

# Predictors of fall protection motivation among older adults in rural communities in a middle-income country: A cross-sectional study using the Protection Motivation Theory

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## Abstract

**Aims:** To evaluate factors associated with fall protection motivation to engage in fall preventive behaviour among rural community-dwelling older adults aged 55 and above using the protection motivation theory scale.

**Design:** A cross-sectional study.

**Methods:** The study was conducted in a healthcare clinic in Malaysia, using multistage random sampling from November 2021 to January 2022. Three hundred seventy-five older adults aged 55 and older were included in the final analysis. There were 31 items in the final PMT scale. The analysis was performed within the whole population and grouped into 'faller' and 'non-faller', employing IBM SPSS version 26.0 for descriptive, independent t-test, chi-square, bivariate correlation and linear regressions.

**Results:** A total of 375 older participants were included in the study. Fallers ( $n=82$ ) and non-fallers ( $n=293$ ) show statistically significant differences in the characteristics of ethnicity, assistive device users, self-rating of intention and participation in previous fall prevention programmes. The multiple linear regression model revealed fear, coping appraisal and an interaction effect of fear with coping appraisal predicting fall protection motivation among older adults in rural communities.

**Conclusion:** Findings from this study demonstrated that coping appraisal and fear predict the protection motivation of older adults in rural communities. Older adults without a history of falls and attaining higher education had better responses in coping appraisal, contributing to a reduction in perceived rewards and improving protection motivation. Conversely, older adults from lower education backgrounds tend to have higher non-preventive behaviours, leading to a decline in fall protection motivation.

**Implications for the profession and/or patient care:** These results contribute important information to nurses working with older adults with inadequate health literacy in rural communities, especially when planning and designing fall prevention interventions. The findings would benefit all nurses, healthcare providers, researchers and academicians who provide care for older adults.

**Patient or Public Contribution:** Participants were briefed about the study, and their consent was obtained. They were only required to answer the questionnaire through interviews. Older individuals aged fifty-five and above in rural communities at the healthcare clinic who could read, write or understand Malay or English were included. Those who were suffering from mental health problems and refused to participate in the study were excluded from the study. Their personal information remained classified and not recorded in the database during the data entry or analysis.

#### KEYWORDS

accidental fall, cross-sectional studies, elderly, falls, motivation, nursing, older adult, rural communities, rural population, slip and fall

## 1 | INTRODUCTION

Falls are often linked with an ageing population, which leads to an increasing worldwide concern due to their association with comorbidities (Montero-Odasso et al., 2022; WHO, 2021b). About 60 per cent of fall causal deaths among older adults occurred in low- and middle-income countries (LMICs), specifically in Southeast Asia and the Western Pacific regions (WHO, 2023). The consequences of fatal and non-fatal falls incur a financial burden to the LMICs or those individuals involved in the falls (CDC, 2020). An economic gap exists in LMICs which involves the cumulative wealth in comparison with the spending cost for the provision of healthcare expenditures in fall-related treatment (Sudharsanan et al., 2018). The expenses involved for fatal and non-fatal fall injuries alone have incurred countries' debt for more than millions on medical costs (CDC, 2020; Florence et al., 2018; Haddad et al., 2019).

Falls associated with most of the costs involve hospitalization and nursing home care, healthcare providers' services, rehabilitation, community-based services and the use of medical equipment (Haddad et al., 2019). Families or individuals also suffer from spending expenses (Sudharsanan et al., 2018) and further expenditure is anticipated because falls are inevitable among older people (Montero-Odasso et al., 2022). The pre-existing comorbidities with advanced age among older adults make them more vulnerable to fall risk (WHO, 2023). Fall prevention strategies may improve the quality of life among older adults by reducing their fall risk and decreasing families' and the country's financial burden (WHO, 2021b, 2023).

## 2 | BACKGROUND

There are considerable differences that exist in fall management when comparing LMICs and high-income countries in hospital settings (International Bank for Reconstruction and Development & The World Bank, 2021; WHO, 2021b). Given the numerous cross-cultural variations among populations in LMICs, local cultural practices and available resources have play essential roles in fall prevention planning and decision-making (Montero-Odasso et al., 2022). Fall management is highly recommended in LMICs, such as

the use of non-educationally and culturally biased tools that have been appraised locally in assessing cognitive impairments of older adults in the multifactorial fall risk assessments (Montero-Odasso et al., 2022). Additionally, review and educational interventions for fall prevention strategies should deliberate on the various cultural practices, such as footwear and environmental safety in the countries (Montero-Odasso et al., 2022).

The international guidelines for fall prevention have been proposed and implemented for many years. However, the applicability of these guidelines is still challenging due to the differences in older adults and contributing risk factors for falls in LMICs (Romli et al., 2017). The high prevalence of cognitive impairments, obesity and diabetes is significant causative fall risk factors that might differ between older adults in LMICs and those in high-income countries (Montero-Odasso et al., 2022). In addition, the healthcare priority in LMICs focuses on delivering essential services, such as internal medicine, emergency medicine and intensive care, compared to fall management, adding to their lack of fall prevention designs and interventions (Obermeyer et al., 2015; WHO, 2021b). Furthermore, the inadequate investment in quality improvement causes LMICs to have insufficient resources to improve patient safety (WHO, 2021b). WHO, OECD and The World Bank (2018) reported that the quality of care in most LMICs was still suboptimal and one barrier to low-quality care is the lack of resources to maintain the standard of care.

Health literacy requires individuals to search, comprehend, evaluate and use health information when making choices to reduce and prevent the risk of harm to their health (Adams et al., 2013; Meherali et al., 2020). Inadequate or low health literacy has drawn great attention to healthcare providers due to its significant implications on individuals and the healthcare system (Wong et al., 2022). People with low health literacy are associated with a lack of health knowledge and use of health resources, which leads to unfavourable lifestyles and behaviours, such as avoidance of participating in disease prevention, non-compliance with medications and deprivation of understanding the information from healthcare providers (IPH, 2015; WHO, 2013; Wong et al., 2022). Additionally, ineffective communication with healthcare professionals or limitations in their ability to access health information, especially if it is not in their preferred language, will impede their access and understanding of health information (IPH, 2015; WHO, 2013;

Wong et al., 2022). In addition, individuals with low health literacy have a higher mortality, increase in hospitalization rate or length of stay and poor self-management skills (Jaffee et al., 2017; Mitchell et al., 2012). This situation inevitably leads to increased healthcare expenditure, hospitalization and financial burden for the government, individuals or families (Meherali et al., 2020; WHO, 2013).

Older adults with a history of previous falls compared to those older individuals with no falls might differ in their perceptions and motivations for fall prevention activities. Some older adults perceived that they were not at risk for falls, in which they believed that fall prevention activities were more relevant to other older individuals than to themselves (Haines et al., 2014; Shuman et al., 2019). Many younger older individuals neither recognized their fall risk nor were motivated to participate in fall prevention activities (Horne et al., 2009). Those with previous falls positively acknowledged being at risk of future falls (Horne et al., 2009). However, only a few were willing to engage in fall preventive behaviour change (Stevens et al., 2018). Older individuals in advanced age who were hesitant to admit their fall threats were most likely to have lower motivations (Horne et al., 2014). Despite suffering from previous fall-related injuries and being admitted to the emergency department, many older adults were still reluctant or lacked the motivation to adopt fall preventive activities (Shankar et al., 2017). Therefore, it is crucial that healthcare providers constantly discover alternative approaches to assess the discrepancies in mitigating fall risk (Loganathan et al., 2016).

Malaysia is a developing country which is considered as a LMIC (The World Bank, 2021). Malaysian older adults in rural communities or villages are mostly illiterate or lacked of higher formal education (Hickey et al., 2018; IPH, 2015; Jaafar et al., 2021). Low-education backgrounds and income contribute to the vulnerability of individuals to low health literacy, thereby increasing their risk of experiencing falls (WHO, 2021b; Wong et al., 2022). The inadequate health literacy of older adults in rural communities also leads to a barrier or withdrawal from discussing fall-related issues with family or healthcare providers due to a lack of understanding of fall threats (Allen-Meares et al., 2020). Aside from seeking consultations and routine follow-ups for their medical problems in the primary healthcare settings, most of them rarely discuss falls or are engaged in open dialogue about falls, nor are involved in any fall prevention activities (Loganathan et al., 2015; Loganathan et al., 2016). This phenomenon signifies that falls and fall prevention are not essential issues to address, nor to assess older adults' abilities to recognize fall threats despite their inadequate health literacy. This outcome has significantly influenced their protection motivation for preventive behaviour. One of the possible cost-effective alternatives for rural community-dwelling older adults with diverse cultural practices and limited resources was to investigate factors contributing to their protection motivation for preventive behaviour (Floyd et al., 2000; Ruthig, 2016).

According to Kiegaldie and Farlie (2019), fall prevention interventions underpinned with a theoretical framework contribute to older persons' positive behavioural change. The health belief model

(HBM) is a commonly used theoretical framework for health promotion behaviour, which has been adopted vastly in intervention studies, such as in a study of older adults' health beliefs and their implications for fall prevention (Li, Zhou, et al., 2019), health beliefs of the older adults to fall prevention actions and fall prevention education for community-dwelling physical therapy older adults (Ott, 2018). In addition, the HBM and protection motivation theory (PMT) have similar concepts for protective behaviour and consist of cost-benefit analyses (Maddux & Rogers, 1983).

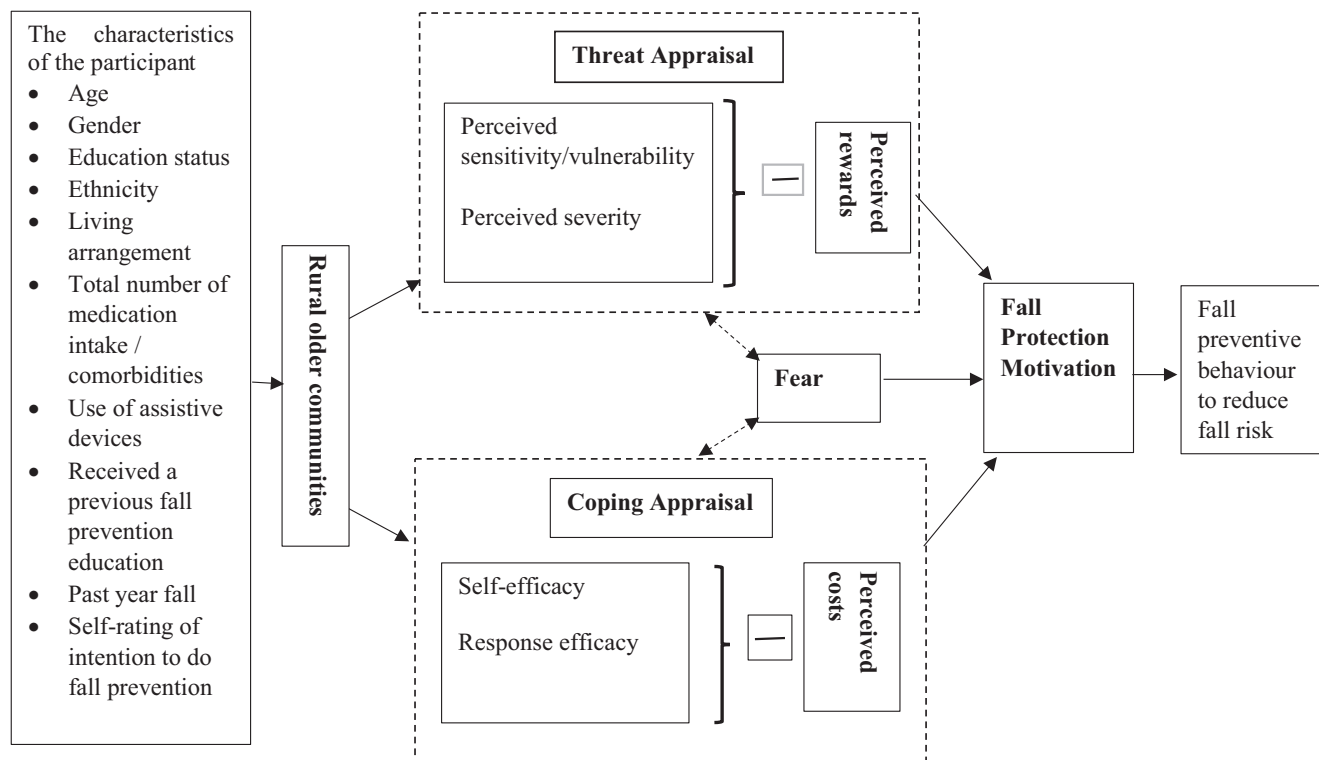
Despite the HBM being straightforward in explaining preventive practices, its drawback was lacking in informing the extent of the influence of the different HBM components on preventive measures taken by individuals (Floyd et al., 2000; Maddux & Rogers, 1983). In contrast, PMT explains the intricacies of motivation by considering individuals' threat and coping appraisals (Floyd et al., 2000; Maddux & Rogers, 1983) (Figure 1).

Thus, PMT could be an alternative theoretical framework in fall-related strategies to evaluate older individuals' behavioural intention or protection motivation, in which their intention to engage in protective behaviour from a perceived threat motivates them to positive attitudes and decision-making, thus incorporating the recommended actions into practice (Floyd et al., 2000; Popova, 2011). Furthermore, poorly designed fall prevention policies and insufficient training of healthcare professionals in one of the LMICs revealed a disparity in fall management for older adults with a high risk of falls (Loganathan et al., 2015). Thus, nurses could utilize PMT to investigate how seniors perceive the severity and vulnerability of falling, their belief in the effectiveness of these recommended actions, their confidence in taking preventive actions and the impact of response costs or maladaptive actions on their protection motivation.

These factors enhance nurses' understanding and knowledge about the design of targeted intervention programmes that address specific concerns and motivations of older individuals. They could then implement appropriate fall prevention intervention programmes guided by this framework to reduce fall risks among rural senior communities.

Reinforcing older adults' coping response in fall prevention using PMT's concept heightens their belief in response efficacy and self-efficacy, which empowers their protection motivation (Shillair, 2020). The threat appraisal and fear factors would also contribute to better intent among older adults in protection motivation due to their perceived seriousness of the threats and consequences to their lives or health (Rogers, 1983). A few studies also supported that PMT facilitates positive behavioural change among their participants (Sadri et al., 2022; Taheri-Kharamah et al., 2020). Hence, PMT could be a promising theoretical framework to be incorporated into fall prevention interventions.

The attempt to use PMT to assess fall protection motivation among rural community settings was still unclear, especially for older adults with low-education backgrounds and inadequate health literacy. Thus, the study attempts to answer the following questions: Did coping appraisal, threat appraisal, perceived rewards, perceived



**FIGURE 1** Conceptual framework for the Protection Motivation Theory of fall protection motivation among older adults in rural communities. The symbol for—indicates reduce/decrease.

costs and fear appeal contribute to the fall protection motivation among rural community-dwelling older adults in Malaysia? Are there any predictor differences between those with a history of falls and those with no falls?

### 3 | THE STUDY

#### 3.1 | Aim

To evaluate factors associated with fall protection motivation for preventive behaviour among rural community-dwelling older adults aged 55 and above using the PMT scale.

### 4 | METHODOLOGY

#### 4.1 | Study design

This cross-sectional study was carried out in Malaysia at a public primary healthcare clinic from November 2021 to January 2022.

#### 4.2 | Study setting and sampling

Multistage random sampling was adopted during the selection of the older participants, and a healthcare clinic from one division was

randomly selected. Out of the five regions with 48 settlements, 18 villages were randomly identified and chosen. The clinic follows the geographical zones in identifying and registering its patients. There are five geographical zones and about fourteen to twenty-nine residential housing and villages in a zone. Only villages were included in each zone, and two to four villages from each zone were randomly selected. About 10–30 participants from each village were randomly selected according to the registration list. Thus, three hundred eighty-nine older individuals aged 55 years and above were eligible for the final sampling.

#### 4.3 | Sample size calculation

A-priori sample size calculator for multiple regression by Cohen (1988) was performed, in which the finding of  $R^2$  (.26) from the previous study by Goh et al. (2021) on the evaluation of fall behavioural and awareness among older adults was calculated for the effect size,  $f^2 = 0.35$  (Cohen et al., 2003). The  $\alpha$  (alpha) error probability of 0.05 and power ( $1-\beta$  error probability) of 0.90 with five predictors were calculated. The five predictors were the total number of predictors in the model (Cohen et al., 2003). Some researchers suggested that less than 10% of the attrition is adequate (Naing et al., 2022). However, for older participants, especially among advanced-age participants with low or impaired cognitive levels, it would most likely result in a higher non-response or exclusion from the study (Jacobsen et al., 2021). Hence, the final

sample of 375 participants was included to improve the study's power and the comparison between fallers and non-fallers was determined after deleting fourteen samples due to outlier data that influenced the interpretation findings of the regression model (Jones et al., 2003).

#### 4.4 | Inclusion and exclusion criteria

The inclusion criteria included community-dwelling older adults aged fifty-five and above who could read, write or comprehend Malay or English. The age of fifty-five and above was selected as a cut-off in the study due to their health conditions and being considered as high risk for falls since they approached retirement age (Alex et al., 2020). Older adults residing in rural communities or villages with no severe hearing or cognitive impairment or who are able to understand the questions and who can ambulate independently with or without minimal assistance were included. The exclusion criteria were those living in urban communities with severe cognitive or hearing impairment, total dependent users of assistive devices and who refused to participate in the study. Low-education level in this study refers to those with primary education and lower, indicating those who did not receive a formal education or with a primary or elementary education background consisting of 6 years of education and below (Ministry of Education Malaysia, 2019). They may or may not complete their primary education.

#### 4.5 | Instrument with validity and reliability

The demographic section consists of participant characteristics' information adapted and modified from Wiens et al. (2006) and the Malay version by Goh et al. (2021) with written permission obtained from the authors. The translated Malay version of the PMT scale consists of seven subscale components and another for fall protection motivation. The data collection for this study was part of the scale's translation, reliability and validity study by Ong et al. (2023). Coping appraisal includes self-efficacy (4 items) and response efficacy (6 items); the higher the score, the more they perceived the benefits or effectiveness of the recommended actions and confidence and self-abilities for fall protection motivation to engage in preventive behaviours with reduced perceived costs (Taheri-Kharamah et al., 2020). Perceived costs (3 items) refer to the costs for their intent to practise preventive behaviours for falls, such as their perception towards fall prevention tools that are not available, including the absence of handrails in the bathroom or toilet or no walking stick to use, feeling ashamed to use auxiliary equipment and feeling unpleasant to get help from others when necessary, such as in requiring assistance to ambulate or mobilize, to change light bulbs or to reach for things at a height that is difficult to reach. An increase in this score implies more significant costs involved for fall protection motivation.

Threat appraisal consists of perceived vulnerability (4 items) and severity (4 items); the higher the score, the greater they perceive

their vulnerability to falling and the understanding of the severity of falls, eliminating perceived rewards. Perceived rewards (2 items) indicate that the higher the score, the more chances there are for non-preventive behaviours of falls. Fear appeals (3 items) enhance their self-protection from harm; the more they score, the more fear they have regarding falling. Protection motivation (5 items) is another subscale component, in which the higher the score, the more intent they have to engage in preventive behaviour. The items were rated with a five-point Likert scale, such as not at all was scored as one point, a little (2-point), somehow (3-point), much (4-point) and too much (5-point) for fear, perceived costs and protection motivation. Meanwhile, strongly agree (5-point), agree (4-point), no idea (3-point), disagree (2-point) and strongly disagree (1-point) were rated in the remaining subscales.

Falls in the study were defined as an event which results in a person coming to rest inadvertently on the ground or floor or other lower level (WHO, 2023). Falls from slipping, tripping or stumbling and falls from the bed, chair, stairs, steps or ladders were also included. ('ICD-10 International Statistical Classification of Diseases and Related Health Problems 10th Revision', 2021). Participants were requested to share about their previous falls through questions such as 'Have you ever fallen in the past year?' and 'Unintentional falls because of slipping/tripping/stumbling or unplanned descent to a floor or place lower than your body; hitting onto the chair, bed, furniture; falls due to steps, stairs, ladders and not falling because of road traffic accidents involving motorcycles or bicycles'. The previous fall referred to falls that occurred within the past year from the time of data collection.

#### 4.6 | Data collection

Data were collected among participants who attended the clinic from November 2021 to January 2022. The eligible participants were invited to participate in the study and were informed about its purpose. They were provided with verbal and written consent. Their approval to participate in the study was also obtained. They were also informed that they could withdraw from participating in the study without any penalties. Most of the questionnaires were administered via face-to-face interviews since most of them were either illiterate or preferred to be assisted in the interview procedures. The investigators examined for any incomplete or missing information after the interview, which lasted 30–35 min. Assistant investigators conducted the interviews, and they were assisted by the main investigator.

#### 4.7 | Data analysis

Data were entered and analysed using IBM SPSS version 26.0. One of the co-authors in the study is a statistician who has checked and confirmed the choice of analysis was conducted and interpreted appropriately. The Mahalanobis's distance was performed to



identify outliers with significant observations of  $p$  values less than .001 (Leys et al., 2018; Tabachnick & Fidell, 2019). Researchers also performed an expectation maximization for observations with missing data (Kang, 2013; Mirzaei et al., 2022). The final analysis included a total of 375 participants. The descriptive analysis was performed to identify the sociodemographic characteristic variables, and they were presented in percentages, mean and standard deviations. Data normality distribution for continuous variables was implemented by assessing their kurtosis (within  $-2$  to  $+2$ ), skewness (within  $-2$  to  $+2$ ) and a visual assessment on the histogram graph and Q-Q plot (Hair et al., 2019). Multiple linear regression is an appropriate analysis to examine the relationship between predictors and fall protection motivation as well as the relationship between individual predictors (Pallant, 2016). All potential continuous variables or factors contributing to protection motivation of falls were tested using bivariate correlation. The subscales of PMT variables that presented statistically significant correlation or greater correlation with the dependent variable were further analysed using multiple linear regressions.

The assumptions for linear regression analysis were confirmed by assessing its model of fit, absence of multicollinearity, interaction, VIF, tolerances, linearity, homoscedasticity, independence of the residuals and normality (Hair et al., 2019; Pallant, 2016). Statistically significant values for variables in the correlation or regression were at  $p < .05$ . The results were presented as  $\beta$  and Beta values,  $p$  values, 95% confidence intervals (CI), tolerances and variance-inflation factor (VIF). The tolerance  $> 0.1$  and VIF  $< 10$  are considered to have no multicollinearity presence between independent variables (Pallant, 2016).

High multicollinearity between correlated predictors was a potential issue in testing the interaction effects (Tabachnick & Fidell, 2019), and it could undermine the predictors' statistical significance (Allen, 1997; Siegel & Wagner, 2022). The study result showed that there were significant interaction terms between continuous predictors with strong multicollinearity present, VIF  $> 10$ . Therefore, Aiken et al. (1991) in Tabachnick and Fidell (2019) suggested that independent variables were to be centred by converting to deviation scores so that each variable has a mean of zero. This approach does not implicate the unstandardized coefficient interpretation. However, a method suggested by Friedrich (1982) was performed to interpret the standardized regression coefficients (Tabachnick & Fidell, 2019). In addition, plots were also formed for the interaction terms and three groups were created for low, moderate and high levels, as suggested by Cohen et al. (2003).

#### 4.8 | Ethical considerations

The National Medical Research Registry (NMRR-21-1680-61095) and Sarawak State Health Department have granted their ethical approvals to collect data in primary healthcare clinics. The PMT scale was adapted into the Malay language and reused with permission

from the original authors, Taheri-Kharameh et al. (2020). The activity to collect data has been informed to the physician in charge and other staff. The identity of participants remained classified and not recorded in the database.

## 5 | RESULTS

### 5.1 | Characteristics of fallers versus non-fallers

The total number of participants in this study was three hundred and seventy-five, of which 293 (78.1%) were fallers and 82 (21.9%) were non-fallers (Table 1). The mean age for fallers was 65.79 (9.40) and non-fallers was 65.32 (8.39). There was a statistically significant association between ethnicity ( $\chi^2(1) = 8.37$ ,  $p = .004$ ), users of assistive devices ( $\chi^2(1) = 9.10$ ,  $p = .003$ ), who had previously participated in a fall prevention programme (Fisher's exact test (1) = 8.74,  $p = .009$ ), a mean difference in self-rating of intention to do fall prevention ( $F(373) = 0.69$ ,  $t = -2.63$ ,  $p = .009$ ) and those with a history of one-year fall. Age, gender, education level, living arrangement, comorbidity and medication consumption were not statistically significant between fallers and non-fallers. These insignificant findings indicated that older adults in rural communities had similar characteristics compared to those with a history of falls or no falls.

### 5.2 | Relationship between characteristics of participants, attitudes and beliefs within the PMT's subscale and fall protection motivation

The overall analysis of older adults revealed that there were statistically significant relationships between coping appraisal, threat appraisal, perceived rewards, fear, self-rating of intention to do fall prevention, education background (low education versus high education), previous participation in a fall prevention programme, ethnicity and fall protection motivation (Table 2). In contrast, age, medication intake, comorbidity, perceived costs, history of last year's fall, gender, living arrangement and assistive device users were not correlated with protection motivation (Table 2).

In comparison between fallers and non-fallers, perceived rewards ( $F(373) = 0.10$ ,  $t = -2.61$ ,  $p = .010$ ) and coping appraisal ( $F(373) = 2.92$ ,  $t = -2.08$ ,  $p = .038$ ) demonstrated a statistically significant mean difference with fall protection motivation (Table 3 (a)). On the contrary, protection motivation ( $F(373) = 0.65$ ,  $t = -2.11$ ,  $p = .035$ ) and perceived rewards ( $F(373) = 0.40$ ,  $t = 2.73$ ,  $p = .007$ ) were statistically significant in the mean difference between low education and high education of older adults (Table 3b). The results suggested that protection motivation and perceived rewards differed according to rural older adults' educational backgrounds for low or high education levels. However, there was no further comparison of analysis performed between fallers and non-fallers since the history of last year's fall and fall protection motivation was not statistically significant.

TABLE 1 The characteristics of the participants.

| Demographic variables                    |                                               | Fallers (past 1-year) <i>n</i> = 82 |          |      | Non-fallers <i>n</i> = 293 |          |      | <i>p</i> -value             |
|------------------------------------------|-----------------------------------------------|-------------------------------------|----------|------|----------------------------|----------|------|-----------------------------|
|                                          |                                               | Mean (SD)                           | <i>n</i> | %    | Mean (SD)                  | <i>n</i> | %    |                             |
| Age                                      | 55–59                                         | 65.79                               | 25       | 30.5 | 65.32                      | 85       | 29.0 | .416                        |
|                                          | 60–64                                         | (9.40)                              | 15       | 18.3 | (8.39)                     | 75       | 25.6 |                             |
|                                          | 65–69                                         |                                     | 20       | 24.4 |                            | 55       | 18.8 |                             |
|                                          | 70–74                                         |                                     | 7        | 8.5  |                            | 36       | 12.3 |                             |
|                                          | 75 ≥                                          |                                     | 15       | 18.3 |                            | 42       | 14.3 |                             |
| Gender                                   | Female                                        |                                     | 51       | 62.2 |                            | 152      | 51.9 | .097                        |
|                                          | Male                                          |                                     | 31       | 37.8 |                            | 141      | 48.1 |                             |
| Ethnicity                                | Malay                                         |                                     | 70       | 85.4 |                            | 203      | 69.3 | .004*                       |
|                                          | Non-Malay (Chinese and local indigenous)      |                                     | 12       | 14.6 |                            | 90       | 30.7 |                             |
| Living arrangement                       | Live alone or with another person             |                                     | 4        | 4.9  |                            | 14       | 4.8  | .571 (Fisher's exact test)  |
|                                          | Two ≥                                         |                                     | 78       | 95.1 |                            | 279      | 95.2 |                             |
| Education level                          | Not receiving a formal education              |                                     | 24       | 29.3 |                            | 79       | 27.0 | .208                        |
|                                          | Primary education                             |                                     | 41       | 50.0 |                            | 133      | 45.4 |                             |
|                                          | Secondary education                           |                                     | 12       | 14.6 |                            | 56       | 19.1 |                             |
|                                          | Tertiary education                            |                                     | 5        | 6.1  |                            | 25       | 8.5  |                             |
| 1-year fall                              | Yes                                           |                                     | 82       | 21.6 |                            | -        | -    |                             |
|                                          | No                                            |                                     | 297      | 78.4 |                            | -        | -    |                             |
| Previous fall                            | 1-month ago                                   |                                     | 18       | 22.0 |                            | -        | -    |                             |
|                                          | 6-month ago                                   |                                     | 26       | 31.7 |                            | -        | -    |                             |
|                                          | 1-year ago                                    |                                     | 38       | 46.3 |                            | -        | -    |                             |
|                                          | More than 1-year ago                          |                                     | -        | -    |                            | 88       | 30.0 |                             |
| No. of fall                              |                                               | 2.61 (0.80)                         |          |      |                            |          |      |                             |
|                                          | 1                                             |                                     | 48       | 58.5 |                            | -        | -    |                             |
|                                          | 2                                             |                                     | 18       | 22.0 |                            | -        | -    |                             |
|                                          | 3 ≥                                           |                                     | 16       | 19.5 |                            | -        | -    |                             |
| Mechanism of fall                        | Slipping, tripping or stumbling               |                                     | 72       | 87.8 |                            | -        | -    |                             |
|                                          | Fall involving bed, chair and other furniture |                                     | 3        | 3.7  |                            | -        | -    |                             |
|                                          | Fall on and from stairs and steps, and ladder |                                     | 4        | 4.9  |                            | -        | -    |                             |
|                                          | Dizziness                                     |                                     | 2        | 2.4  |                            | -        | -    |                             |
|                                          | Weakness of knees                             |                                     | 1        | 1.2  |                            | -        | -    |                             |
| Previously participated in FPE programme | No                                            |                                     | 76       | 92.7 |                            | 289      | 98.6 | .009* (Fisher's exact test) |
|                                          | Yes                                           |                                     | 6        | 7.3  |                            | 4        | 1.4  |                             |
| Assistive device user                    | No                                            |                                     | 62       | 75.6 |                            | 260      | 88.7 | .003*                       |
|                                          | Yes                                           |                                     | 20       | 24.4 |                            | 33       | 11.3 |                             |

TABLE 1 (Continued)

| Demographic variables                          |     | Fallers (past 1-year) <i>n</i> = 82 |          |      | Non-fallers <i>n</i> = 293 |          |      | <i>p</i> -value |
|------------------------------------------------|-----|-------------------------------------|----------|------|----------------------------|----------|------|-----------------|
|                                                |     | Mean (SD)                           | <i>n</i> | %    | Mean (SD)                  | <i>n</i> | %    |                 |
| No. of comorbidity                             |     |                                     |          |      | 1.27 (1.01)                |          |      | .470            |
|                                                | 0   | 1.28 (1.32)                         | 29       | 35.4 |                            | 76       | 25.9 |                 |
|                                                | 1   |                                     | 22       | 26.8 |                            | 105      | 35.8 |                 |
|                                                | 2   |                                     | 19       | 23.2 |                            | 69       | 23.5 |                 |
|                                                | 3 ≥ |                                     | 12       | 14.6 |                            | 43       | 14.7 |                 |
| No. of medication                              |     |                                     |          |      |                            |          |      |                 |
|                                                | 0   | 0.74 (0.93)                         | 41       | 50   | 0.89 (0.98)                | 123      | 42.0 | .486            |
|                                                | 1   |                                     | 20       | 24.4 |                            | 93       | 31.7 |                 |
|                                                | 2   |                                     | 16       | 19.5 |                            | 55       | 18.8 |                 |
|                                                | 3   |                                     | 4        | 4.9  |                            | 16       | 5.5  |                 |
|                                                | 4 ≥ |                                     | 1        | 1.2  |                            | 6        | 2.0  |                 |
| Self-rating of intention to do fall prevention |     | 6.38 (2.12)                         |          |      | 5.62 (2.34)                |          |      | <b>.009*</b>    |

\*Note: Bold *p*-value <.05 denotes statistically significant.

TABLE 2 Relationship between characteristics of participants, attitudes and beliefs of the PMT's subscale and fall protection motivation using bivariate correlation.

|                                                            | <i>r</i> <sup>2</sup> | <i>p</i> -value |
|------------------------------------------------------------|-----------------------|-----------------|
| Age                                                        | 0.04                  | .486            |
| Ethnicity                                                  | −0.13                 | <b>.012</b>     |
| Medication intakes                                         | 0.06                  | .277            |
| Comorbidity                                                | 0.05                  | .380            |
| Perceived costs                                            | 0.03                  | .610            |
| History of last year's fall                                | 0.04                  | .441            |
| Gender                                                     | −0.04                 | .403            |
| Living arrangement                                         | 0.05                  | .312            |
| Assistive device users                                     | −0.02                 | .699            |
| Threat appraisal                                           | 0.18                  | <b>&lt;.001</b> |
| Perceived rewards                                          | −0.14                 | <b>.009</b>     |
| Fear                                                       | 0.34                  | <b>&lt;.001</b> |
| Coping appraisal                                           | 0.39                  | <b>&lt;.001</b> |
| Self-rating of intention to do fall prevention             | 0.19                  | <b>&lt;.001</b> |
| Education background (low education versus high education) | 0.11                  | <b>.035</b>     |
| Previously participated in a fall prevention programme     | −0.10                 | <b>.048</b>     |

Note: Bold *p*-value <.05 denotes statistically significant.

### 5.3 | Factors predicting rural older adults aged 55 and above in their fall protection motivation

The model of fit for multiple linear regression was statistically significant,  $F(3, 371) = 51.69$ ,  $p < .001$  (Table 4), and it explains 30% of the variance in fall protection motivation. The results demonstrated that there were statistically significant positive main effects of coping appraisal ( $\beta = .38$ ,  $p < .001$ ) and fear ( $\beta = .58$ ,  $p < .001$ ) on fall protection motivation.

Coping appraisal ( $\beta = .396$ ) and fear ( $\beta = .366$ ) were almost equally strong in predicting fall protection motivations. In addition, there was a statistically significant interaction effect between coping appraisal and fear on fall protection motivation ( $\beta = -.05$ ,  $p < .001$ ) (Table 4). The greater the coping appraisal, the more it reduces the effect of fear on fall protection motivation, as indicated in the plots of low fear ( $R^2 = .24$ ), moderate fear ( $R^2 = .13$ ) and high fear ( $R^2 = .10$ ) (Figure 2). However, threat appraisal and perceived rewards were statistically insignificant in this final regression model (Table 4).



**TABLE 3** The protection motivation theory subscales compared by (a) fallers versus non-fallers and (b) low education versus high education using an independent t-test.

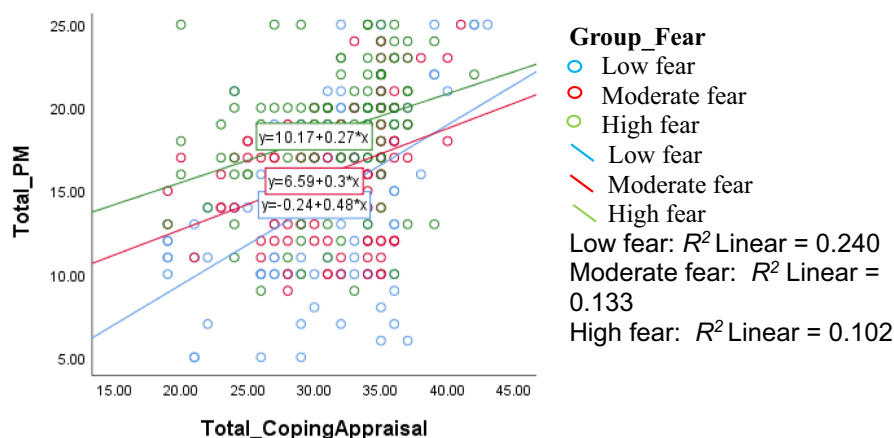
| (a) Protection motivation theory variables | Fallers, <i>n</i> = 82, Mean (SD)        | Non-fallers, <i>n</i> = 293, Mean (SD)   | <i>t</i> | 95% CI       | <i>p</i> -value |
|--------------------------------------------|------------------------------------------|------------------------------------------|----------|--------------|-----------------|
| Protection motivation                      | 16.88 (4.46)                             | 16.45 (4.48)                             | -0.77    | -1.53; 0.67  | .441            |
| Perceived rewards                          | 5.18 (1.57)                              | 4.70 (1.47)                              | -2.61    | -0.85; -0.12 | .010*           |
| Fear                                       | 8.80 (2.65)                              | 8.25 (2.88)                              | -1.58    | -1.25; 0.14  | .115            |
| Perceived costs                            | 7.61 (2.81)                              | 7.40 (2.76)                              | -0.61    | -0.89; 0.47  | .543            |
| Coping appraisal                           | 30.57 (5.15)                             | 31.78 (4.50)                             | 2.08     | 0.07; 2.35   | .038*           |
| Threat appraisal                           | 23.49 (4.80)                             | 24.14 (4.89)                             | 1.07     | -0.54; 1.85  | .285            |
| (b) Protection motivation theory variables | Low education, <i>n</i> = 277, Mean (SD) | High education, <i>n</i> = 98, Mean (SD) | <i>t</i> | 95% CI       | <i>p</i> -value |
| Protection motivation                      | 16.25 (4.35)                             | 17.36 (4.72)                             | -2.11    | -2.13; -0.08 | .035*           |
| Perceived rewards                          | 4.93 (1.49)                              | 4.45 (1.51)                              | -2.73    | 0.13; 0.82   | .007*           |
| Fear                                       | 8.27 (2.81)                              | 8.64 (2.92)                              | -1.12    | -1.03; 0.28  | .265            |
| Perceived costs                            | 7.50 (2.79)                              | 7.30 (2.70)                              | 0.62     | -0.44; 0.84  | .535            |
| Coping appraisal                           | 31.35 (4.64)                             | 31.98 (4.77)                             | -1.14    | -1.71; 0.45  | .255            |
| Threat appraisal                           | 24.21 (4.81)                             | 23.39 (5.03)                             | 1.44     | -0.30; 1.95  | .150            |

\*Denotes *p*-value < .05.

**TABLE 4** Factors predicting fall protection motivation among older adults in rural communities aged 55 and above using multiple linear regression.

| Variables                      | $\beta$ (unstandardized) | Beta (standardized) | <i>t</i> | <i>p</i> -value | 95% CI       | Tolerance | VIF  | $R^2$ /adjusted $R^2$ |
|--------------------------------|--------------------------|---------------------|----------|-----------------|--------------|-----------|------|-----------------------|
| Fear                           | .58                      | .366                | 8.35     | <.001**         | 0.44; 0.71   | 0.98      | 1.01 | .30/.29               |
| Coping appraisal               | .38                      | .396                | 9.09     | <.001**         | 0.30; 0.46   | 0.98      | 1.00 |                       |
| Coping appraisal $\times$ Fear | -.05                     | -.141               | -3.21    | .001*           | -0.08; -0.02 | 0.98      | 1.01 |                       |
| Excluded variables             |                          |                     |          |                 |              |           |      |                       |
| Threat appraisal               | -.05                     | -.06                | -1.13    | .257            | -0.14; 0.04  | 0.83      | 1.20 |                       |
| Perceived rewards              | .27                      | .09                 | 1.74     | .083            | -0.04; 0.58  | 0.70      | 1.42 |                       |
| Perceived costs                | -.02                     | -.01                | -0.26    | .793            | -0.16; 0.12  | 0.99      | 1.00 |                       |

\*Denotes *p*-value < .05. \*\*Denotes *p*-value < .001.



**FIGURE 2** An interaction effect of coping appraisal with fear on fall protection motivation.  $R^2$  denotes the combination of two or more independent variables.

## 6 | DISCUSSION

The study evaluated the associated factors of beliefs, attitudes and protection motivation of falls among rural community-dwelling older adults aged 55 and above in Malaysia using the PMT scale.

Over half of the older communities had lower education backgrounds (primary education and below) and reside in villages or rural communities. Most of the older adults in this study ranged from 55 to 59 years old, followed by 60 to 64, 65 to 69, 70 to 75 and 70 and over. Fallers were mostly observed as a higher proportion of those who participated in a previous fall prevention programme than non-fallers. Their involvement in the programme was probably due to last year's fall, which resulted from their ill health conditions, frailness or fear of falling, leading to their falls (Goh et al., 2021; Phelan et al., 2015). A higher prevalence of falls was suggested among the Malay ethnicity as they were the majority population participating in this study.

Those with prior falls had greater self-rating of intention to do fall prevention than non-fallers. The higher intent was observed among female seniors, probably because they were more enthusiastic about fall prevention or accessible to additional information elsewhere (Goh et al., 2021). Although older female adults had higher self-ratings for the intention, males were reported to be more superior in fall prevention than females. Males had greater fall prevention in a study conducted in an urban state of Malaysia (Goh et al., 2021) and females had lower fall prevention because they tended to inhibit their daily activities due to fear of falls (Batra et al., 2013). This finding could be due to a higher fear of falling among older female adults, especially those with low education as this influences their poor engagement in preventive behaviours (Thiamwong & Suwanno, 2017).

On the contrary, non-fallers were demonstrated to have a higher mean in coping appraisal compared to fallers. This finding was probably because non-fallers mostly attained higher education, which may explain their better coping response than the lower education group. Also, older individuals who have pursued higher education were generally correlated with better knowledge and skills necessary for understanding health information (Wong et al., 2022). Additionally, they may be more inclined to adopt and maintain healthier lifestyles, which could lead to positive health outcomes (Goh et al., 2021). Conversely, older fallers of this study, especially those from lower education backgrounds, were prone to non-preventive behaviours. Thus, the result concurred that education levels probably affect senior individuals' protection motivation for preventive behaviour.

The outcomes of PMT for beliefs and attitudes elements were also parallel with the hypotheses of the conceptual framework, in which coping appraisal and fear were positive predictors, while perceived costs were a negative predictor for fall protection motivation. One unit increase in each fear and coping appraisal would heighten their fall protection motivation. The current study also showed that fear appeal and coping appraisal were equally important in predicting their fall protection motivation. Fear in this study was observed to be slightly higher than the result reported by Taheri-Kharamah

et al. (2020). The result from Taheri-Kharamah et al. (2020) could be due to their participants were selected from active elderly centres, possibly with higher education backgrounds, adequate health literacy, greater self-motivation and probably opted for healthy lifestyles compared to older individuals in rural communities.

Furthermore, the interaction effect of coping appraisal with fear in this study indicated that the better older adults' self-efficacy and response efficacy with preventive measures and recognizing fall risks, the higher their ability to deal with fall risk circumstances, thus lowering their fear effect and improving protection motivation (Bandura et al., 1999; Li, Mpofu, et al., 2019; Rogers, 1975). Therefore, this outcome encourages nurses to design interventions that focus on enhancing coping skills to mitigate the potentially adverse effects of fear. On the contrary, this study's result demonstrated that threat appraisal was a negative predictor, while perceived rewards were a positive predictor for protection motivation. This finding could also be due to the fear factors influencing the threat components, including maladaptive behaviours or rewards (Floyd et al., 2000). However, both variables in this study were found to be non-significant. Therefore, the finding was inconclusive to the hypothesis that threat appraisal and perceived rewards were able to predict protection motivation negatively or positively.

As posited by authors of the extended parallel process model, who applied the dangerous control response of the PMT, the theoretical concept was that reducing fear by performing activities to thwart fear could improve a person's protective behaviours (Popova, 2011, 2020; Rogers, 1975). Therefore, enhancing older individuals' experiences in daily activities dealing with fall risks may empower them about their surroundings and reduce their fear (Bandura et al., 1999; Marks, 2001). However, if the thoughts were due to fear processes, somehow they evaded or denied the situation due to defensive responses (Popova, 2011, 2020). For example, a greater fear of falling could lead to non-preventive behaviours (Patel et al., 2014). These circumstances suggestively occurred were related to their cognitive vulnerability versus emotional processes leading to prevention action or avoidance (Popova, 2011). Lack of self-efficacy, resources and support systems also mediate a cycle contributing to fear increases, motivation decreases and preventive measures become less likely to be engaged (Popova, 2011, 2020; Rippetoe & Rogers, 1987).

Most of older adults in this study perceived falls as sad events, fearful and anxious, which most likely suggest that their main concern was losing their independence following falls, becoming a hassle to others or being concerned that nobody can look after them since they were living alone or children are working. Therefore, this strongly motivated them to be engaged and remain physically functioning in their daily activities to protect themselves from falls (van Leeuwen et al., 2019; WHO, 2021b), whereas in another study among the ageing population in Utopia, it reported that older individuals with lower education backgrounds, being females, those of advanced age with comorbidities and walking aid users had significantly greater fear in developing a fear of falling than those with

higher education attainment (Birhanie et al., 2021). A similar finding was demonstrated among older individuals of other LMICs, such as in Thailand and India (Mane et al., 2014; Thiamwong & Suwanno, 2017). The main concern among rural older adults was that their lower educational backgrounds and inadequate health literacy contributed to the superiority of fear among them. The increase in fear may also indicate their lack of evaluation and judgement skills and thus hinder their ability to receive, process and understand health-related information effectively (Wong et al., 2022). Tailoring programmes to address specific literacy levels and cultural contexts could make a significant difference in effectively communicating information and alleviating their fears (Howard et al., 2016). Hence, the findings emphasize the importance of providing information and ensuring it is presented in a way that is accessible and easily understandable for older individuals with diverse educational backgrounds and literacy levels.

Independent living for older adults in rural communities was a substantial motivation for freedom and the ability to move around freely without burdening families or others (van Leeuwen et al., 2019). In independent living, rural older adults mostly perceived these essential points as being able to perform their daily activities actively and being involved in other activities organized by their respective villages. Thus, they could have more freedom to stroll or walk from house to house, self-perform house chores and work on the farm. Walking was also their routine commute to another place within their villages. Hence, the choice of activity, independent living, socio-economic status, social support and cultural differences may also play a role in determining their motivation for preventive behaviours (Naseri et al., 2021; Taheri-Kharamah et al., 2020; WHO, 2021b). Preserving independence is vital in successful ageing (Enogela et al., 2022), thus promoting and emphasizing independent living may maximize their fall prevention behaviour change (Stevens et al., 2018).

Conversely, nurses are encouraged to equip themselves with knowledge and skills in fall management, in which they are encouraged to collaborate actively with other multidisciplinary teams to educate and communicate with older adults about falls by disseminating the information via primary healthcare clinics or communities, allowing older individuals the opportunity to recognize and talk about their fall risks (Institute for Public Health, National Institutes of Health, & Ministry of Health Malaysia, 2019). Nurses are also recommended to develop and design a fall prevention education using evidence-based and theoretical frameworks, such as the PMT's beliefs and attitudes, which can provide a structured and informed approach in designing prevention education for older adults by promoting their motivation for fall preventive behaviour (Floyd et al., 2000; Ong et al., 2021).

Providing continuous prevention education for falls by including information on fall risks referred from the World Health Organization's International Classification of Functioning, Disability and Health (WHO-ICF) components and describe risk factors to older adults could help them recognize their fall threats (Ong et al., 2022; WHO, 2021a). The external factors mainly contribute to falls among rural older

adults, including pets, whose homes mostly consist of cats (Stevens et al., 2018). Unfortunately, they did not seem to be aware that pets could be one of the causative risk factors for their fall threats (Chini et al., 2019). Furthermore, adopting risky behaviours such as climbing ladders or rushing everywhere (Chini et al., 2019; Demura et al., 2011) and the hazards of their homes since the majority of the rural communities houses follow the design of the traditional houses with more stairs and high steps with distant toilets and present of uneven floors (Romli et al., 2018). The squatting type of toilet could also contribute to a hazard for older individuals with knee pain or mobility problems (Romli et al., 2018). Additionally, the non-existence of structural supports, such as no handrails in the bathroom or toilet, becomes a challenge for them to use without compromising their safety, eventually leading to falls (Romli et al., 2018).

Therefore, the dissemination of information related to falls could be implemented by reaching out to the communities since the majority at risk for falls are predominantly female older adults who mostly stay indoors and seldom visit the clinic or have less social interaction due to taking care of their grandchildren or having issues with transportation compared to their male counterparts. In a study among rural older communities in New Hampshire, the authors reported that only a few older adults were aware of the fall prevention programme being held in their communities (Kiami et al., 2019). Additionally, they suggested that fall prevention activities should be disseminated through social marketing in the areas or places that older adults gather or go in their everyday lives, for example, grocery shops, coffee shops or places of worship within the targeted communities (Kiami et al., 2019; Kotler & Lee, 2008). This proposed awareness strategy benefits healthcare clinics with limited budgets or staff shortages while helping older communities.

Older populations in this study are mostly living at home without supportive care, especially in LMICs with insufficient care facilities or support services for older people (WHO, 2021b). When working-age children leave their parents at home, especially older female parents with younger children, some depend on neighbours to communicate during emergencies since they do not possess phones or know how to use them. Hence, this phenomenon increases their risk of falls and causes a delay in seeking treatment; eventually, it may affect their independence and quality of life following fall-related injuries (WHO, 2021b). Alternatively, house alarms in calling for help during emergencies and emphasis on the techniques on how to get up after falls or how to call for help using phones are beneficial to this group of older communities.

The proposed installation of house alarms involved great costs and resources. Alternatively, Soh et al. (2021) recommended approaches for improving self-efficacy, such as teaching them to balance recovery confidence, improving their reaction from slipping or tripping by grabbing onto a handrail or taking a few steps to recover balance (Soh, 2022). Another measure was fall recovery confidence, which was vital for those who were alone at home and it guided them to trust their ability to recover from falls; examples of techniques on how to get up or get help (Hofmeyer et al., 2002). Additionally, balance recovery confidence was applicable to them since most of their

houses consist of stairs and high steps, with no handrails in the toilet, bathroom and uneven floors. Hence, emphasis should be given to the correct techniques to ascend and descend the stairs safely or stabilize their balance to prevent slipping or tripping, especially in the toilet or bathroom.

Coping appraisal has positively influenced fall protection motivation, and the finding has been supported in another study using the adapted version of PMT (Preissner et al., 2023). The authors reported that coping appraisal had positively affected the intention for physical activity among their older participants (Preissner et al., 2023). Their involvement could be due to their trust in the ability to turn from fall threat by getting involved in physical activity for maintaining health benefits (Floyd et al., 2000; Preissner et al., 2023). Preissner et al. (2023) also revealed that coping appraisal was more critical than fear appeals in older adults' intention to engage in physical activity. The finding as such was probably because of their study location and older participants in a high-income country, the United States, with better education levels and computer literacy. The result of the current study, in contrast, demonstrated that coping appraisal mediated by fear and fear also contributes to a significant variance of fall protection motivation among older adults in these rural communities.

The non-significant predictor of threat appraisal in this study indicated that emotion was not associated with their fall protection motivation, as supported in a study by Taheri-Kharamah et al. (2020). This finding may suggest that the older population from villages or rural settlements in LMICs, mostly from an elementary education background and lower, was associated with inadequate health literacy. The outcome could also be due to the insufficient information dissemination of fall hazards and prevention to rural seniors. Following this, they lacked awareness or knowledge of fall threats. Furthermore, the diversity in beliefs and cultural practices, lack of resources and social support contribute to their crucial priority of the health threats and decision-making for preventive behaviours (WHO, 2021b).

Following this evidence, they do not see the seriousness of informing their family members after falls if there are no injuries. Despite being aware of their potential to fall risk, they prefer not to discuss it due to the misconception or 'labelling of being falls' that it could lead them to fall. In addition, preventing falls are never their top priority. This perception may explain to their insignificant finding of threat cognitions to protection motivation. Furthermore, their educational background, mainly from elementary schools, and low health literacy pose a challenge for them to understand or grasp health information (Wong et al., 2022). The higher education attainment of older individuals was associated with increased health literacy and greater protection motivation than those from lower education backgrounds. This finding concurred with the conclusion that older individuals with inadequate health literacy seldom engage in preventive care compared to those with adequate health literacy (IPH, 2015; Wong et al., 2022).

Perceived costs in this study were insignificant and negatively correlated with fall protection motivation. This finding has been concurred with the result from Taheri-Kharamah et al. (2020) that it could be due to their lack of awareness of

fall threats and alternatives to fall prevention resources, especially for home modifications, as most of them are either farmers, homemakers or unemployed who depend mainly on their children to provide the resources. Thus, nurses could offer information when collaborating with the occupational team on alternatives and resources for home modifications tailored to their financial capability and this could improve older adults' fall protection motivation for preventive behaviour (Naseri et al., 2021). Furthermore, involving caregivers in fall prevention helps them identify fall risks and establishes a support system for their older family members. Caregivers can play a key role in creating a safe environment and encouraging preventive behaviours.

On the contrary, although older adults may know the importance of preventing falls, they may not necessarily uptake the changes. This may be due to their decreased autonomy (Sánchez-García et al., 2019), limited resource support availability (Fougère et al., 2018) or choices to healthy behaviours (Raghupathi & Raghupathi, 2020). The root problem is most likely due to their poor education or low health literacy background, leading to their options (Ro et al., 2016). Following this circumstance, they lose their autonomy to engage in fall prevention behaviours or fail to understand the importance of preventing the risk of falls.

Therefore, continuous awareness and education create an ongoing dialogue, keeping fall prevention at the forefront of individuals' minds, which is not just a one-time effort but a sustained initiative to build and reinforce knowledge (Cerilo, 2016). Thus, the emphasis on continuous follow-up and resource availability shows a commitment to long-term support (Chidume, 2021; Ng et al., 2022). In addition, the outcome of a tailored education has been shown to enhance older adults' motivation and awareness of fall risks (Naseri et al., 2021). Although adherence and participation in fall preventive behaviour were challenging, continuous fall interventions could make changes and a slight behavioural difference could lead to considerable health and life expectancy improvements for older adults (Davis et al., 2015).

Further intervention and longitudinal studies on fall protection motivation and preventive behaviour among older adults in rural communities could confirm the relationship between their fear appeal, threat appraisal, coping appraisal and perceived costs or rewards. Future studies investigating older adults with diabetes, depression, cognitive impairment and obesity could help nurses understand their lifestyles, physical activities and cultural influences contributing to their protection motivation for fall preventive behaviour, particularly among low education and inadequate health literacy older adults in LMICs. There is a critical need for targeted education and awareness initiatives to emphasize the significance of fall prevention, enhance older individuals' understanding of fall risks and foster their motivation in preventive behaviours. Most importantly, future studies on nurses' preparedness to provide fall prevention education tailored to older adults' needs, knowledge in identifying fall risks and acquiring skills or competency to manage falls are deemed necessary.

## 6.1 | Strengths and limitations of the study

The study's strengths were that it could randomly select more older participants since it was conducted in a primary healthcare clinic attended mainly by older patients and the characteristics of the participants were almost similar. However, some limitations were observed in this study. Firstly, they felt reluctant to participate in the study due to distrust and were uninterested. Secondly, the environment in the healthcare clinic may not be conducive for the interview, in which participants were anxiously waiting to be seen by doctors. Thirdly, low-education participants needed more time for investigators to explain examples associated with their routine to help them understand the scale. Furthermore, this scale is limited to assessing their intention to engage in fall preventive behaviours.

## 7 | CONCLUSION

Findings from this study supported the study's conceptual framework, suggesting that coping appraisal and fear appeals effectively encouraged fall protection motivation among older adults residing in rural communities. An interaction effect of coping appraisal with fear indicates that individuals' ability to cope with fear directly influences their motivation for fall protection; stronger coping mechanisms can mitigate the impact of fear, consequently improving their overall motivation for fall protection. The study's findings also indicate that older adults with low literacy levels tend to exhibit more non-preventive behaviours, leading to decreased motivation for fall protection. This outcome underscores the importance of tailored interventions to address literacy-related barriers and promote preventive actions. Furthermore, the findings also emphasize the need to educate older adults in rural communities to help them recognize their fall risks, understand preventive interventions and explore alternatives. Therefore, this can improve fall protection motivation from perceived rewards, improving their coping appraisal for preventive behaviours.

### AUTHOR CONTRIBUTIONS

Made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data: OMF, SKL, RS, TIK, HIS, WWM, MM and SJ; Involved in drafting the manuscript or revising it critically for important intellectual content: OMF, RS, TIK, HIS and MM; Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content: OMF, SKL, RS, TIK, HIS, WWM, MM and SJ; Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: OMF, SKL, RS, TIK, HIS, WWM, MM and SJ.

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### CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests.

### PEER REVIEW

The peer review history for this article is available at <https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/jan.16190>.

### DATA AVAILABILITY STATEMENT

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the National Medical Research Registry (NMRR-21-1680-61095) and Sarawak State Health Department. All participants were provided with oral and written informed consent.

### CONSENT FOR PUBLICATION

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