

## The Effectiveness of Multicomponent Exercise Combined with Art Therapy on Balance, Stress and Anxiety Among Community Dwelling Elderly: A Pilot Study

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### Received

21<sup>st</sup> June 2023

### Received in revised form

8<sup>th</sup> January 2024

### Accepted

22<sup>nd</sup> January 2024

### Published

1<sup>st</sup> September 2024

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### ABSTRACT

**Introduction:** According to the Department of Statistics Malaysia, the population aged 60 years and above has rose and Malaysia is estimated to be an aging country by 2030 as 15% of the population are elderly. As Malaysia's aging population increase, the physically inactive population increases. This study is to assess the effectiveness of eight weeks intervention of multicomponent exercise combined with art therapy on balance, stress, and anxiety among community-dwelling older adults. **Methods:** A single randomized trial control pilot study was conducted on 37 community-dwelling older adults were randomly allocated into three groups (i) multicomponent exercise (Exercise, n=12), (ii) multicomponent exercise combined with art therapy (Combined, n=13), (iii) art therapy (Art, n=12). Participants were given tasks according to groups allocated and needed to complete the task within eight weeks. Balance performance was measured via Time Up and Go test (TUG), while stress and anxiety were assessed via components in the Bahasa Malaysia version of the Depression Anxiety and Stress Scales (BM DASS-21). A repeated-measure ANOVA was used for data analysis. **Results:** Compared to the pre-intervention, all three groups showed a significant effect of time for balance performance, stress, and anxiety, ( $p < 0.05$ ) but no statistically significant differences in the three variables were found between the three groups ( $p > 0.05$ ). **Conclusion:** Eight weeks intervention of multicomponent exercise combined with art therapy had shown positive effect on balance, stress, and anxiety among community dwelling older adults. This study recommends integrating multicomponent interventions into rehabilitation program among older adults by healthcare practitioner particularly physiotherapist to achieve healthy aging.

**KEYWORDS:** Multicomponent exercise, Art therapy, Balance, Stress, Anxiety

### INTRODUCTION

Currently, the aging population in Malaysia has risen. According to the Department of Statistics Malaysia, the population aged 60 years and above has rose from 10.3% in 2019 to 10.7% in 2020, and Malaysia is estimated to be an aging country by 2030 as 15% of the population are elderly [1,2]. As Malaysia's aging population increased, the physically inactive population increased, especially after the movement control order period, as most of them were restricted from socializing and were forced to stay at home to protect themselves from the COVID-19 outbreak. The overall prevalence of physical inactivity among older adults in Malaysia

aged 60 years old was 48.8%, and approximately half of the Malaysian older population is physically inactive [3]. This physical inactivity among community-dwelling older adults is concerning as it might impact their quality of life (QOL) and lead to various severe diseases as they age.

Aging is usually related to reduced physical and cognitive function as they slowly lose muscle mass and are replaced by adipose and fibrous tissues [5]. This then reduces the general muscle strength and function and leads to progressive muscle loss, which causes sarcopenia and dynapenia to occur. Consequently, it affects one's independence in daily living, physical



activity and overall QOL. Exercise training was beneficial for humans in reducing the risk of chronic illnesses, especially for older adults. It does not only improve physical performance, such as balance, strength, and endurance but is also clinically proven to boost mood and cognitive function among community-dwelling older adults [6]. However, long structured exercise causes a burden for older adults, which makes them prone to be physically inactive. Previous study reported that, the overall prevalence of physical inactivity among older adults in Malaysia aged  $\geq 60$  years old was approximately half of the Malaysian older population, and concerns as this might reduce their quality of life (QOL) as it may lead to various severe diseases as they aged [3].

Previous research claimed that most older adults had depression symptoms like feelings of sadness, anxiety, worthlessness, and sleeping problems at night as they were drawn into loneliness, which reflects feelings of detachment from the world [4]. This occurs as most older adults live alone as their family members grow and have their own lives. Additionally, natural physiological changes such as low folate levels in the blood and neurological system may increase a person's risk of depression, especially in people over 60 years old [4]. These depressive symptoms may cause difficulties in an older adult's activities of daily living and may reduce emotional resources, thus making healthy aging more challenging [4].

Healthy aging was defined as a "process of maintaining functional ability to enable well-being in older age" [7]. Based on the World Health Organization WHO, the active aging model consists of six determinants: economic, physical environment, health, and social services, personal, behavioral, and social [7]. However, in this study, only two determinants will be highlighted, which are behavioral and personal determinants. Behavioral determinants in this model were about one's behavior on being healthy. For instance, an individual performs exercise three times weekly or is physically active. While personal determinants focus more on an older adult's good cognitive function and psychological status. Thus, an intervention of multicomponent exercise and art therapy was created from these two determinants. This intervention represents the behavioral determinants, and

art therapy's therapeutic effect helps improve psychological status.

Similarly, art therapy provides a creative space for older adults to explore their emotions which aids in improving one's physical, mental, and emotional well-being. It is proven effective in reducing anxiety symptoms, improving QOL, improving cognitive function and emotion regulation [4,8,9]. Art therapy establishes the chance for creative expression via visual a task, such as drawing and painting [9]. These creative expression approaches to aid in mobilizing several aspects of the human mind, such as cognition, the sensorimotor system, emotions, and desires.

Many studies showed promising results on community-dwelling older adults engaging in multicomponent exercise or art therapy interventions. Thus, this pilot study aims to investigate the feasibility of this study on the effects of multicomponent exercise combined with art therapy on balance performance, stress, and anxiety among community-dwelling older adults.

## MATERIALS AND METHODS

### Participants

A pilot intervention study was done over eight weeks. Thirty-seven older adults aged 57 years and above were allocated from Kampung Bukit Cherakah Jaya in Selangor. Participants were recruited based on the following criteria (1) aged 57 and above (2) functionally independent (able to perform ADL on their own such as bathing, dressing, able to walk around the house with or without a walking device independently) (3) Mini-Mental State Examination (MMSE) score between 24 to 30 or able to follow standard instruction (e.g., able to take a paper and fold into two as instructed) (4) able to communicate verbally, fluently and understand instructions in English or Bahasa Malaysia. Participants who presented with major or chronic health conditions (e.g., knee osteoarthritis stage 4, chronic stroke, severe dementia), major psychiatric disorders (e.g., major depression), and refusal were excluded from this study. This study allocated thirty-seven older adults and was randomly allocated into three groups: the multicomponent exercise group, the multicomponent exercise combined with the art therapy group, and the art therapy group (Exercise = 12, Combined = 13, Art = 12). Participants were given sealed opaque and were allocated in groups following the numbers they

received. There were no dropouts in this research (Figure 1).

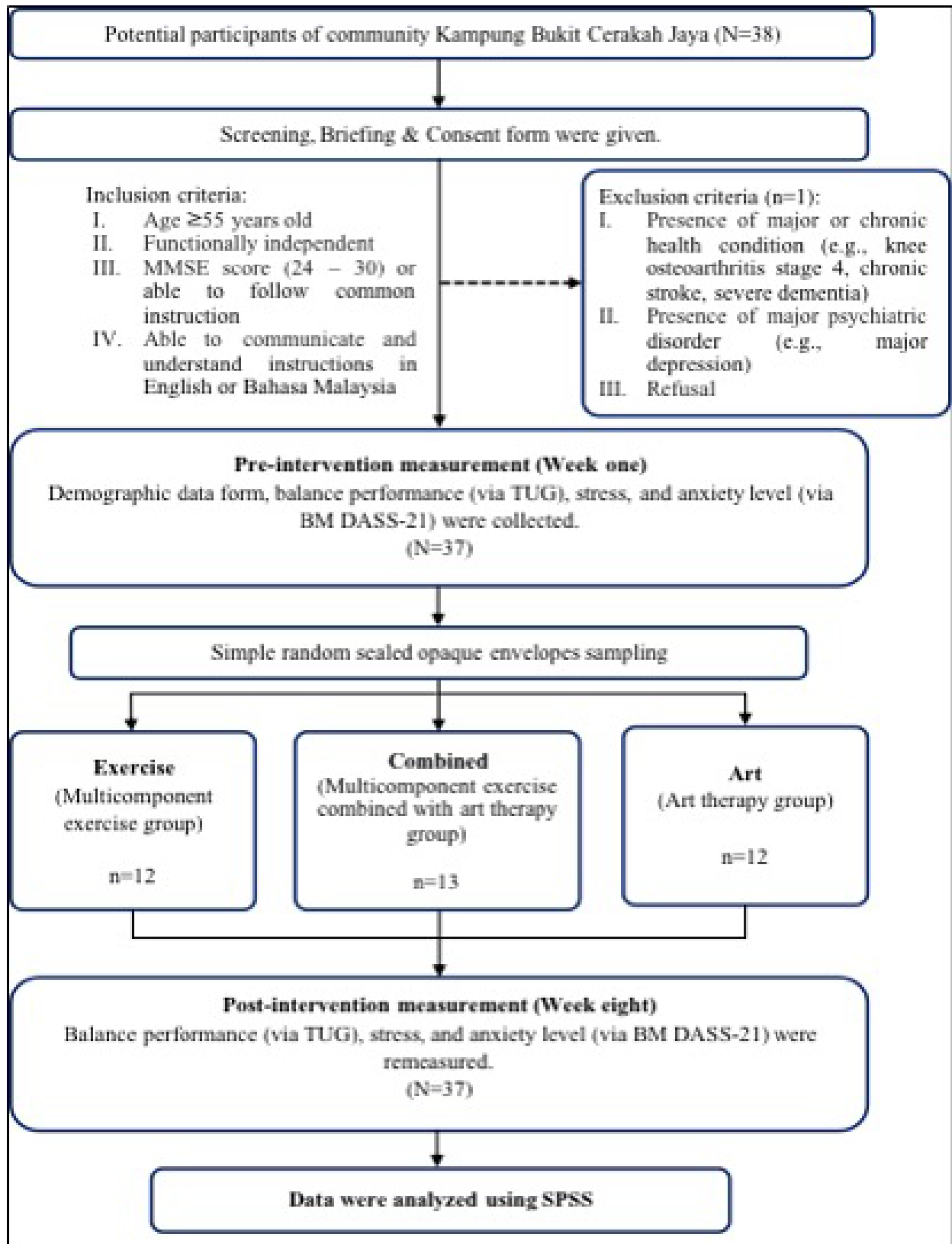


Figure 1 The flowchart on data collection procedure

## Multicomponent Exercise & Art Therapy Protocol

The exercise group was given a set of Multicomponent Exercise Programs (MCEP), including aerobic, strengthening, and balance exercises. This intervention was done over eight weeks for about 60 minutes per day, thrice a week. Each participant was given a PDF set of MCEP books with a picture and video guidance on the exercise given (Table 1). Before the intervention starts, each participant will be measured for their average Time Up and Go test (TUG) time taken for balance performance, stress, and anxiety score via DASS 21, Bahasa Malaysia version for physiological factors. Participants were also given the lightest weight of elastic band for their strengthening exercise. Whatsapp application was used as a medium to connect with the participants. Every week, participants will be reminded to perform the exercise. After eight weeks of intervention, participants were regathered to remeasure the variables taken in the first week of intervention.

The art therapy was also done in eight weeks. Four sets of art activities were done everyone week apart, which are on weeks one, three, five, and seven. Each participant was given four sets of sealed opaque envelopes with a number on each. Participants were provided with video guidance on how to complete the art activities. Every week apart, the researcher will deliver video guidance via WhatsApp application to the participants, and they need to complete the task any day within the week and submit their creativity in the group WhatsApp after completing the task. Participants were not allowed to open the envelope until it was told. Before starting the intervention, every participant will be measured for their average TUG time taken for balance, stress, and anxiety score via DASS 21 Bahasa Malaysia version for physiological factors, and the same variables will be retaken on the final week of intervention (Table 2).

As for the combined group, they were given a combination of the same intervention as the exercise group and art group, and it needed to be completed within eight weeks. Pre and post-measure of variables will be taken the same as the exercise and art group.

**Table 1** Multicomponent exercise

Exercise training	Description	Duration	Intensity
<b>Chair Aerobic</b>	(i) seated marching (ii) punching (iii) trunk twisting and bending (iv) arm curl (v) hip abduction and adduction	15 minutes	Slow to moderate
<b>Strengthening exercise</b>	Elastic band (i) biceps (ii) triceps (iii) hip flexor (iv) hip extensor (v) hip abductor (vi) hip adductor	20 - 30 mins	Hold 5 seconds for 10 repetitions; 3 set
<b>Balance exercise</b>	(i) half squatting (ii) sit to stand (i) close feet (ii) single leg standing (iii) tip-toeing (iv) standing one-foot in front	10 mins	Hold for 10 seconds for 5 repetitions; 3 set

**Table 2** Art therapy

Week	Art activities
1	Coloring with crayon
3	Weaving an art set
5	Stamping with watercolor
7	Coloring a batik set

## Outcome measures

The main variables in this study were balance performance, stress, and anxiety level. Time Up and Go test (TUG) was used to measure the balance performance as it is easily implemented with minimal equipment. TUG was proven to be a clinically valid tool to examine the risk of falls among older adults [10] with a high intratester and intertester reliability (ICC) from 0.92-0.99 [11]. TUG was sensitive and specific, identifying older adults at risk of falls with a sensitivity and specificity of both 87% [12]. It is suggested that the cut-off time for TUG among older adults was 13.5 seconds [12].

As for the stress and anxiety level it was measured via the Bahasa Malaysia version of the Depression Anxiety and Stress Scales (BM DASS-21). The score of stress and anxiety were taken in the stress and anxiety part in BM DASS-21. This questionnaire was proven to be highly reliable and valid, with high psychometric properties [13]. BM DASS-21 have good factor loading values for the most item (0.39 to 0.73) on the construct validity during the validity test and Cronbach's alpha value for overall items 0.904 (CI 95%). The level of stress and anxiety were detected if they scored  $\geq 8$  and  $\geq 5$ , respectively.

## Statistical analysis

The results were analyzed via SPSS version 26.0. The descriptive statistics were calculated, including numbers and percentages for categorical variables and means and standard deviations for continuous variables. A One-Way ANOVA repeated measure was utilized to assess the time factor effects, group effects, and the interaction between group and time (time x group) variables across all groups. A P-value of  $<0.05$  will be considered statistical significance.

## RESULTS

The final data allocated 37 community-dwelling older adults (12 from the exercise group, 13 from the combined group, and 12 from the art group). The respondents were 11 males (29.7%) and 26 females (70.3%), with an average age of 65.32 (SD = 1.06) years. 56.8% of the participant's BMI was overweight, 81.2% were married, 51.2% had a primary education level, 89.0% exercised regularly, and 72.6% had at least one or more health problems. There was no significant difference in the participants' characteristics between the three groups ( $p > .05$ ) (Table 3).

A one-way repeated measures ANOVA was conducted to compare the time taken for TUG, stress, and anxiety score at pre and post-intervention. Table 4 and Figure 2 show the time taken for TUG on balance performance at pre-intervention and post-intervention. There was a significant effect for time [Wilks' Lambda = .445,  $F(1,34)=40.665$ ,  $p < 0.05$ , multivariate partial eta squared = .545.] after intervention (Mean = 8.76, SD = 1.81) was significantly lower than the pre-intervention (Mean = 9.55, SD = 1.75) There was no significant effect of group [  $F(2,34)=.767$ ,  $p > .0005$ , partial eta squared = .545.] and time x group [Wilks' Lambda = .973,  $F(2,34)=.466$ ,  $p = .472$ , multivariate partial eta squared = .043.]

Table 4 and Figure 3 show the stress score at pre-intervention and post-intervention. There was a significant effect for time [Wilks' Lambda = .583,  $F(1,34)=24.345$ ,  $p < 0.05$ , multivariate partial eta squared = .417.] after intervention (Mean = 1.81, SD = 1.84) was significantly lower than the pre-intervention (Mean = 3.48, SD = 3.46) There was no significant effect of group [  $F(2,34)=.568$ ,  $p = .572$ ,

partial eta squared=.32.] and time x group [Wilks' Lambda= .806, F(2,34)=.080, p=.194, multivariate partial eta squared=.032.]

Table 4 and Figure 4 show the anxiety score at pre-intervention and post-intervention. There was a significant effect for time [Wilks' Lambda= .847, F(1,34)=6.145, p=0.018, multivariate partial eta

squared=.153.] after intervention (Mean=1.44, SD=1.3) was significantly lower than the pre-intervention (Mean=1.91, SD=2.05) There was no significant effect of group [F(2,34)=1.385, p=.264, partial eta squared=.75.] and time x group [Wilks' Lambda= .890 F(2,34)=2.111, p=.137, multivariate partial eta squared=.110.]

**Table 3** Demographic characteristic and health status of participants

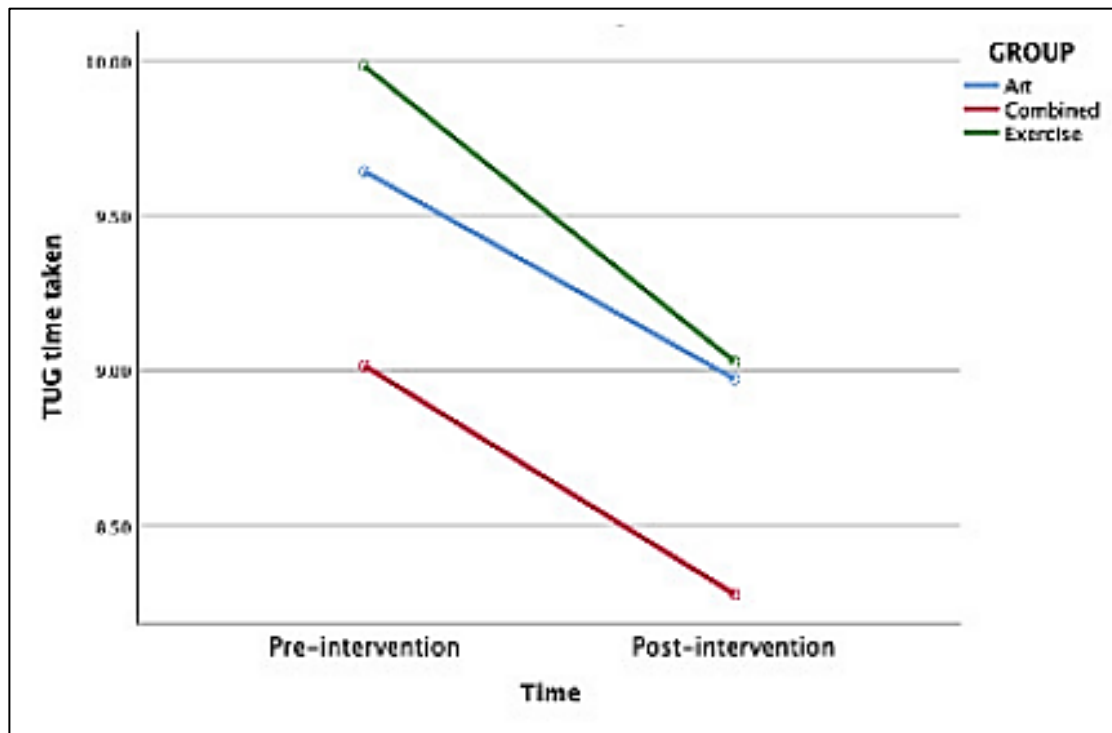
Characteristic	Exercise (n=12)		Combined (n=13)		Art (n=12)		p-value
	n(%)	m(SD)	n(%)	m(SD)	n(%)	m(SD)	
<b>Age (Years)</b>		63 (5.56)		64.38 (7.433)		68.67 (5.449)	0.032
<b>Gender</b>							0.386
Male	3 (25)		3 (23.1)		5 (41.7)		
Female	9 (75)		10 (76.9)		7 (58.3)		
<b>Weight</b>		59.33 (6.95)		63.38 (11.17)		68.47 (16.16)	0.67
<b>Height</b>		155.17 (6.37)		156.08 (7.34)		159.75 (10.24)	0.171
<b>BMI category</b>							0.546
Normal	2(16.7)		2(15.4)		3(25)		
Overweight	9(75)		7(53.8)		5(41.7)		
Obese	1(8.3)		4(30.8)		4(33.3)		
<b>Marital status</b>							0.689
Never married	-		-		1 (8.3)		
Married	9 (75)		10(76.9)		11 (91.7)		
Divorced	-		1 (7.7)		-		
Death of spouse	3 (25)		2 (15.4)		-		
<b>Education Level</b>							0.813
None	1 (8.3)		4(30.8)		2(16.7)		
Primary education							
Secondary education	7(58.3)		7(53.8)		5(41.7)		
Tertiary education	2(16.7)		2(15.4)		4(33.3)		
	2(16.7)		-		1(8.3)		
<b>Working status</b>							0.70
Not working	-		1 (7.7)		-		
Housewife	8 (66.7)		7 (53.8)		2 (16.7)		
Non-technical	-		-		-		
Pensioner	3 (25)		2 (15.4)		8 (66.7)		
Others	1(8.3)		3 (23.1)		1 (16.7)		
<b>Exercise status</b>							0.050
Yes	9 (75)		12(92.3)		12(100)		
No	3 (25)		1(7.7)		-		

			-	-		
<b>Arthritis</b>						0.219
Yes	1 (8.3)		13(100)		12(100)	
No	11(91.7)					
<b>Asthma</b>						0.381
Yes	-		1(7.7)		1(8.3)	
No	12(100)		12 (92.3)		12 (91.7)	
<b>Cataract</b>						1.000
Yes	-		2(15.4)		-	
No	12(100)		11 (84.6)		12(100)	
<b>Epilepsy</b>						1.000
Yes	-		1(7.7)		-	
No	12(100)		12(92.3)		12(100)	
<b>Diabetes</b>						0.832
Yes	4 (33.3)		5 (38.5)		4 (33.3)	
No	8 (66.7)		8 (61.5)		8 (66.7)	
<b>Osteoporosis</b>						0.381
Yes	-		1(7.7)		1(8.3)	
No	12(100)		12(92.3)		11(91.7)	
<b>Low BP</b>						1.000
Yes	-		1(7.7)		-	
No	12(100)		12(92.3)		12(100)	
<b>High BP</b>						0.428
Yes	5(41.7)		7(53.8)		7(58.3)	
No	7(58.3)		6(46.2)		5(41.7)	
<b>High cholesterol</b>						0.011
Yes	2(16.7)		4(30.8)		8(66.7)	
No	10(83.3)		9(69.2)		4(33.3)	
<b>Heart problem</b>						0.025
Yes	-		-		3 (25)	
No	12(100)		13(100)		9 (75)	
<b>No health problem</b>						0.372
Yes	5(41.7)		2(15.4)		3 (25)	
Yes	7(58.3)		11 (84.6)		9 (75)	
No						

**Table 4** One-Way repeated measures ANOVA for three variables between groups at Pre and Post-intervention

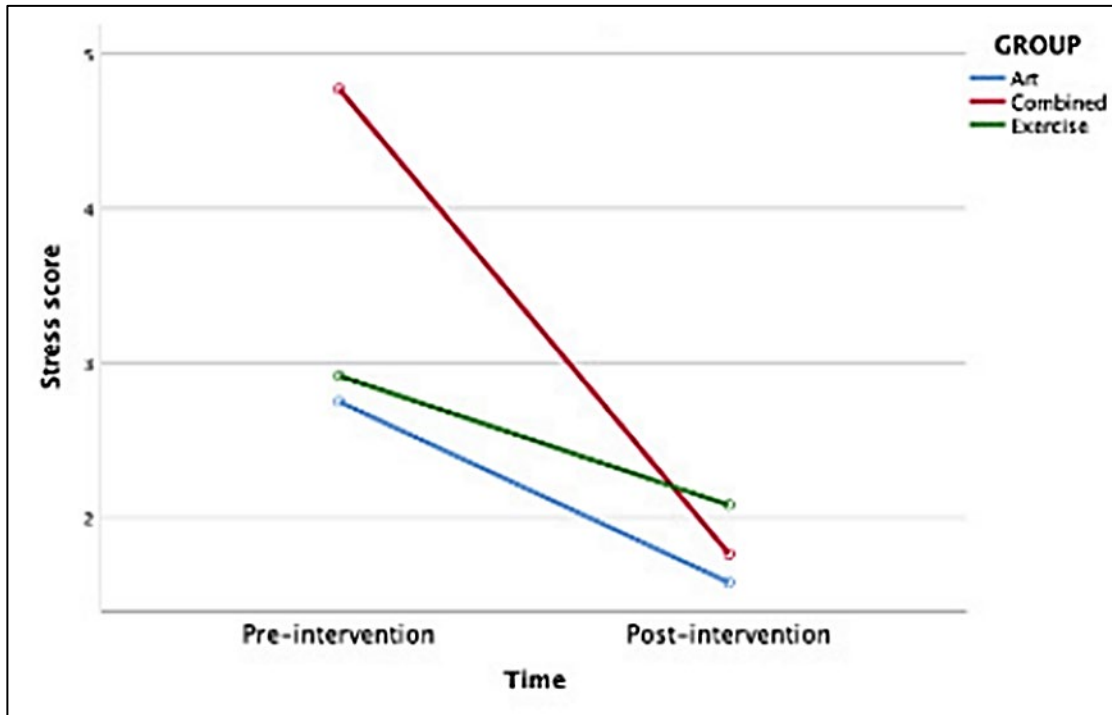
Variables	Time / group	n	Pre Mean ± SD	Post Mean ± SD	% Changes	One-Way repeated measures ANOVA
Balance performance	Exercise	12	9.98 ±1.33	9.03 ±1.76	9.52	<b>Time:</b> Wilks' Lambda= .445, F(1,34)=40.665, p<0.05, multivariate partial eta squared=.545. <b>Group:</b> F(2,34)=.767, p=.472, partial eta squared=.545. <b>Timexgroup:</b> Wilks' Lambda=.973, F(2,34)=.466, p=.472,
	Combined	13	9.02 ±1.26	8.28 ±1.19	8.2	
	Art	12	9.64 ±2.67	8.97 ±2.48	6.95	

Stress score	Exercise	12	2.92 ±2.91	2.08 ±1.68	28.77	multivariate partial eta squared=.043. <b>Time:</b> Wilks' Lambda= .583, F(1,34)=24.345, p<0.05, multivariate partial eta squared=.417. <b>Group:</b> F(2,34)=.568, p=.572, partial eta squared=.32. <b>Timexgroup:</b> Wilks' Lambda=.806, F(2,34)=.080, p=.194, multivariate partial eta squared=.032.
	Combined	13	4.77 ±4.34	1.77 ±2.29	62.89	
	Art	12	2.75 ±3.14	1.58 ±1.56	42.54	
Anxiety score	Exercise	12	2.42 ±2.84	2.08 ±2.23	14.05	<b>Time:</b> Wilks' Lambda= .847, F(1,34)=6.145, p=0.018, multivariate partial eta squared=.153. <b>Group:</b> F(2,34)=1.385, p=.264, partial eta squared=.75. <b>Timexgroup:</b> Wilks' Lambda=.890 F(2,34)=2.111, p=.137, multivariate partial eta squared=.110.
	Combined	13	2.23 ±2.42	1.23 ±0.93	44.84	
	Art	12	1.08 ±0.90	1.00 ±0.74	7.41	

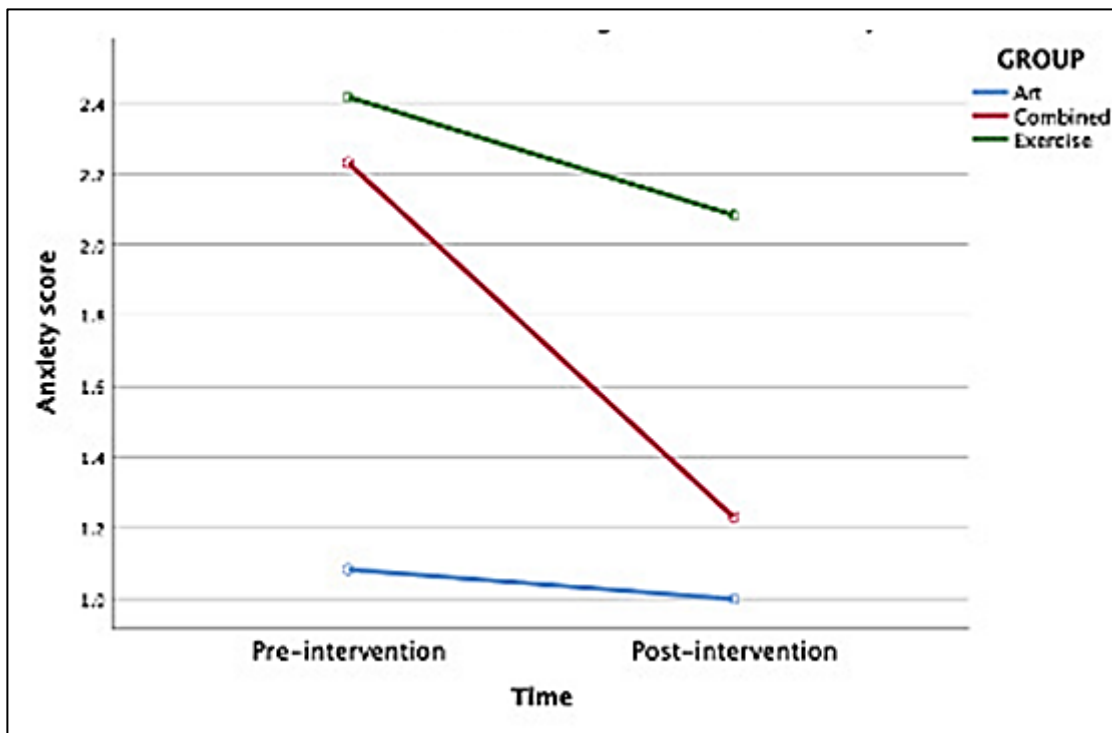


**Figure 2** The changes of TUG time taken for all groups in term of mean differences at pre- and post-intervention





**Figure 3** The changes of stress score for all groups in term of mean differences at pre- and post-intervention



**Figure 4** The changes of anxiety score for all groups in term of mean differences at pre- and post-intervention

## DISCUSSION

This study explored the positive effects of eight weeks of multicomponent exercise combined with art therapy on balance, stress, and anxiety among community-dwelling older adults. Previous research had proven that a range of 12 to 24 weeks of multicomponent exercise manifests positive improvements in the physical performance of older adults in terms of muscle strength, endurance, and balance [14,15,16]. In this study, an eight-week of intervention is sufficient to show positive effects on pre and post-intervention balance performance in Exercise, Combined, and Art groups with changes of percentages of 9.52%, 8.2%, and 6.95%, respectively. Similarly, earlier research of a four weeks intervention showed a significant difference in pre and post-intervention dynamic balance performance [17]. This shows that short-term or long-term exercise programs can positively affect balance performance. However, the art group showed the slightest changes in percentage in pre and post-intervention. It is suspected due to no exercise interventions related to improve strength and balance were given to the art group. Previous research reported that a combination of strength exercise and balance had significant improvements in the strength of all seven lower limb muscle groups and balance within eight weeks of intervention [18]. This aid in reducing frail and the risk of fall among older adults [19]. Additionally, committed, and enthusiastic participants contributed to this study's positive result.

This study reported that eight weeks of intervention had reduced the stress and anxiety score significantly post-intervention compared to pre-intervention in all three groups. The reduction of the anxiety score in the study was aligned with earlier studies [4,9] where both studies agreed that art therapy effectively reduced anxiety symptoms, improved QOL, cognitive function, and emotion regulation. Through visual tasks like coloring, stamping, weaving, and painting, art therapy provides chances for creative expression, mobilizing various aspects of the human mind, including cognition, the sensorimotor system, and emotions. The result of this study shows that the combined group had the most percentage of changes in stress (62.89%) and anxiety (44.84%) scores. This was

due to exercise contributing to not only physical performance such as balance, strength, and endurance but is also clinically proven to boost mood and cognitive function among community-dwelling older adults [6].

It was reported that there was a significant effect for time  $P=0.000$ , but there was no significant effect between all three groups (time x group)  $P=0.159$ . This may be due to the conflict of interest as the participants were all from the same village. However, all three groups show a significant positive effect on balance performance, stress, and anxiety scores during post-intervention measures compared to pre-intervention measures. These positive effects will then reduce the risk of falls, improve physical and cognitive function (psychological status) together, minimize the risk of disease, and aid in improving and boosting their social life. Hence all three domains in successful aging theory were tackled; thus, successful aging was achievable as defined [20]. There were certain limitations encountered in this study. This study holds a small sample size, with fewer participants, so the statistical power of this study may be insufficient to detect small-scale effects accurately. Besides, the short duration of this study may hinder the comprehensive evaluation of long-term changes. Despite these limitations, a pilot study was valuable in refining future study designs, identifying challenges, and providing preliminary insights into the feasibility of a larger sample size.

## CONCLUSION

This study suggested that an eight-week intervention with or without the combination of multicomponent exercise and art therapy positively affects balance performance, stress, and anxiety score among community-dwelling older adults. However, the combined group reported to have more significant improvement pre and post-intervention measures compared to exercise and art group. It is also recommended to integrate multicomponent interventions into rehabilitation program among older adults by healthcare practitioner particularly physiotherapist to achieve healthy aging.

## Conflict of interest

Authors declare none.

## Acknowledgement

We want to thank all the participants for their full cooperation throughout this study and Universiti Teknologi Mara for the facilities. Authors acknowledge the Universiti Teknologi MARA for funding under the GERAN PENYELIDIKAN INOVASI (GIS) (600-RMC/GIS 5/3 (006/2023). Also, the authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

## Authors' Contribution

Conception or design of work: Azliyana Azizan

Data collection: Syafiqah Shuhaimi

Data analysis and interpretation: Syafiqah Shuhaimi, Azliyana Azizan

Drafting the article: Syafiqah Shuhaimi

Writing the article: Syafiqah Shuhaimi

Final version of the article to be published: All authors.

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