

# A Comparative Study Between Self-Perception of Walking Ability, Balance and Risk of Fall with Actual Clinical Assessment

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## ABSTRAK

Masalah gaya jalan dan keseimbangan adalah diantara sebab utama kejatuhan dikalangan warga tua dan sering menyebabkan kecederaan, ketidakupayaan dan kebergantungan. Walau bagaimanapun, mungkin terdapat percanggahan di antara persepsi warga tua sendiri dengan penilaian doktor mengenai keupayaan diri untuk berjalan, keseimbangan dan risiko kejatuhan. Objektif kajian ini adalah untuk membandingkan diantara persepsi diri warga tua mengenai keupayaan berjalan, keseimbangan dan risiko kejatuhan dengan penilaian klinikal. Kajian ini merupakan kajian keratan lintang yang telah dijalankan di Klinik Kesihatan Primer dan melibatkan warga tua berumur  $\geq 60$  tahun yang direkrut menggunakan persampelan rawak sistematik. Peserta telah mengisi sendiri borang yang mengandungi maklumat mengenai butir-butir diri dan soalan yang menilai persepsi diri mengenai keupayaan berjalan, keseimbangan dan risiko kejatuhan. Penilaian klinikal dijalankan menggunakan 'Tinetti Performance Oriented Mobility Assessment'. Kebanyakan peserta menganggap diri mereka mempunyai keupayaan yang baik untuk berjalan (84.4%) dan daya keseimbangan baik (77%). Segelintir (11.5%) mengakui terdapat risiko untuk kejatuhan. Terdapat persetujuan/persamaan baik dari segi keupayaan berjalan ( $k:0.702$ ,  $p:<0.001$ ), persetujuan/persamaan sederhana mengenai keseimbangan ( $k:0.546$ ,  $p:<0.001$ ) dan persetujuan/persamaan lemah mengenai risiko kejatuhan ( $k:0.300$ ,  $p<0.001$ ). Regresi logistik berganda menunjukkan faktor-faktor yang mempengaruhi persepsi risiko kejatuhan adalah umur, mengalami strok dan pengambilan ubat psikotropik. Percanggahan telah didapati diantara persepsi diri dengan penilaian klinikal mengenai keseimbangan dan risiko kejatuhan. Peningkatan umur, sejarah mengalami strok dan ubat

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*psikotropik didapati berkaitan dengan peningkatan persepsi risiko kejatuhan. Program intervensi dicadangkan perlu fokus terhadap meningkatkan kesedaran terutamanya dikalangan mereka yang mempunyai faktor-faktor tersebut.*

*Kata kunci: gaya berjalan, kesimbangan, persepsi, penilaian klinikal, penjagaan primer, persetujuan, warga tua*

## ABSTRACT

Gait and balance disorder are among the most common causes of falls in elderly and often lead to injury, disability and loss of independence. However, there might be a discrepancy between elderly's perception of their own walking ability, balance, risk of fall with doctor's evaluation. The aim of this study was to compare perception of the elderly's walking ability, balance and risk of fall with clinical assessment. This cross sectional study was done in a Primary Care Clinic which involved elderly  $\geq 60$  years using systematic random sampling. Participants completed a self-administered questionnaire comprising of sociodemographic data and question assessing their perception of ability of walking, balance and risk of fall. Actual clinical assessment was done using Tinetti Performance Oriented Mobility Assessment. Most of the participants perceived they had good walking (84.4%) and balance ability (77%). A small proportion (11.5%) agreed that they are at risk of fall. There was a good agreement in walking ability ( $k: 0.702$ ,  $p: <0.001$ ), moderate agreement in balance ( $k: 0.546$ ,  $p: <0.001$ ) but poor agreement in the risk of fall ( $k: 0.300$ ,  $p: <0.001$ ). Multiple logistic regression demonstrated that factors associated with participant's perception of risk of fall are age, having stroke and taking psychotropic drugs. A discrepancy is observed between self-perception of balance and risk of fall with actual assessment. Advancing age, history of stroke and psychotropic drugs were significantly associated with increased perception of fall risk. The future intervention programme need to focus on creating awareness particularly among those who have these factors.

Keywords: agreement, balance, gait, clinical assessment, elderly, perception, primary care

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## INTRODUCTION

Globally, there has been a tremendous increase in the aging population (He et al. 2016) as individual live longer due to the improvement in healthcare. One of the important aspect in managing

elderly people is to minimize their risk of fall as fall would bring significant negative impact to the elderly's health leading to a poorer quality of life (Terroso et al. 2014). According to the United Nations, elderly are those who are 60 years (WHO 1989) and above

and Malaysia also adopts a similar definition (Karim 1997).

Few population survey found that approximately one in three to four older people fall each year (Siqueira et al. 2011; Bekibele & Gureje 2010). The most important cause of fall are gait and balance disorders (Bueno-Cavanillas et al. 2000). These conditions are common in the elderly and there is a higher chance as the age increases (Terroso et al. 2014). Among the reasons for gait and balance problems in elderly are reduced muscle strength, lack of muscle elasticity and sensory problems (Terroso et al. 2014). These could cause postural instability and gait stiffness, which subsequently lead to the occurrence of fall. Due to this detrimental effect, it is important to assess gait and balance problems in elderly (Phelan et al. 2015).

There are several methods to assess gait and balance such as Time up and Go Test, Berg Balance Test and Tinetti Performance Oriented Mobility Assessment (POMA) (Middleton & Fritz 2013). There are no adequate prospective studies that support selection of a specific test for gait and balance. The Berg Balance Test examines the functional balance skills and requires 15-20 minutes to administer and does not measure specifically for gait. Timed Up and Go (TUG) test is a simple test which measure the time in seconds for patient to do certain tasks. It is a good tool to measure functional mobility but not for balance (Podsiadlo & Richardson 1991). Another useful screening method is the Tinetti Performance Oriented Mobility Assessment (POMA)

test (Tinetti 1986). Tinetti POMA is used to screen elderly for balance and gait impairment that is feasible to use, reliable and reflected changes in body position and gait manoeuvres used during daily activities (Tinetti 1986). This assessment tool has shown good sensitivity (70%) and specificity (52%) for fall prediction (Raïche et al. 2000).

One crucial aspect in managing elderly's health is the elderly's own perception of their walking ability, balance as well as risk of fall and whether their perceptions differ with the clinical assessment. This concerns us as the finding from an early survey highlighted that elderly who are at high risk of fall, did not consider themselves susceptible (Dudek et al. 2007). Further work by Wolf & Hignett in 2015 also pointed to us that patients have difficulty admitting their risk of fall even though they have risk factors. This problem may also exists in our local population but currently, there is still limited work on this issue. Based on previous studies, many factors could affect their perception and among those are being women, age more than 70 years, stays alone, previous history of fall, presence of multiple comorbidities and polypharmacy (Hughes et al. 2008).

Having the correct perception of own risk of fall is vital for elderly to maintain good health and well-being. Hence, research is needed to evaluate whether there is a gap between the elderly's perception and their abilities of walking ability, balance and the risk of fall among our local people. We conducted this study with the purpose to assess the agreement between

the elderly's own perception and their actual performance and factors influencing their self-perception of fall risk. We hope this study would provide some insights to improve our elderly's perception of their own health and plan for a more effective fall preventive programme.

## MATERIALS AND METHODS

### STUDY DESIGN

This was a cross-sectional study conducted in a public primary care clinic, Klinik Kesihatan Bandar Alor Setar from June until October 2016.

### STUDY PARTICIPANTS AND RECRUITMENT CRITERIA

The participants were selected based on systematic random sampling through a computerised registration system. Every third elderly aged  $\geq 60$  years were invited to participate the study. We included those who could walk for 5 metres with or without walking aid, able to understand short instructions and do not have severe cognitive impairment. Participants were given an information sheet and written informed consent were obtained before enrolling into the study. The sample size calculation was determined using Kish's sample size formula. The percentage of gait and balance disorders in elderly was estimated as 50% (Graafmans et al. 1996). The sample size of 122 was calculated with absolute precision of 10% and dropout rate of 20%.

## STUDY PROCESS

The study involved three parts. Firstly, participants were given a self-administered questionnaire in Malay version. The Malay version was used as the population in this city speaks Malay. The items in the questionnaire were developed from literature review and subsequently, were reviewed by two primary care and a public health physician to ensure the contents meet the study objectives. The questionnaires assessed their socio-demographic characteristics, living arrangement and history of fall. The participants were also asked to rate their ability of walking, their body balance and risk of fall. The options for items assessing walking ability and balance scored from 1 to 6, where 1=very poor, 2=poor, 3=fair, 4=good, 5=very good and 6=excellent. For item assessing the risk of fall, the responses are strongly disagree with score of 1, disagree is 2, unsure is 3, agree is 4 and strongly agree is 5.

The second part was the clinical gait and balance assessment using Tinetti POMA test. The original author reported an interrater reliability of more than 85% ( $\pm 10\%$ ) indicating that Tinetti POMA has good interrater reliability (Tinetti 1986). Prior to the commencement of this study, the assessor who is a medical officer underwent training with an experienced physiotherapist who is familiar with Tinetti POMA test. An interrater reliability assessment also was done between the physiotherapist and the assessor. The result revealed good interrater reliability with the

interclass correlation coefficient of 0.986 and p-value <0.001.

Tinetti POMA consists of 9 Balance tasks and 7 item Gait characteristics. The Balance tasks include sitting, rising, attempting to rise, immediate standing, standing with alteration base support, sternal nudge, standing with closed eye, turning 360° and standing to sitting. The Gait characteristic examined include initiation, step length and height, step symmetry, step continuity, path, trunk stability and walking stance. Scoring of the Tinetti POMA is done on a three-point ordinal scale with a range of 0 to 2. A score of 0 represents the most impairment, while a score of 2 represents independence (Tinetti 1986).

A total score for each individual component of Gait and Balance was obtained. For Gait, a total score of less than 8 indicates abnormality and for the Balance, a total score of less than 12 means problems with the balance. For the Risk of fall, the total score for both Gait and Balance was summed up. The score of below 19 means high risk for fall, 19-24 is at moderate risk and more than 24 indicates low risk (Tinetti 1986). After completing the assessment, the researcher also gather information on the participants' comorbidities and number of current medications from the medical records.

## DATA AND STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS version 22. The descriptive analysis was used for sociodemographic data, proportion of gait and balance as well as patient's perception. The

responses for items of self-perceived walking ability and balance are re-categorized. The options of good, very good and excellent were labelled as 'good' where else very poor, poor and fair were considered 'poor'. The responses for self-perceived risk of fall were also re-coded into and 'agree' and 'disagree/not sure'. Options stated agree and strongly agree were labelled as 'agree' where else disagree and not sure were grouped into another category. This re-categorization is considered relevant and practical for the clinicians in interpreting the results of the study.

To compare agreement between patient's perception and actual performance of walking, balance and risk of fall, Kappa statistic was used. A p-value of 0.05 was taken as significance. Simple logistic regression was used as a first step to determine factors associated with self-perception of risk of fall. All variables were included in the multiple logistic regression. The method that was used was backward and forward stepwise procedure. All possible 2-way interaction were checked and those significant variables were included in the model.

The study was approved by Research and Ethical Committee, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre on May 5<sup>th</sup>, 2016 with project code FF-2016-174 as well as by Medical Research and Ethic Committee (NMRR-16-630-29805(IIR)) Ministry of Health on 24<sup>th</sup> May 2016.

## RESULTS

### SOCIO-DEMOGRAPHIC CHARACTERISTICS OF SUBJECTS

A total of 130 subjects were invited to participate the study, but only 122 consented, giving the response rate of 93%. Table 1 shows general demographic characteristic of subjects. The median age was 67 with interquartile range of 8. There is an equal distribution of gender and more than half of the participants were Malay ethnic group (n=74, 60.7%). Less than half of the participants received

education beyond primary level (n=54, 44.2%). Approximately a third of the subjects (39.4%) had a history of fall. Most of subjects has chronic illness 81 (66.4%) and a third of them was taking more than 4 drugs (polypharmacy).

### CLINICAL ASSESSMENT OF PARTICIPANTS' ACTUAL GAIT, BALANCE PROBLEM AND RISK OF FALL

Table 2 illustrate the Gait, Balance problem and Risk of fall based on Tinetti POMA test. There were 26 (21.3%) subjects had abnormal gait,

Table 1: Demographic characteristics of the participants

Characteristic N= 122		n (%)	median (IQR)
Age(in years)	60-69	77 (63.1)	67.0 (8.0)
	70-79	37 (30.3)	
	> 80	8 (6.6)	
Gender	Male	61 (50.0)	
	Female	61 (50.0)	
Race	Malay	74 (60.7)	
	Chinese	39 (32.0)	
	Indian	9 (7.3)	
Education	Primary	68 (55.7)	
	Secondary	42 (34.4)	
	Tertiary	12 (9.8)	
Living arrangement	Live with family	102 (83.6)	
	Live alone	20 (16.4)	
History of fall	no incident	74 (60.7)	
	1 time	44 (36.1)	
	2 times	4 (3.3)	
Co-morbids	Diabetes	29 (23.8)	
	Hypertension	81 (66.4)	
	Asthma	4 (3.3)	
	Heart disease	10 (8.2)	
	Stroke	6 (4.9)	
	Urogenital disease	10 (8.2)	
	Medication		
Polypharmacy		37 (30.0)	
	Non-polypharmacy	85 (69.7)	
Psychotropic drug		6 (4.9)	

Table 2: Clinical assessment of gait, balance and risk of fall among the participants

Variable		n (%)	median (IQR)
Gait	Normal (score >8)	96 (78.7)	10.0 (3.00)
	Abnormal (score <8)	26 (21.3)	
Balance	Normal (score >12)	76 (62.3)	13.0 (4.5)
	Abnormal (score ≤12)	46 (37.7)	
Risk of fall	High (score <19)	32 (26.2)	23 (7.00)
	Medium (score 19-24)	52 (42.6)	
	Low (score 25-28)	38 (31.1)	

46 (37.7%) abnormal balance and 32 (26.2%) were at high risk of fall. The median score of gait was 10 (IQR 3), balance was 13.0 (IQR 4.5) and risk of fall was 23 (IQR 7).

### SELF-PERCEPTION OF WALKING, BALANCE ABILITY AND RISK OF FALL AMONG THE PARTICIPANTS

Table 3 demonstrate participants own perception of walking, balance ability and risk of fall. A large proportion of the participants perceived they have good ability to walk (n=103, 84.4%) and balance (n=94, 77%). Only a small proportion thought they are at risk of fall (n=14, 11.5%).

### AGREEMENT BETWEEN PERCEIVED AND ACTUAL CLINICAL ASSESSMENT OF GAIT, BALANCE AND RISK OF FALL

Table 4 presents analyses of agreements between perceived and the actual clinical assessment. Good agreements were demonstrated in gait (k: 0.702,  $p < 0.001$ ) and moderate agreement for balance (k: 0.546,  $p < 0.001$ ). A low agreement was observed between perceived and actual risk of fall due to small differences between the clinical assessment and perceived risk (k: 0.300,  $p < 0.001$ ).

### FACTORS ASSOCIATED WITH SELF-PERCEPTION OF RISK OF FALL

Simple logistic regression (Table 5) revealed that age, history of fall, having stroke, taking psychotropic drug and polypharmacy ( $\geq 4$  medication) were significantly associated with perception of risk of fall. Further analysis with multiple logistic regressions showed that age, subjects with stroke and are on

Table 3: Self-perception of walking, balance ability and risk of fall

Variable		n	(%)
Walking ability	Poor	19	(15.6)
	Good	103	(84.4)
Balance ability	Poor	28	(23.0)
	Good	94	(77.0)
Risk of falling	Agree	14	(11.5)
	Not sure/disagree	108	(88.5)

Table 4: Agreement between self and actual clinical assessment of gait, balance and risk of fall

Variable		Concordance n (%)	kappa-value	p-value <sup>a</sup>
Gait	Normal	94 (77.0)	0.702	<0.001
	Abnormal	17 (13.9)		
Balance	Normal	73 (59.8)	0.546	<0.001
	Abnormal	25 (20.5)		
Risk of fall	High	13 (10.7)	0.300	<0.001
	Medium	16 (13.1)		
	Low	36 (29.5)		

<sup>a</sup>: Cohen's kappa test

Table 5: Factors associated with self-perception risk of fall (simple and multiple logistic regression)

	Variable	Crude OR (95% CI)	p-value	Adjusted OR 95% CI	p-value
Age group (yrs old)	60-69	1.00 (ref)	0.007	1.00 (ref)	0.005
	70-79	2.25 (0.61-8.31)		1.19 (0.23-6.18)	
	≥ 80	14.4 (2.75-76.43)		17.48 (2.89-105.68)	
Gender	Male	1.38 (0.45-4.25)	0.571	4.41 (0.69-28.01)	0.116
	Female	1.00 (ref)		1.00 (ref)	
Race	Malay	1.00 (ref)	0.127	1.00 (ref)	0.144
	Chinese	0.69 (0.17-2.75)		1.17 (0.16-8.27)	
	Indian	4.12 (0.86-19.79)		8.56 (0.92-79.62)	
Living arrangement	With family	1.00 (ref)	0.59	1.00 (ref)	0.227
	Alone	1.46 (0.37-5.79)		3.45 (0.46-25.69)	
Education level	Primary	1.00 (ref)	0.211	1.00 (ref)	0.179
	Secondary	0.26 (0.05-1.23)		0.03 (0.001-1.35)	
	Tertiary	0.49 (0.05-4.03)		0.19 (0.006-6.59)	
History of fall	No Fall	1.00 (ref)	0.007	1.00 (ref)	0.401
	1 times	6.08 (1.55-23.89)		6.81 (0.41-112.99)	
	2 times	23.67 (2.43-230.25)		8.10 (0.03-209.55)	
Diabetes	Yes	2.77 (0.87-8.79)	0.083	0.68 (0.06-7.05)	0.745
	No	1.00 (ref)		1.00 (ref)	
Hypertension	Yes	1.99 (0.52-7.57)	0.313	0.81 (0.03-21.26)	0.901
	No	1.00 (ref)		1.00 (ref)	
Stroke	Yes	21.2 (3.44-130.45)	0.001	13.03 (1.46-122.47)	0.022
	No	1.00 (ref)		1.00 (ref)	
Polypharmacy	Yes	5.14 (1.59-16.65)	0.006	1.26 (0.04-41.21)	0.897
	No	1.00 (ref)		1.00 (ref)	
Psychotropic Drug	Yes	21.2 (3.44-130.45)	0.001	22.03 (2.64-183.75)	0.004
	No	1.00 (ref)		1.00 (ref)	

psychotropic drugs have a significant association with perception of risk of fall. Forward and backward stepwise was chosen and both methods had similar significant variables. The Hoshmer and Lemeshow's test 'p' value=0.902 indicating there is no significant difference between observer and predicted probability.

## DISCUSSION

The proportion of gait and balance problem among our participants was 21% and 37%, respectively and the figures are quite similar to a previous study (Mahlknecht et al. 2013). The findings also suggest to us that these problems may exist as early as 60 years old in our population since more than half of the study participants were between 60 to 69 years. The present study also revealed that approximately 60% the participants had either moderate or high risk of fall which parallel with other studies (Dhargave & Sendhilkumar 2016).

Majority of the participants in this study believed they had good capabilities in walking and balance. When we compared between the participant's clinical assessment and their own perception of walking ability, good agreement (kappa 0.702) was observed. Although this finding was consistent with a study by Aziz et al. (2014), a recent work found a contrary result (Kluft et al. 2017). Kluft et al. reported that the actual performance of walking and self-perception among the elderly was different. This concurs with an earlier opinion that elderly may have an overly positive

perception of their state of health and minimized their personal susceptibility (Braun 1998). For balance ability, the agreement between self-perception and actual assessment were moderate (k: 0.546) and this is consistent with a study among ambulating stroke patients (Aziz et al. 2014).

The agreement for gait is better probably because it is much easier to assess walking ability compared to the balance and risk of fall, which requires a higher level of thinking. It is also important to take note that most of the study participant only attained up to primary level of education, reflecting a possibility of them having limited knowledge and confidence to evaluate their own balance and risk of fall.

A small proportion of the participants perceived they are at risk of fall and poor agreement is seen between their perception and actual risk (kappa value 0.3). The result is of concern to us as more than half of the participants are under the category of moderate (46.2%) and high risk (26.2%). This signals to us that elderly may overestimate their physical ability and unaware of their risk of fall which concurs with the opinion by Sakurai et al. (2013). A published report in 2014 also stated that 30% of elderly have incorrect perception of their risk of fall (Pearson et al. 2014) and this false belief could impose danger to their health.

Moreover, some of the elderly believed they do not need a walking aid even though they have the risk of fall (Aminzadeh & Edwards 2000). The clinicians were obviously bewildered with the discrepancy but it is obvious

to us that the elderly have their own opinions. A qualitative study reported that elderly view 'being active' as having own autonomy and independence (Hughes et al. 2008). It is their wish to be able to live independently and not relying on others, hence this may have influence their own judgment of risk of fall. All these information prove that we need to enhance awareness among our older generation.

In designing any awareness programme for the elderly, it is important for us to identify factors that may influence their perception of risk so that our programs are tailored to those in need. This is also in line with the fact that for a person to adopt a desired behaviour, his or her perception has to be corrected first (Baum et al. 1997). In the present study, we found that age more than 80 years, consuming psychotropic drugs and having stroke are the significant factors associated with perceived risk of fall. These finding are in agreement with previous studies by Hughes et al. (2008) and Delbaere et al. (2010).

A number of reasons could be hypothesized. Firstly, it is expected to see those who are at advanced age (above 80 years) feel they are at risk as their muscle strength and body stability declines throughout the years. On the other hand, the younger age group (between 60-70 years) is less likely to think they are at risk as they are still physically active and contributes to the community (Delbaere et al. 2010). Secondly, those who are taking psychotropic drugs exhibit more psychological symptoms, hence they are anxious and may be

having irrational fears including fear of fall (Delbaere et al. 2010). They are also probably aware of the fact that this type of medication is sedative and can cause drowsiness, leading to a risk of fall (Johnell et al. 2017). Lastly, people who have stroke commonly believe their physical health deteriorates as a result of the condition (Andersson et al. 2008) and reportedly to have fear of fall, leading them to feel susceptible for fall (Cho et al. 2015).

The present study is considered a preliminary study as it was done in one single centre and study subjects are small in number. Therefore, the result cannot be generalized to the entire population. However, the current finding helps us to give us the information on our elderly's actual gait, balance and risk of fall as well as their own perception.

## CONCLUSION

The study finding shows poor agreement between participants' perception with their actual risk of fall while good and moderate agreement for gait and balance. Factors that influenced perception of having risk of fall are advancing age, participants with stroke and taking psychotropic drugs.

The findings from this study give us an important message to the primary care physicians. Some of our elderly population are not fully aware of their physical competency and less aware of their risk of fall. It is also clear to us that unless we intervene now, the poor awareness could give a negative impact to their health. This problem

need to be addressed by improving our educational strategies to the community targeting to those at risk of fall. The educational session can also go hand in hand with the exercise programmes specifically design to reduce fall risk by improving muscle strength and balance training.

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