), ordinal scale measurement is used. For example, “Do you suffer from Diabetes? No represent 0, Yes (Low severity) is 1, Yes (Medium severity is 2, Yes (High severity) is 3 (Simon and Goes 2013). And lastly, the measurement scale in section C is categorized as strongly disagree for 1, disagree for 2, normal for 3, agree for 4 and strongly agree for 5. While, never represent 1, sometimes represent 2, often represent 3, and routine represent 4 (Simon and Goes 2013).

## SmartPLS Model

### Reliability

In the SmartPLS 3.0 analysis, the individual factor reliability was assessed by examining the loadings of the respective factors on their respective latent constructs (Hulland 1999). The higher loadings imply that there is more shared variance between the construct and its measures the error variance. In addition, the reliability of each variable was assessed through Fornell and Larker's (1981) measure of composite reliability.

### Convergent Validity

Convergent validity refers to the degree of agreement in two or more measures of the construct (Hair et al. 2011). Evidence of convergent validity was assessed by inspection of variance extracted for cash factor (Fornell and Larker 1981). According to Fornell and Larker (1981), convergent validity is established, if the variance-extracted value exceeds 0.50.

### Discriminate Validity

Discriminate validity is the degree to which any single construct is different from the other constructs in the model (Hair et al. 2011; Hair et al. 2012). The discriminate validity is adequate when construct have an AVE loading greater than 0.5, meaning that at least 50% of measurement variance should be captured by the construct (Chin 1998). In addition, discriminate validity is confirmed if the diagonal elements are significantly higher than the off-diagonal values in the corresponding rows and columns. The diagonal elements are the square roots of the AVE score for each construct (i.e. Healthy eating, exercise, stress management, interpersonal relationship, health responsibility and spiritual growth).

### Bootstrapping

According to Streukens and Leroi-Werelds (2016) in a bootstrapping procedure, model confidence intervals are typically constructed to test the relationship between constructs (i.e. direct relationship) are statistically significant. Besides that, bootstrapping provides assessment of direct relationships and much more beyond this, such as testing the significance of both non-direct effects and the coefficient of determination as well as a formal comparison of effects.

## Findings and Discussion

### Demographic Descriptive Statistic Analysis

A total of 520 data information was collected, through the questionnaire distribution in the selected locations, namely Selangor, Perak, Penang and Melaka. However, 20 questionnaires were incomplete, therefore, were regarded as outliers. Hence, excluded

from the total number of data with proper supervision. The remaining 500 were properly screened and used in the data analysis, respectively. According to Tables 2, 47.4% are recorded as male respondents, while 52.6% are female respondents. The age classification ranges from 60 years and above, 70.8% are of the age 60-70 years, 21.8% are of age 71-80 years, and 7.4% are of age 81-100 years. For the demographic location, 39.2% of the respondents are within the region of Selangor, 25.6% are reportedly from within Perak state, 17.2% are within Penang, and 18% are within Melaka region respectively. 53.8% of the respondents' ethnicity are Malays, 36% are Chinese, and 9.8% are Indian. Moreover, 14.6% have no education, 40.6% have at least the primary education qualification, 35.6% have the secondary education qualification, and lastly, respondents with tertiary education level qualification are just 9.2%. For individual monthly income, 24.6% have no source of monthly income, 32.6% receives monthly income <RM1000, 35.6% of the respondents receives monthly income between RM1000-RM4000. And lastly, 7.2% receives a monthly income >RM4000. Household size indicates the number of members in a family, 54.4% of the respondents have a household size from 1 to 3 members in a family, 40% have a household size from 4 to 6 members in a family, and only 5.6% of the respondents have a household size from 7 to 10 members in a family.

### **Statistic of Malay and Elderly Health Diseases**

The Table 3 shows the statistics of the Malay and health diseases. 25.25% of the respondents have diabetes, 23.70% have been diagnosed with hypertension, and 12.59% have been diagnosed with heart problems. 13.33% have been diagnosed with hypercholesterolemia. In relationship to Kidney failure, only 4.44% have Kidney failure. Interestingly, only 2.22% have been diagnosed with stroke. However, only 6.66% of them have been diagnosed with other health diseases (including Asthma, Blood Pressure, Joint Pain, Cancer, Hearing Problem, Gastric, Arteritis, Myopic Eyes, and Coral Disease).

### **Statistic of Chinese and Elderly Health Diseases**

The Table 4 shows the statistics of the Chinese and health diseases. 22.22% of the respondents have diabetes, 29.44% have been diagnosed with hypertension and only 5% have been diagnosed with heart problems. 17.78% have been diagnosed with hypercholesterolemia. Only 1.11% have been diagnosed with Kidney failure. Interestingly, only 0.56% have been diagnosed with stroke, respectively. However, all the Chinese respondents have not been diagnosed with any other health diseases (including Asthma, Blood Pressure, Joint Pain, Cancer, Hearing Problem, Gastric, Arteritis, Myopic Eyes, and Coral Disease).

### **Statistic of Indian and Elderly Health Diseases**

The Table 5 shows the statistics of the Indian and health diseases. 46.94% of the respondents have diabetes, 36.73% have been diagnosed with hypertension and 16.32% have been diagnosed with heart problems. 16.32% have been diagnosed with hypercholesterolemia. In relationship to Kidney failure, only 4.08% have been diagnosed. Interestingly, 10.20% have been diagnosed with stroke. However, all the Indian respondents have not been diagnosed

**Table 2** Demographic profile of the respondents

Demographic Variables	Frequency	Percentage (%)
Age		
60–70	354	70.8%
71–80	109	21.8%
81–100	37	7.4%
Gender		
Male	237	47.4%
Female	263	52.6%
State		
KL	196	39.2%
Perak	128	25.6%
Penang	86	17.2%
Melaka	90	18%
Education		
No Education	73	14.6%
Primary	203	40.6%
Secondary	178	35.6%
Tertiary	46	9.2%
Ethnicity		
Malay	270	53.8%
Chinese	180	36%
Indian	49	9.8%
Household Size		
1–3	272	54.4%
4–6	200	40%
7–10	28	5.69%
Individual Income		
No income	123	24.6%
<RM1000	163	32.6%
RM1000–RM4000	178	35.6%
>RM4000	36	7.2%

with any other health diseases (including Asthma, Blood Pressure, Joint Pain, Cancer, Hearing Problem, Gastric, Arteritis, Myopic Eyes, and Coral Disease).

According to the report, more Malay respondents have been diagnosed with diabetes (total of 69 respondents), followed by the Chinese (total of 40 respondents) and lastly, the Indian (total of 23 respondents). And for hypertension, more Malays have the disease (total of 64 respondents), as compare with Chinese (total of 53 respondents) and Indians (total of 18 respondents). Again, more Malays have been diagnosed with heart problems (total of 34 respondents), compare with the Chinese (total of 9 respondents) and the Indians (total of 6 respondents), respectively. Nonetheless, a significant number of Malays have been diagnosed with hypercholesterolemia (total of 36 respondents), followed by the Chinese (total of 32 respondents) and lastly, the Indians (total of 8 respondents).

**Table 3** Statistic of ethnicity and elderly health diseases

Ethnicity	Diseases	No (%)	Yes Low Severity (%)	Yes Medium Severity (%)	Yes High Severity (%)	Total Yes
Malay						<b>Total</b>
1.	Diabetes Mellitus	74.07	13.33	10.74	1.48	<b>25.55</b>
2.	Hypertension	75.93	13.70	9.63	0.37	<b>23.70</b>
3.	Heart Problem	87.04	8.52	3.70	0.37	<b>12.59</b>
4.	Hypercholesterolemia	86.30	9.63	3.70	0	<b>13.33</b>
5.	Kidney Failure	95.19	4.44	0	0	<b>4.44</b>
6.	Minor Stroke	97.41	0.74	1.48	0	<b>2.22</b>
7.	Others	85.56	2.96	3.70	0	<b>6.66</b>

The research finding from Tan et al. (2011a) and Rampal et al. (2010) basically support this study finding. They stated that Malay, Chinese, and Indian have significant chances of being diagnosed with diabetes, hypertension and obesity. However, the Malays are more likely to be diagnosed with diabetes and hypertension, due to the level of obesity among them. Etnik (2015) revealed that all the races (Malay, Chinese, and Indian) are likely to be affected with diabetes, hypertension and obesity. But the Malay and Indian are most likely to be affected by such diseases, despite the Indian having the minority aging population. Studies (Tan et al. 2011a; Rampal et al. 2010) have also indicated that for being an Indian the log odds of being diagnosed with Diabetes Mellitus increases as compared to Malay. And, for being a Chinese the log odds of being diagnosed with Hypercholesterolemia increases as well, as compared to Malay, Indian and others. Other studies (Tan et al. 2011a; Rampal et al. 2012) emphasized that among the major race, the Chinese have high HPB and the Malay have low HPB. Explaining that, among the ethnicity, the Chinese have a high life expectancy as compared to Malay and Indian, due to their low risk factor to NCDs.

**Table 4** Statistic of Chinese and elderly health diseases

Ethnicity	Diseases	No (%)	Yes Low Severity (%)	Yes Medium Severity (%)	Yes High Severity (%)	Total Yes
Chinese						<b>Total</b>
1.	Diabetes Mellitus	<b>77.78</b>	17.22	5.00	0	<b>22.22</b>
2.	Hypertension	70.56	26.11	3.33	0	<b>29.44</b>
3.	Heart Problem	95	4.44	0.56	0	<b>5</b>
4.	Hypercholesterolemia	82.22	14.44	2.78	0.56	<b>17.78</b>
5.	Kidney Failure	98.89	1.11	0	0	<b>1.11</b>
6.	Minor Stroke	99.44	0.56	0	0	<b>0.56</b>
7.	Others	100	0	0	0	<b>0</b>

**Table 5** Statistic of Indian and elderly health diseases

Ethnicity	Diseases	No (%)	Yes low severity (%)	Yes medium severity (%)	Yes High Severity (%)	Total Yes
Indian						Total
1.	Diabetes Mellitus	53.06	28.57	16.33	2.04	<b>46.94</b>
2.	Hypertension	63.27	28.57	8.16	0	<b>36.73</b>
3.	Heart Problem	83.67	12.24	4.08	0	<b>16.32</b>
4.	Hypercholesterolemia	83.67	12.24	4.08	0	<b>16.32</b>
5.	Kidney Failure	95.92	4.08	0	0	<b>4.08</b>
6.	Minor Stroke	89.80	10.20	0	0	<b>10.20</b>
7.	Others	100	0	0	0	<b>0</b>

## SmartPLS Analysis and Discussion

The measurement model was tested by assessing the individual items and scale reliability followed by convergent and discriminant validity of constructs measures. Initially, the relationships were displayed between the constructs (Healthy eating, Exercise, interpersonal relationship, stress management, Health responsibility, Spiritual growth and Elderly health disease). In relation to independent variables analysis, for example healthy eating items include HE1, HE2 HE3, HE4 and HE5 indicates factor loadings 0.793, 0.798, 0.808, 0.824 and 0.739 respectively, 0.739 as the least factor loading, indicate that all factor loadings are  $>0.70$ . Exercise, on the other hand, has a total of six (6) variable items with their respective factor loadings 0.784, 0.826, 0.783, 0.854, 0.723 and 0.774. According to Fig. 2, all items for all independent variables have factor loadings  $>0.70$ . Indicating that, all measurements for each item is significant (Hair et al. 2012).

PLS algorithm was applied and the resultants relationships, coefficients and values of loadings are shown in Fig. 1. After the loading being examined, the negative factor loadings were dropped out to improve the construct individual items. Hence, the existing factor loading lower than 0.70 were significantly maintained because they improve the items on the subsequent test, including Cronbach's alpha, Composite reliability and AVE according to Hulland (1999) and Hair et al. (2012). The model was again analysed by using SmartPLS 3.0. The loadings of the respective factors were acceptable on their respective latent constructs, and were then further examined to assess the reliability of the factors (Hair et al. 2011). The Fig. 3 below shows the t-statistic for the construct items. The t-statistic loadings for all independent, including Healthy eating, Exercise, Health Responsibility, Interpersonal Relation, Stress Management and Spiritual Growth have values  $>1.96$ .

The data simulation shows that, the factor loadings Cronbach's alpha, Composite reliability and Average Variance Extracted values calculated by PLS algorithms are tabulated as follows. The Cronbach's alpha of the constructs ranges from 0.706 to 1.000. The composite factor reliability coefficients of the constructs range from 0.725 to 1.000 (seen in Table 6 below), which actually met the standard of 0.70 as suggested by (Formell and Larker 1981; Hair et al. 2011),



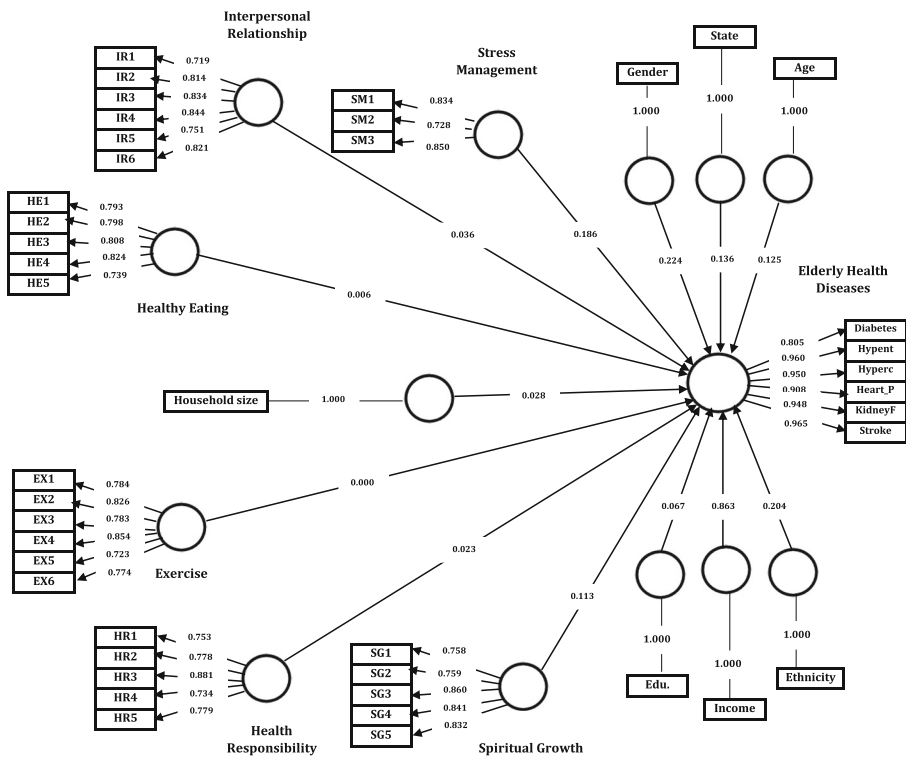


Fig. 2 Constructs factor loading

However, the PLS result indicated that the variance extracted for the construct scales ranged from 0.554 to 1.000 (Table 7). This, moreover, proves that the scales used for Healthy eating, Exercise, Stress management, Interpersonal relationship, Health responsibility and Spiritual growth possessed convergent validity, as the construct scales is above 0.50.

The discriminant validity is adequate as the constructs have an AVE loading greater than 0.5, meaning that at least 50% of measurement variance has been captured by the construct (Chin 1998). This, moreover, confirms that the diagonal elements are significantly higher than the off-diagonal values in the corresponding rows and columns, at a corresponding construct scale ranged from 0.720 to 1.000. Therefore, all the constructs possess discriminant validity. Nonetheless, according to (Chin 1998; Fornell and Larcker 1981; Hair et al. 2011) in smartPLS analysis, single variable items including the demographic items (age, gender, education, income, household size, ethnicity and state) cannot be interpreted. Since, all the demographic variables are all single items construct (1.00). Hence, the internal consistent reliability becomes irrelevant and therefore, there is no need to interpret. Even though household size is significant to elderly health disease, the item cannot be interpreted (as shown in Table 9).

Multicollinearity was tested by calculating the variance inflation factors (VIF). This was to ensure that each indicator had a distinct influence of the intended latent constructs (Hair et al. 2011; Freeze and Raschke 2007). According to Kock (2015) Variance Inflation Factor (VIF) is also significant when investigating for common

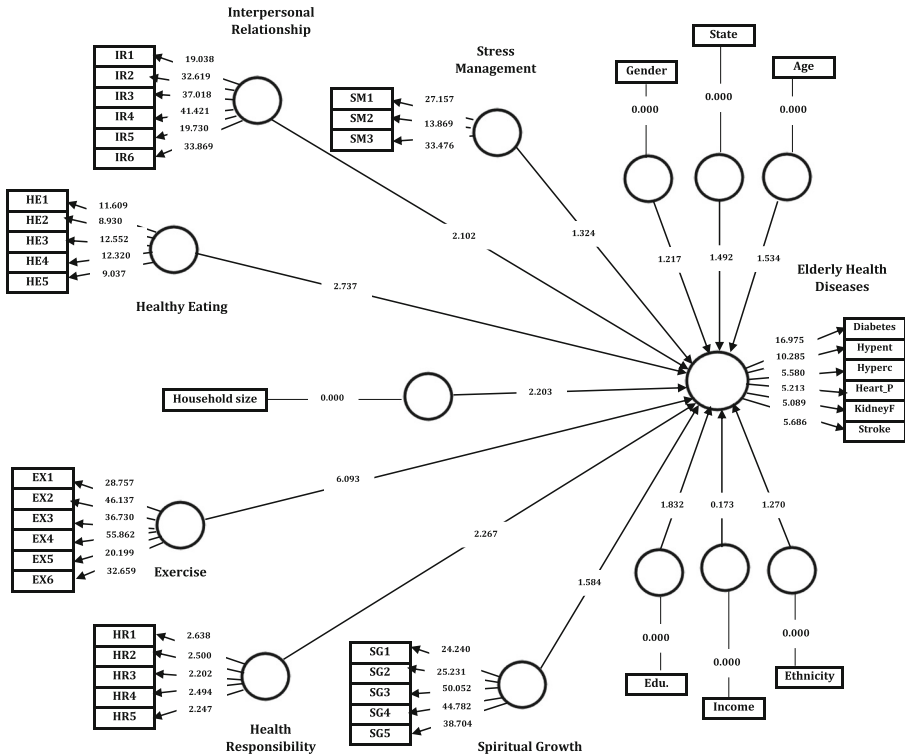


Fig. 3 Showing the T-statistic path model

method bias. Because VIF value greater than the minimum threshold of 3.3 is an indication of pathological collinearity. Hence, based on the report (the Table 8) all variable items are below the 3.3 minimum threshold. Therefore, VIF values indicate a zero multicollinearity problem. The model fit evaluation (Table 10 in appendix) indicates that, all the independent and dependent variable items are significant and fit

Table 6 Construct reliability and validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Elderly Health Diseases	0.720	0.758	0.725	0.571
Exercise	0.883	0.897	0.910	0.627
Healthy Eating	0.706	0.705	0.806	0.554
Interpersonal Relationship	0.891	0.921	0.913	0.638
Spiritual Growth	0.870	0.881	0.906	0.658
Health Responsibility	0.862	0.969	0.890	0.619
Stress Management	0.727	0.733	0.847	0.649

Table 7 Discriminant validity

	Age	Education	E H D	Ethnicity	Ex	Gender	H R	H E	Household Size	Individual Income	I R	S G	State	S M
Age	1.000													
Education	-0.383	1.000												
Elderly Health Diseases	0.148	-0.212	0.720											
Ethnicity	0.010	-0.115	0.114	1.000										
Exercise	-0.134	0.225	-0.299	0.019	0.792									
Gender	0.025	-0.120	0.000	0.008	-0.123	1.000								
Health Responsibility	-0.081	0.208	-0.121	-0.105	0.505	0.042	0.787							
Healthy Eating	-0.049	0.098	-0.209	-0.107	0.244	0.094	0.174	0.774						
Household Size	-0.027	0.016	0.072	0.136	0.028	0.005	0.029	-0.018	1.000					
Individual Income	-0.286	0.498	-0.148	-0.196	0.137	-0.196	0.164	0.144	-0.053	1.000				
Interpersonal Relationship	-0.111	0.254	-0.230	-0.334	0.214	-0.033	0.378	0.202	0.021	0.217	0.798			
Spiritual Growth	-0.120	0.266	-0.247	-0.280	0.228	-0.009	0.334	0.303	0.002	0.240	0.603	0.811		
State	0.011	-0.104	0.052	-0.167	-0.106	0.001	-0.131	0.158	-0.215	0.039	-0.068	-0.068	1.000	
Stress Management	-0.099	0.211	-0.237	-0.064	0.572	-0.033	0.561	0.168	0.010	0.196	0.332	0.383	-0.165	0.806

for exploratory factor analysis, since all items have values greater than 0.70 in both discriminant and convergent validity. Moreover, the average variance between independent and dependent factor loadings is 0.75. And the R-square and adjusted r-square are 0.25 and 0.15. This is to justify that, not all the independent variables defined the dependent variable well, as two of the variables indicated insignificant, while 4 of the variables are significant with  $p$  value greater than 0.05.

### Factors of HPB and Elderly Health Diseases (EHD)

In order to evaluate the statistical significance level of the constructs, a bootstrapping test was conducted. The result from Table 9 indicates that, the relationship between exercise and elderly health diseases is statistically significant at  $p$  value of 0.000. This has indicated that exercise has a direct negative influence on the elderly health disease. Hence, elderly health diseases changes in direct proportion to exercise with a coefficient of  $-0.254$ . This clearly indicates that, with an increase in score of exercise, the elderly health disease decreases significantly by  $-0.254$ .

The relationship between exercise and elderly health diseases is significant because when an elderly person exercise properly, the exercise boost the immune system to fight against health diseases such as diabetes and hypertension (Rutherford and Mark 2017). Rutherford and Mark (2017), and Colberg et al. (2010) found a similar finding that indicates that, exercise and health diseases (such as Diabetes Mellitus, Hypertension, Kidney Failure and Heart Problem) are found to be significantly related. As a result, exercise has significant influence on elderly health diseases. Hence, physical activity is an important modifiable risk factor associated with the prevention of chronic diseases such Diabetes Mellitus, Hypertension, Kidney Failure and Heart Problem. Their findings further show that sufficient physical activity can help to manage biomedical risk factors such as Overweight, High Blood Pressure, Diabetes Mellitus and Hypertension (Basheti et al. 2019).

The relationship between healthy eating and elderly health diseases is statistically significant at  $p$  value of 0.006. Indicating that, healthy eating has a direct negative influence on the elderly health disease. Hence, elderly health diseases change in direct proportion to healthy eating with a coefficient of  $-0.106$ . This clearly indicates that, with an increase in score of healthy eating, the elderly health disease decreases significantly by  $-0.106$ .

The relationship between healthy eating and elderly health diseases is significant because when the elderly people observe a good healthy eating habits (such as eating nutritious meals, balance diet and avoid intoxicants) the body is more likely to grow healthy and prevent health diseases (Norhayati et al. 2018; Shahri et al. 2019). However, the result corresponds to Food (2004) and Shahri et al. (2019) findings, which indicate that the healthy eating and health diseases (such as Diabetes Mellitus, Hypercholesterolemia, Hypertension etc.) are significantly related. Hence, observing a healthy eating habit, including eating a balance diet nutrition. This does not only aid in the development of the body, but it also enables prevention of obesity, diabetes and hypertension (Pan American Health Organization (PAHO) 2004; World Health Organization 2003).

The relationship between interpersonal relationship and elderly health diseases are statistically significant at  $p$  value of 0.036. Indicating that, interpersonal relationship has a direct negative influence on elderly health disease. Hence, elderly health diseases change in direct proportion to interpersonal relationship with a coefficient of  $-0.099$ .

**Table 8** Collinearity statistics (VIF)

Outer VIF Values	
	VIF
Diabetes Mellitus	1.258
Heart problem	1.052
Hypercholesterolemia	1.158
Hypertension	1.243
Kidney_failure	1.071
Minor stroke	1.066
EX1	2.729
EX2	2.291
EX3	1.923
EX4	2.522
EX5	2.298
EX6	1.859
HE1	1.225
HE2	1.569
HE3	1.222
HE4	1.589
HE5	1.669
HR1	2.301
HR2	1.973
HR3	2.365
HR4	1.822
HR5	1.613
IR1	1.959
IR2	2.222
IR3	2.926
IR4	2.353
IR5	2.500
IR6	1.949
SG1	1.879
SG2	1.805
SG3	2.624
SG4	2.355
SG5	2.032
SM1	1.611
SM2	1.264
SM3	1.735

This clearly indicates that, with an increase in score of interpersonal relationship, the elderly health disease decreases significantly by  $-0.099$ .

The relationship between interpersonal relationship and elderly health diseases is significant because the elderly people who are treated from the mental and emotional

**Table 9** Path coefficients

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/ STDEV )	<i>P</i> Values
Age -> Elderly Health Diseases	0.062	0.063	0.040	1.534	0.125
Education -> Elderly Health Diseases	-0.086	-0.086	0.047	1.832	0.067
Ethnicity -> Elderly Health Diseases	0.052	0.052	0.041	1.270	0.204
Individual Income -> Elderly Health Diseases	-0.008	-0.003	0.047	0.173	0.863
Gender -> Elderly Health Diseases	-0.049	-0.046	0.040	1.217	0.224
State -> Elderly Health Diseases	0.058	0.059	0.039	1.492	0.136
Household Size -> Elderly Health Diseases	0.084	0.086	0.038	2.203	0.028
Exercise -> Elderly Health Diseases	-0.254	-0.244	0.042	6.093	0.000
Healthy Eating -> Elderly Health Diseases	-0.106	-0.116	0.039	2.737	0.006
Interpersonal Relationship -> Elderly Health Diseases	-0.099	-0.097	0.047	2.102	0.036
Spiritual Growth -> Elderly Health Diseases	-0.075	-0.073	0.048	1.584	0.113
Health Responsibility -> Elderly Health Diseases	-0.163	-0.127	0.072	2.267	0.023
Stress Management -> Elderly Health Diseases	-0.067	-0.060	0.051	1.324	0.186

disorder did improve their health condition after getting a proper relationship bonding with their loved ones or people closely related. And indirectly will improve by practicing healthy eating habit and exercising. (Jenkins et al. 2018; Rodgers et al. 2006). Previous studies support the result by specifying that interpersonal relationship has a significant effect on elderly health diseases. In a way that emphasizes that interpersonal relationship is potentially significant in addressing the risks associated with High Blood Pressure, High Cholesterol, Stroke and Bodyweight (Rodgers et al. 2006). Therefore, the effect of Stroke and Hypercholesterolemia tend to reduce when the elderly who are affected by the diseases get a proper interpersonal relationship with the people close to them (Jenkins et al. 2018; Rodgers et al. 2006).

The relationship between Spiritual growth and elderly health diseases is statistically insignificant at p-value of 0.113. Indicating that, spiritual growth has no significant influence on elderly health diseases. This further shows that, with an increase in score of spiritual growth, the elderly health disease will have no significant changes. Thus, the psychological changes only occur when the spiritual growth aspect of the elderly life coincides with their self-awareness, regardless the type of health decision being taken. Therefore, the impact of any changes in the elderly's spiritual growth will insignificantly affect their decision-making ability (Heidarzadeh and Aghamohammadi 2017).

The relationship between Spiritual growth and elderly health diseases is insignificant because studies (Saad et al. 2010; Minhat 2014) have supported this result by revealing

that, spiritual growth has no significant influence on elderly health diseases. But instead it has a significant effect on individual self-awareness, self-willingness and psychological health condition. Previous findings (Lastra et al. 2014; Heidarzadeh and Aghamohammadi 2017) have supported this result by showing that spiritual growth has no influence on elderly health diseases. However, the only instance an elderly person benefits from a positive spiritual growth is when the Spirituality assists them in maintaining their health responsibility, and even sometimes leads to positive mental effects.

The relationship between health responsibility and elderly health diseases are statistically significant at  $p$  value of 0.023. This has indicated that health responsibility has a direct negative influence on the elderly health disease. Hence, elderly health diseases change in direct proportion to health responsibility with a coefficient of  $-0.163$ . This clearly indicates that, with an increase in score of health responsibility, the elderly health disease decrease significantly by  $-0.163$ .

The relationship between Spiritual growth and elderly health diseases is significant because when the elderly people observe or practice a good health responsibility such as medical check-up, eating healthy, proper medication, exercise, etc., those actions will directly and indirectly improve their health condition (Cheong et al. 2017; Kaur et al. 2015). Studies (Roopa and Rama Devi 2014; Kaur et al. 2015) have found a similar result which indicates that improving patient's status and perceived ability to control their disease results can reduce Diabetes Mellitus and Hypertension. Other findings (Jaafar et al. 2015; Damulak et al. 2015) report similar result which indicates that 65% of the elderly respondents opted that, their health condition has significantly improved after receiving proper medical examination which includes prescribe medication and counselling.

The relationship between Stress management and elderly health diseases is statistically insignificant at  $p$  value of 0.186. Indicating that, stress management has no significant influence on elderly health diseases. Thus, with an increase in score of Stress management, the elderly health disease will have no significant changes. That is, regardless of any decision being made to change the elderly behavior, toward his or her level of stress, there will be no direct impact on the health disease.

The relationship between Stress management and elderly health diseases is insignificant because when an elderly person makes a health decision to change his or her behaviour to manage his or her stress level. There will be no direct negative effect on risk factor to NCDs. This is because, regardless of a positive score or an improvement in stress management, elderly may still suffer from the health diseases (Papageorgiou et al. 2016). Jenkins et al. (2018) noted in corresponding to the findings by instigating that, stress management has no direct influence on health diseases. This is because, regardless of a positive score or an improvement in stress management, elderly may still suffer from the health diseases (Jenkins et al. 2018; Rutherford and Mark 2017).

## Conclusion

In conclusion, the findings of this study have clearly fulfilled the objective of this research, thus the significant relationship between all six (6) independent constructs and the dependent construct have been ascertained, accordingly. Constructs including



healthy eating, exercising, health responsibility and interpersonal relationship indicated to have a significant relationship with the elderly health diseases. Hence, with any significant improvement in the independent constructs, the elderly health disease reduces, subsequently. Whereas, constructs, including stress management and spiritual growth have an insignificant relationship with the elderly health diseases. That is, regardless of any improvement in those two constructs, there is no direct effect on the elderly health diseases. This shows that, when there is a positive drive on the factors, elderly that are affected stands a high chance of curing or preventing health diseases such as Diabetes Mellitus, Hypercholesterolemia and Hypertension. The finding of this study also revealed that diabetes mellitus, hypercholesterolemia, and hypertension are the most common diseases affecting the elderly people among the ethnicity (Malay, Chinese and Indian). Thus, almost 20% of the total number of respondents are affected with hypertension, diabetes mellitus and hypercholesterolemia, respectively. While, below 10% of the respondents are affected by Heart Problem, Kidney Failure and Minor Stroke. Consequently, the findings reflect that 32% of the elderly do sometimes practice healthy eating habit, and 8% of the elderly have never practiced healthy eating habit. Besides that, 56.18% of the total respondents never involve in exercise, and 29% of the total respondents never observe good health responsibility.

## Policy Implications

Now, for the government to encourage the initiation of more exercise or physical activities among the elderly, since the aging population is expected to increase, based on the finding, this study highlights that, adequate policies or proper enhancement of elderly health policies should be enforce, directly focusing on building more senior citizen social parks such as elderly exercise centers, exercise park, walking-friendly built environments, should be given a critical consideration should be built in the communities, especially in the rural areas where there is lack of social infrastructure. Besides that, authorities should consider the implementation of scheme for medical practitioners to educate and encourage family homes and old folks' homes, to provide health responsibility for the elderly people. Family homes and old folks' homes should be responsible to provide the most love and health concern to the elderly. As the ageing population is consciously rising and expected to double in the coming years, adequate policies regarding public and private healthcare education through TV shows, public announcement and health programs, is necessary, to increase good healthcare practice among the elderly especially in the rural areas. The study further recommends that Policymakers should consider allocating the ample amount of resources for the provision of more exclusive healthcare services and health promoting programs for its elderly population. In a similar vision, the health industry should consider intensifying its internal technical capacity to deal with problems related to those above mentioned diseases. (United Nation 2019). Besides that, the health ministry should consider providing intensive and extensive guidelines as well as useful training modules to help in preventing and controlling the diseases. Further research on the causes and mitigating of such diseases will be required.

## Limitation of the Study

This research only implements four (4) states (including Perak, Penang, Melacca and Selangor). However, according to Population and Demographics Ageing Malaysia (2017) States, including Selangor, Johor, Sarawak, and Sabah will experience an unprecedented growth in the aging population by 2025 Therefore, this study suggests that the inclusion of Selangor, Johor, Sarawak, and Sabah in future research will be necessary as the outcome will reflect the importance of the elderly health promotion behavior (HPB). Since this study cross-sectional analysis focuses on a single data collection of the sample size of the aging population for a specific period at the selected locations (Perak, Penang, Selangor, and Malacca). Therefore, this study proposes that with the same sample location a Longitudinal study should be conducted to capture how the elderly exposure to factors of HPB might correlate with their elderly health diseases, repeatedly over some time. Moreover, a questionnaire-based analysis was conducted, and elderly respondents provided significant information to run the analysis. However, this study proposes that medical analysis should also be conducted especially on elderly health diseases. To be able to examine and determine the impact of factors of HPB on the health diseases.

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## Appendix

**Table 10** Outer factor loading

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
Age <- Age	1.000	1.000	0.000	–	–
Gender <- Gender	1.000	1.000	0.000	–	–
State <- State	1.000	1.000	0.000	–	–
Household size <- Household Size	1.000	1.000	0.000	–	–
Education <- Education	1.000	1.000	0.000	–	–
Ethnicity <- Ethnicity	1.000	1.000	0.000	–	–
Individual Monthly_Income <- Individual Income	1.000	1.000	0.000	–	–
Diabetes Mellitus <- Elderly Health Diseases	0.805	0.740	0.138	16.975	0.000
Hypertension <- Elderly Health Diseases	0.960	0.717	0.149	10.285	0.000
Heart_problem <- Elderly Health Diseases	0.950	0.694	0.157	5.213	0.000
Hypercholesterolemia <- Elderly Health Diseases	0.908	0.790	0.168	5.580	0.000
Kidney_failure <- Elderly Health Diseases	0.948	0.704	0.160	5.089	0.000
Minor_stroke <- Elderly Health Diseases	0.965	0.757	0.163	5.686	0.000
EX1 <- Exercise	0.784	0.784	0.028	28.436	0.000

**Table 10** (continued)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/ STDEV )	P Values
EX2 < - Exercise	0.826	0.824	0.018	45.833	0.000
EX3 < - Exercise	0.783	0.781	0.021	36.506	0.000
EX4 < - Exercise	0.854	0.854	0.015	56.023	0.000
EX5 < - Exercise	0.723	0.723	0.036	20.013	0.000
EX6 < - Exercise	0.774	0.774	0.024	32.725	0.000
HE1 < - Healthy Eating	0.793	0.703	0.056	12.680	0.000
HE2 < - Healthy Eating	0.798	0.713	0.060	12.001	0.000
HE3 < - Healthy Eating	0.808	0.624	0.071	9.004	0.000
HE4 < - Healthy Eating	0.824	0.687	0.061	11.424	0.000
HE5 < - Healthy Eating	0.739	0.595	0.066	9.046	0.000
HR1 < - Health Responsibility	0.753	0.670	0.283	2.658	0.008
HR2 < - Health Responsibility	0.778	0.688	0.307	2.535	0.011
HR3 < - Health Responsibility	0.881	0.774	0.391	2.251	0.024
HR4 < - Health Responsibility	0.734	0.650	0.293	2.501	0.012
HR5 < - Health Responsibility	0.779	0.686	0.338	2.308	0.021
IR1 < - Interpersonal Relationship	0.719	0.715	0.039	18.612	0.000
IR2 < - Interpersonal Relationship	0.814	0.812	0.025	32.306	0.000
IR3 < - Interpersonal Relationship	0.834	0.830	0.023	36.348	0.000
IR4 < - Interpersonal Relationship	0.844	0.843	0.020	41.485	0.000
IR5 < - Interpersonal Relationship	0.751	0.745	0.039	19.030	0.000
IR6 < - Interpersonal Relationship	0.821	0.821	0.024	34.484	0.000
SG1 < - Spiritual Growth	0.758	0.758	0.031	24.335	0.000
SG2 < - Spiritual Growth	0.759	0.759	0.030	25.175	0.000
SG3 < - Spiritual Growth	0.860	0.859	0.017	51.317	0.000
SG4 < - Spiritual Growth	0.841	0.839	0.019	45.275	0.000
SG5 < - Spiritual Growth	0.832	0.831	0.021	39.977	0.000
SM1 < - Stress Management	0.834	0.833	0.031	26.688	0.000
SM2 < - Stress Management	0.728	0.724	0.055	13.348	0.000
SM3 < - Stress Management	0.850	0.847	0.025	33.610	0.000

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