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Baseline Functional Capacity and Activities of Daily Living Among Geriatrics in Nairobi, Kenya: A Pre-Intervention Assessment for an Integrated Virtual Reality Physical Activity Programme

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Abstract

Purpose: The global increase in the population of older adults has led to a significant rise in age-related functional decline, particularly in low- and middle-income countries such as Kenya. In Nairobi, older adults in institutional care settings are especially vulnerable to reduced functional capacity due to sedentary lifestyles and limited access to engaging and structured physical activity programs. Before evaluating the effectiveness of an integrated virtual reality (VR)-enhanced physical activity program, it was critical to establish the baseline functional capacity and activities of daily living (ADL) of this demographic.

Materials and Methods: This study adopted a quasi-experimental research design involving a control group and an experimental group. A total of 42 older adults participated in the baseline assessment, comprising 19 participants in the control group and 23 participants in the experimental group. Participants were assessed at baseline using functional capacity measures including handgrip strength, Five-Times Sit-to-Stand Test (5TSTS), Berg Balance Scale (BBS), Timed Up and Go (TUG) test, and De Morton Mobility Index (DEMMI). Data were analyzed using independent samples t-tests and Mann-Whitney U tests to establish group equivalence. Statistical significance was determined at $p < 0.05$.

Findings: The findings demonstrated that the control and experimental groups were statistically comparable at baseline, with no significant differences observed across all functional capacity domains ($p > .05$). The baseline demographic profile revealed a predominantly male sample (61.9%) in the young-old age bracket (65–74 years, 54.8%), with moderate anthropometric measurements. The baseline functional profile reflected the multidimensional nature of ageing-related decline, confirming that both groups entered the study with comparable levels of muscular strength, balance, coordination, and mobility. Establishing this baseline equivalence provided a strong foundation for evaluating the subsequent intervention effects, ensuring that post-intervention differences could be attributed to the VR intervention rather than pre-existing disparities.

Implications to Theory, Practice, and Policy: The study recommends that caregiving homes should conduct routine baseline functional capacity assessments using validated tools (e.g., DEMMI, BBS, TUG) to accurately profile the physical vulnerabilities of their residents and track decline over time

Keywords: *Functional Capacity, Older Adults, Geriatrics, Activities of Daily Living (ADL), Institutional Care, Baseline Assessment*

JEL Codes: *I12, I18, J10, J14*

INTRODUCTION

Background of the Study

The demographic composition of the global population is undergoing a profound transformation, characterized by a rapidly increasing proportion of older adults. This shift is largely attributed to advancements in healthcare, increased life expectancy, and declining fertility rates across many regions of the world (Gianfredi et al., 2025). According to the United Nations, the number of individuals aged 65 years and above was estimated at 771 million in 2019 and is projected to more than double to approximately 1.6 billion by 2050 (United Nations, 2019). This unprecedented rise in the aging population presents significant social, economic, and healthcare challenges, particularly in relation to maintaining functional independence, quality of life, and overall well-being among older adults. In 2020, Africa had approximately 74 million older adults, a number expected to surge to 235 million by 2050 (United Nations, 2022).

According to recent census data, the population of individuals aged 60 years and above in the Eastern Africa region including Tanzania, Burundi, Rwanda, South Sudan, and Kenya is no exception, with older adults constituting about 6% of the population, translating to approximately 2.7 million individuals (KNBS, 2019). According to the 2022 Statistical Abstract by the Kenya National Bureau of Statistics (KNBS, 2022), Nairobi Province had the highest number of elderly persons at the county level, with 76,078 individuals aged 65 years and above. The 2019 Kenya Population and Housing Census revealed 4,864 persons living in 93 old age homes nationwide, with Nairobi containing a significant proportion of the country's care homes (55 out of 93 registered caregiving homes).

Ageing brings about a complex array of physiological and anatomical changes that collectively diminish functional capacity among older adults. These changes notably affect the musculoskeletal, nervous, cardiovascular, and sensory systems, contributing to reduced strength, endurance, balance, and mobility. Sarcopenia, characterized by the progressive loss of muscle mass and strength, is a key contributor to functional decline, limiting the ability to perform everyday tasks and increasing frailty. Additionally, the deterioration of balance and coordination due to slower neural processing, impaired proprioception, and changes in motor control further elevates the risk of falls, loss of independence, and functional capacity decline (Monaghan et al., 2025). However, ageing alone does not fully account for the variability in functional decline observed among older adults; chronological age interacts with a cluster of modifiable physical, medical, and psychosocial factors that together determine the trajectory of functional decline (Fong, 2019).

Statement of the Problem

The rapidly expanding global population of older adults has intensified concerns regarding age-related functional decline, particularly in low- and middle-income countries where healthcare and geriatric support systems remain limited. Kenya has seen a marked increase in institutional care for older adults. Research highlights that a decline in functional capacity reduces autonomy and heightens reliance on caregivers, especially among individuals aged 65 and above (Kimani, Karanja, and Muthami, 2019). Furthermore, limited functional capacity is associated with poor health outcomes, a diminished quality of life, and increased rates of hospitalization (James, Olayo, Kisia, and Were, 2020). Although physical activity is effective in preventing functional decline among older adults, many remain sedentary and fail to meet recommended activity levels (Clarke, Norris, and Edwards, 2019). Adherence to conventional exercise programs is often limited by physical discomfort, fear of falling, low motivation, and

unengaging program designs (Stewart, Miller, and Brown, 2023). To address these barriers, innovative approaches such as integrated Virtual Reality (VR)-based physical activity have emerged. However, evidence on the feasibility and effectiveness of VR interventions in low-resource settings such as Nairobi remains limited, necessitating a rigorous baseline assessment to establish the functional capacity of this population prior to intervention.

Objectives

The main objective of this baseline study was to establish the baseline functional capacity and activities of daily living (ADL) of geriatrics before the implementation of an integrated-VR physical activity intervention program in Nairobi, Kenya.

Hypothesis

$H_0 1$: There is no significant difference in functional capacity between the control and experimental groups before the integrated-VR physical activity program.

Justification and Significance

This baseline study is significant for several interconnected reasons. First, understanding the pre-intervention functional status of institutionalized older adults in Nairobi provides critical empirical data on the extent of age-related functional decline in a low-resource African setting. Second, establishing baseline equivalence between the experimental and control groups is a methodological prerequisite for quasi-experimental designs, ensuring that any post-intervention differences can be confidently attributed to the VR intervention. Third, the findings provide a baseline reference for future research examining the feasibility, sustainability, and long-term outcomes of integrated VR physical activity among older adults in Kenya. Finally, healthcare professionals, caregivers, physiotherapists, and nurses benefit from evidence-based insights into the initial functional vulnerabilities of their patients, enabling the design of targeted rehabilitation approaches.

Literature Review

Status of Geriatric Functional Capacity

Functional capacity refers to an individual's ability to perform the physical and mental tasks required for independent daily living, encompassing basic self-care activities (Activities of Daily Living, ADLs) and more complex tasks necessary for independent community living (Instrumental Activities of Daily Living, IADLs) (Sanchez et al., 2024). Mendes et al. (2021) described functional capacity as the composite of physical and mental capacities available to an individual, reflecting the ability to undertake activities of daily living independently. The World Health Organization (WHO, 2022) frames this through intrinsic capacity—the composite of an individual's physical and mental capacities, which interacts with environmental factors to shape functional ability and healthy-aging outcomes.

Globally, the prevalence of functional limitations among older adults is substantial. In the United States, national survey data indicate that between 36.2% and 37.1% of adults aged 60 and above report at least one ADL or IADL disability (Sianturi et al., 2022). In Europe, the EU average ADL limitation prevalence was 8.4%, with IADL limitation at 25.2% (Robert Koch Institute, 2021). In the Asia-Pacific region, a systematic review found pooled ADL disability prevalence of 21.5% and IADL disability prevalence of 46.8% among adults 60 and older (Chan et al., 2021). In Africa, estimates vary widely. A community-based study in Gondar, Ethiopia, found ADL disability prevalence of 34.5% and IADL disability prevalence of 54.4% among older adults (Tolossa et al., 2024). In Kenya, according to the 2022 Kenya Demographic and Health Survey, 56% of Kenyans aged 50 and above report some form of functional

limitation, with county-level disparities pronounced (Kenya National Bureau of Statistics, 2023; Langat, 2024).

Functional Capacity and the Impact of Ageing among Geriatrics

The International Conference on Frailty and Sarcopenia Research (ICFSR) emphasizes that maintaining functional capacity is essential for older adults to perform daily activities and sustain independent functioning (Izquierdo et al., 2021). With advancing age, these capacities may decline because of physiological changes affecting the musculoskeletal, neuromuscular, cardiovascular, and other body systems, potentially resulting in reduced mobility, muscular strength, balance, and endurance. The nervous system experiences reduced neuroplasticity and slower neural transmission, contributing to delayed reaction times and impaired motor coordination (Zhao, Yang, Lu, and Li, 2023). Concurrently, the musculoskeletal system undergoes sarcopenia a progressive loss of muscle mass and strength alongside joint stiffness and decreased motor control, all of which contribute to frailty (Rolland, Cesari, Morley, and Vellas, 2021).

These age-related biological changes negatively affect gait, balance, mobility, and endurance, thereby limiting older adults' ability to perform activities of daily living independently (World Health Organization, 2020). As functional capacity declines, dependence on caregivers increases, creating emotional and financial burdens for families, particularly in low-resource settings with limited long-term care services (Lloyd-Sherlock, Ebrahim, and McKee, 2021). Core physical domains such as balance, coordination, mobility, and muscular strength are closely interconnected and collectively determine an older adult's ability to maintain independence and adapt to environmental demands (Jansen et al., 2020).

Measuring Functional Capacity among the Geriatrics

Functional capacity in older adults is an essential marker for identifying age-related decline and for predicting health outcomes such as falls, hospitalization, disability, and mortality (Sousa et al., 2020; Cesari et al., 2017). Various validated tools are used to measure specific domains of functional capacity:

1. Handgrip Strength (HGS): Assesses upper body strength and serves as a reliable proxy for general muscle strength and predictor of adverse outcomes. McGrath et al. (2021) demonstrated that weak handgrip strength (<26 kg for men and <16 kg for women) significantly predicted mortality and the incidence of disability over an eight-year period.
2. Five-Times Sit-to-Stand Test (5TSTS): Provides a practical measure of lower-limb functional strength and mobility. Muñoz-Bermejo et al. (2021) reported excellent reliability for assessing lower-limb muscle strength, balance control, and functional mobility.
3. Timed Up and Go (TUG) test: Assesses functional mobility and dynamic balance. Schoene et al. (2021) confirmed TUG's excellent predictive validity for identifying individuals at high fall risk, with a completion time of over 12 seconds significantly increasing fall likelihood.
4. Berg Balance Scale (BBS): Provides a comprehensive measure of both static and dynamic balance. Muir-Hunter et al. (2022) identified a BBS score of 49 or lower as the optimal cutoff for predicting future falls, yielding high sensitivity and specificity.
5. De Morton Mobility Index (DEMMI): Captures small but clinically meaningful changes in frail individuals. Sibley et al. (2021) demonstrated that DEMMI was highly

responsive and showed strong concurrent validity with other mobility measures, confirming its applicability in inpatient and geriatric care settings.

Status of Geriatric Involvement in Physical Activity

Physical activity is widely recognized as a critical strategy for mitigating the adverse effects of aging and maintaining functional capacity. However, participation remains suboptimal globally. In the United States, only 13.9% of adults aged 65 years and older met both aerobic and muscle-strengthening physical activity guidelines in 2022 (Elgaddal & Kramarow, 2024). In Kenya, studies indicate that participation in physical activity among older adults remains inadequate. Bosire et al. (2025) reported that 27% of older adults in Vihiga County were physically inactive, with adults aged 65 years and older having 2.62 times higher odds of being physically inactive compared with younger adults. Earlier evidence from Kenya similarly demonstrated low participation in structured physical activity among older adults (Nambaka et al., 2011). This widespread sedentary lifestyle directly compounds age-related physiological deterioration, underscoring the necessity of baseline assessments before implementing targeted interventions.

MATERIALS AND METHODS

Study Design

This baseline assessment was part of a larger quasi-experimental study evaluating the effectiveness of an integrated-VR physical activity program on functional capacity among older adults. A quasi-experimental design with a non-equivalent control group was adopted. Two elderly care facilities in Nairobi were purposively selected: one designated as the experimental facility and the other as the control facility. This approach was suitable in contexts where random assignment was limited by logistical, ethical, or operational constraints (Harris et al., 2006). A single-blind procedure was employed to ensure that outcome assessors remained unaware of group allocation, thereby reducing assessment bias (Schulz et al., 2010).

Study Area and Population

The study was conducted in Nairobi, the capital city of Kenya. The study population consisted of older adults aged 65 to 90 years residing in institutional care settings. According to the 2019 Kenya Population and Housing Census, Nairobi has over 76,078 older adults, making it home to the largest urban geriatric population in the country. The study specifically targeted elderly residents at Mji wa Huruma (MH) and Kariobangi Cheshire Home (KCH), selected due to their robust populations of elderly individuals and facilities supporting health and well-being.

Inclusion and Exclusion Criteria

Participants included were aged 65 years and above, residing in the care home for a minimum of three months, medically cleared for physical activity, and demonstrating sufficient cognitive ability (assessed via the Mini-Mental State Examination). Participants with severe cognitive impairment, recent major surgery, total visual or hearing impairments, severe psychiatric disorders, or on medications severely impacting functional capacity were excluded.

Sampling Design and Sample Size Determination

A multi-stage, non-random sampling approach was utilized. Purposive sampling was used to select the two elderly care homes based on similarities in size, staffing, and resident demographics. Eligible residents who provided informed consent were identified, after which simple random sampling was used within each facility to select study participants. The sample size was estimated using G*Power 3.1.9.7 for a repeated-measures ANOVA. The output

indicated a minimum sample size of 24 participants. Inflating for a 50% attrition rate, the final sample size was 36 participants (18 per group). The actual baseline sample consisted of 42 older adults (19 control, 23 experimental).

Data Collection Instruments

Functional capacity was assessed using five standardized instruments:

- Handgrip Dynamometer: Measured upper body strength in kilograms.
- 5TSTS: Evaluated lower limb muscular strength by timing five successive stands from a chair.
- Berg Balance Scale (BBS): Assessed static and dynamic balance across 14 tasks, scored 0–56.
- Timed Up and Go (TUG): Evaluated coordination by timing the task of rising from a chair, walking 3 meters, returning, and sitting.
- DEMMI: Evaluated overall mobility across bed, chair, static standing, dynamic standing, and walking tasks, scored 0–100.

Reliability and Validity

The instruments possessed strong psychometric properties. Handgrip dynamometry exhibits excellent intra-rater reliability (ICC > 0.95). The 5TSTS has excellent test-retest reliability (ICC = 0.89-0.95). The TUG shows excellent test-retest reliability (ICC = 0.89-0.99). DEMMI demonstrated exceptional inter-rater reliability (ICCs = 0.94-0.98), and the BBS showed excellent inter-rater reliability (ICC = 0.98) and internal consistency (Cronbach's alpha = 0.96).

Data Analysis

To assess baseline equivalence between the control and experimental groups, the normality of the baseline data was first assessed using the Shapiro-Wilk test. For normally distributed variables ($p > .05$ in both groups), Independent Samples t-tests were utilized. For non-normally distributed variables, the non-parametric Mann-Whitney U test was adopted. Statistical significance was established at $p < 0.05$.

FINDINGS

Demographic Characteristics of the Study Participants

The demographic and anthropometric profiles of the 42 older adults assessed at baseline are summarized in Table 1. The sample consisted of more males (61.9%, n=26) than females (38.1%, n=16). Regarding age distribution, the majority of the participants fell into the young-old category (65-74 years), representing more than half of the sample (54.8%, n=23). This was followed by the middle-old category (75-84 years), which comprised 40.5% (n=17) of the participants, while the oldest-old category (85-94 years) had the smallest representation at 4.8% (n=2).

In terms of anthropometric measurements, the weight of the participants ranged from 41 kg to 90 kg. The highest proportion of participants (45.2%, n=19) fell within the 61-70 kg weight bracket. Concerning height, the participants ranged from 131 cm to 190 cm. The largest segment of the sample (45.2%, n=19) measured between 161–170 cm in height. Overall, the demographic profile indicates a predominantly male sample in the young-old age bracket with moderate anthropometric measurements, generally representative of the ambulatory older adult population in institutional care settings.

Table 1: Demographic Characteristics of the Study Participants

	Category	Frequency	Percent
Gender	Male	26	61.9%
	Female	16	38.1%
Age	65-74yrs	23	54.8%
	75-84yrs	17	40.5%
	85-94yrs	2	4.8%
Weight	41-50kgs	3	7.1%
	51-60kgs	9	21.4%
	61-70kgs	19	45.2%
	71-80kgs	7	16.7%
	81-90kgs	4	9.5%
Height	131-140cm	1	2.4%
	141-150cm	5	11.9%
	151-160cm	12	28.6%
	161-170cm	19	45.2%
	171-180cm	4	9.5%
	181-190cm	1	2.4%

Baseline Equivalence of Functional Capacity (Testing $H_0 1$)

The primary objective of the baseline analysis was to establish whether the Control and Experimental groups were statistically equivalent in functional capacity before the implementation of the integrated-VR physical activity program. The Shapiro-Wilk test indicated that Handgrip Strength (Right and Left) and De Morton Mobility Index (DEMMI) score were normally distributed ($p > .05$) in both groups. Conversely, 5TSTS Time (seconds), Berg Balance Scale (BBS), and Timed Up and Go (TUG) violated the normality assumption in the Experimental group ($p < .05$), necessitating the use of non-parametric Mann-Whitney U tests for these variables.

Comparison of Normally Distributed Baseline Variables

An Independent Samples t-test was conducted to compare the Control and Experimental groups at baseline for Handgrip Strength Right, Handgrip Strength Left, and DEMMI scores. Levene's test indicated equal variances could be assumed for all three variables ($p > .05$). As presented in Table 2, the analysis revealed no statistically significant differences between the two groups. There was no significant difference in Handgrip Strength Right ($p = .236$), Handgrip Strength Left ($p = .768$), or DEMMI scores ($p = .361$) between the Control and Experimental groups at baseline.

Table 2: Independent Samples t-test for Normally Distributed Baseline Variables

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Handgrip Strength (kg) Right	Equal variances assumed	.203	.655	1.203	40	.236	3.0362	2.5236	-2.0641	8.1365
	Equal variances not assumed			1.228	39.992	.227	3.0362	2.4731	-1.9621	8.0345
Handgrip Strength (kg) Left	Equal variances assumed	.111	.741	.297	40	.768	.8492	2.8615	-4.9341	6.6325
	Equal variances not assumed			.299	39.397	.767	.8492	2.8414	-4.8962	6.5946
Demmi Total	Equal variances assumed	.955	.334	.923	40	.361	1.048	1.135	-1.247	3.343
	Equal variances not assumed			.911	36.171	.368	1.048	1.150	-1.284	3.380

Comparison of Non-Normally Distributed Baseline Variables

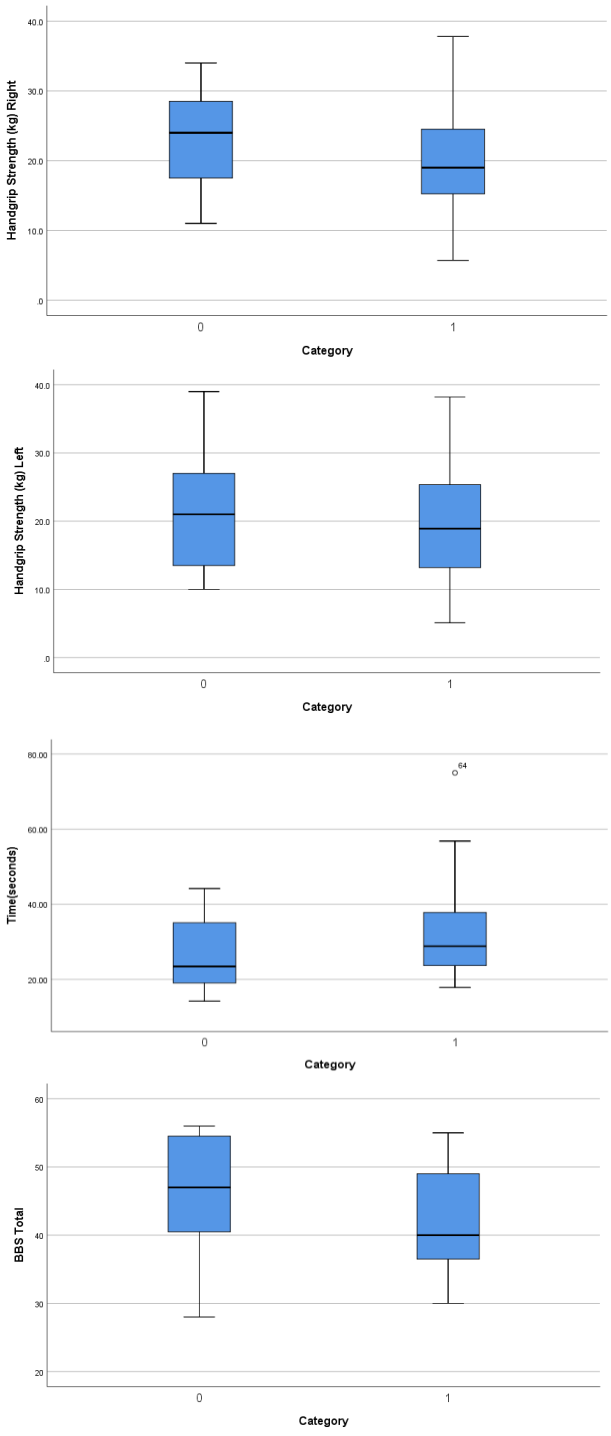
Because 5TSTS Time, BBS, and TUG violated the assumption of normality, the non-parametric Mann-Whitney U test was utilized to compare the Control and Experimental groups. As detailed in Table 3, results indicated that there were no statistically significant differences between the groups in 5TSTS Time (U = 147.00, p = .071), Berg Balance Scale (U = 145.50, p = .064), or Timed Up and Go (U = 156.00, p = .114) at baseline.

Table 3: Mann-Whitney U Test for Non-Normally Distributed Baseline Variables

Variable	Group	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Time (seconds)	Control	25.16	478	147	-1.807	0.071
	Experimental	18.43	424			
BBS Total	Control	24.84	472	145.5	-1.85	0.064
	Experimental	18.61	428			
TUG Average	Control	25.53	485	156	-1.579	0.114
	Experimental	18.11	417			

Graphical representations using box plots were generated for all functional capacity variables to visually inspect central tendencies, data dispersion, and outliers. For right and left handgrip

strength, the substantial overlap of interquartile ranges visually confirmed that both groups started at comparable functional levels. For 5TSTS Time, although the experimental group exhibited a wider spread and a slightly higher median, the substantial overlap confirmed baseline equivalence. The BBS and TUG box plots similarly demonstrated extensive overlap in interquartile ranges despite slight visual median differences, supporting the statistical conclusion of baseline equivalence. The DEMMI box plot displayed striking visual similarity, with both groups sharing an identical score range and virtually indistinguishable medians.



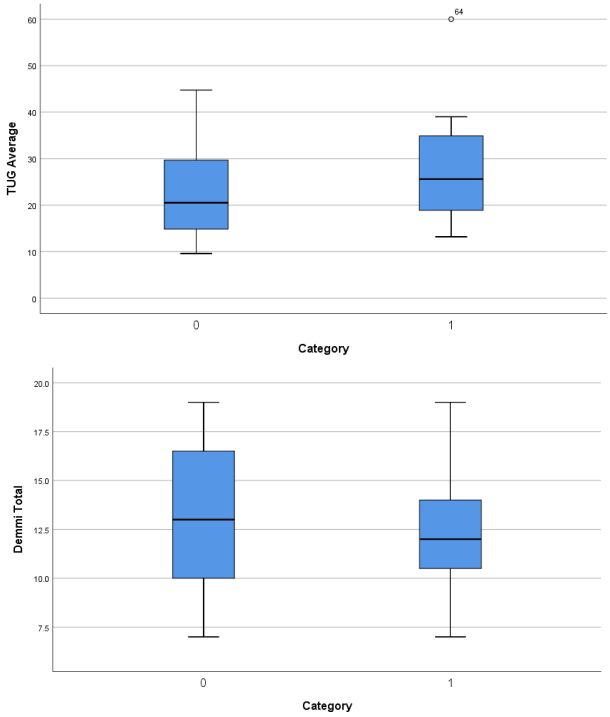


Figure 1: Functional Capacity Variables Box Plots

Conclusion for H₀1

The baseline comparability analysis confirmed that there were no significant statistical differences in any of the four functional capacity measures between the Control and Experimental groups prior to the intervention (all $p > .05$). Therefore, H₀1 was not rejected. This establishes that the two groups were statistically equivalent at baseline, ensuring that any post-intervention differences observed between the groups can be attributed to the VR intervention rather than pre-existing disparities.

Discussion

Baseline Functional Capacity of Older Adults before the Integrated-VR Intervention

The first objective of the study was to establish the baseline functional capacity of older adults before implementation of the integrated-VR physical activity intervention programme in Nairobi, Kenya. Baseline functional capacity was assessed using measures representing different dimensions of physical functioning, including right and left handgrip strength, the Five-Times Sit-to-Stand Test (5TSTS), Berg Balance Scale (BBS), Timed Up and Go (TUG) test, and the De Morton Mobility Index (DEMMI). Establishing baseline functional status was critically important because functional capacity in later life cannot adequately be represented by a single physical performance indicator. Muscular strength, balance, coordination, and mobility interact to determine whether an older person can safely and independently undertake activities of daily living.

The findings showed no statistically significant baseline differences between the experimental and control groups. Independent-samples t-tests indicated no significant differences in right handgrip strength ($p = .236$), left handgrip strength ($p = .768$), or DEMMI scores ($p = .361$). Similarly, Mann-Whitney U tests demonstrated no significant baseline differences in the 5TSTS time ($p = .071$), BBS scores ($p = .064$), or TUG performance ($p = .114$). Consequently, the first null hypothesis was not rejected. The findings therefore established that the control

and experimental groups were statistically comparable in functional capacity before commencement of the intervention.

This baseline equivalence is particularly important for the interpretation of subsequent intervention effects. Since the groups entered the study without statistically significant differences in the major functional outcomes, the considerably better performance subsequently observed in the experimental group is less likely to have resulted from pre-existing functional advantages. Rather, the findings provide a stronger basis for associating the observed post-intervention differences with exposure to the integrated-VR physical activity programme.

The baseline functional profile also reflects the multidimensional nature of ageing-related decline identified in previous research. The World Health Organization (2020) conceptualizes functional ability in older age as resulting from the interaction between an individual's intrinsic capacity and environmental circumstances. Within intrinsic capacity, locomotor functioning (including strength, balance, and mobility) is particularly important for the maintenance of independence. The current study's inclusion of several physical performance measures corresponds with the broader gerontological understanding that functional deterioration is not restricted to one physiological system.

The findings are consistent with Jansen et al. (2020), who indicated that balance, coordination, mobility, and muscular strength are closely interrelated components determining the ability of older adults to remain independent and adapt to environmental demands. Age-related reductions in these capacities can collectively compromise transfers, walking, postural control, and the performance of routine activities. Similarly, Rolland et al. (2021) associated ageing with progressive loss of muscle mass and muscular strength, commonly described as sarcopenia, which can increase vulnerability to mobility limitation and frailty.

The relevance of handgrip strength at baseline is supported by Bohannon (2019), who identified handgrip strength as a practical indicator of overall muscular strength and health status among older persons. McGrath et al. (2021) further demonstrated that weak handgrip strength among adults aged 65 years and above was associated with adverse outcomes including disability and mortality. Consequently, the measurement of handgrip strength in the current study was not merely an assessment of upper-limb performance but provided an indication of general muscular functioning among participants.

Similarly, assessment of lower-limb muscular performance through the 5TSTS was particularly important. Lower-limb strength is central to rising from a chair, climbing steps, maintaining gait, and recovering from postural disturbances. Correa-de-Araujo et al. (2020) demonstrated a strong association between reduced lower-limb strength and impaired mobility among older adults. The present baseline assessment therefore identified a domain directly relevant to everyday independence.

The use of TUG and BBS also corresponds strongly with previous evidence concerning functional deterioration. Schoene et al. (2021), in a meta-analysis involving more than 12,000 older adults, reported that TUG performance has considerable value in identifying older persons with impaired functional mobility and coordination. In addition, Muir-Hunter et al. (2022) demonstrated the utility of the BBS for identifying clinically meaningful balance impairment. These studies reinforce the importance of the functional domains measured in the current research, because deterioration in balance, coordination, and functional mobility may translate directly into reduced independence and a diminished capacity to perform activities of daily living.

The DEMMI provided an additional perspective by examining mobility across a broader functional continuum. Sibley et al. (2021) reported that the DEMMI was responsive to changes in mobility among older adults undergoing rehabilitation and demonstrated strong concurrent validity with other mobility measures. Its inclusion was therefore useful for detecting changes that might not have been adequately represented by isolated measures of strength or balance.

From the demographic data, out of the 42 participants, 54.8% were aged 65-74 years, 40.5% were aged 75-84 years, and 4.8% were aged 85-94 years. Thus, although the sample contained participants across different stages of older adulthood, more than half belonged to the young-old category. Nevertheless, functional limitations can begin well before extreme old age because biological ageing produces gradual deterioration in muscle strength, neurological processing, proprioception, and postural responses. Zhao et al. (2023) associated ageing with reduced neural processing efficiency and slower reactions, while Krause et al. (2024) observed that declining motor adaptability can limit older adults' capacity to respond efficiently to changing environmental demands.

The baseline findings are further supported by evidence from Kenya. Magutah et al. (2016) reported considerable physical inactivity among older Kenyan adults, with sedentary behaviour associated with unfavourable physical fitness characteristics. Oloo et al. (2024) similarly demonstrated the importance of strength, mobility, and balance when examining balance and functional capacity among Kenyan older adults. The present study extends locally relevant evidence by establishing the functional profile of institutionalized older persons in Nairobi before exposure to a technology-supported exercise intervention.

From an intervention perspective, the absence of significant baseline differences is a crucial finding. It strengthens the internal validity of the study because subsequent differences between the groups cannot readily be explained by one group beginning with substantially superior physical capabilities. The baseline findings therefore established an appropriate foundation for evaluating whether integrated VR could meaningfully modify functional capacity over the 12-week intervention period.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the baseline findings, it is concluded that the control and experimental groups were statistically equivalent across all domains of functional capacity, including muscular strength, balance, coordination, and mobility, prior to the implementation of the integrated-VR physical activity intervention. The demographic profile of the participants predominantly male and in the young-old age bracket is generally representative of the ambulatory older adult population in institutional care settings in Nairobi. The baseline assessment successfully established a robust methodological foundation for the quasi-experimental study, confirming that any post-intervention functional differences observed can be confidently attributed to the experimental manipulation rather than pre-existing disparities.

Recommendations

Based on the baseline findings, the following recommendations are made:

1. Caregiving homes should conduct routine baseline functional capacity assessments using validated tools (e.g., DEMMI, BBS, TUG) to accurately profile the physical vulnerabilities of their residents and track decline over time.

2. Clinicians should utilize multidimensional baseline assessments rather than relying on a single metric, as functional capacity encompasses interconnected domains of strength, balance, coordination, and mobility.
3. Future intervention studies in low-resource settings should prioritize establishing baseline equivalence through rigorous statistical testing (e.g., independent t-tests, Mann-Whitney U) to ensure the internal validity of their quasi-experimental designs

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