



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIIF): 5.93
IJPESH 2026; 13(6): 110-120
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<https://www.kheljournal.com>
Received: 19-04-2026
Accepted: 22-05-2026

Rickson Etindi
Alupe University, Kenya

The role of ball games for visually impaired Students within Kenyan Universities

Rickson Etindi

DOI: <https://www.doi.org/10.22271/kheljournal.2026.v13.i6b.4577>

Abstract

This study examined the role of ball games in promoting inclusive education and enhancing sports participation among visually impaired students in Kenyan universities. Specifically, it assessed the accessibility of adaptive sports programmes, participation levels, and institutional factors influencing engagement. A convergent mixed-methods design was employed to collect and integrate quantitative and qualitative data. The study involved 42 purposively selected respondents drawn from public and private universities, including sports directors, coaches/trainers, and visually impaired student representatives. Data were collected using structured questionnaires containing 5-point Likert-scale items and open-ended questions. Quantitative data were analyzed using descriptive statistics and inferential tests, including the Friedman test, one-sample t-tests, and chi-square tests, while qualitative data were analyzed thematically. The findings revealed low levels of accessibility and participation in adaptive sports programmes across the sampled universities. Results indicated uniformly poor perceptions of accessibility features, infrastructure, and support systems. Participation rates were generally low, with most respondents reporting infrequent involvement in sports activities. Inferential analyses showed no significant differences in perceptions of engagement and institutional support. Qualitative findings identified inadequate funding, limited adaptive sports equipment, inaccessible facilities, and weak institutional commitment as major barriers to participation. The study concludes that persistent structural and policy-related challenges continue to hinder inclusive sports participation among visually impaired students. It recommends increased investment in adaptive sports facilities, provision of specialized equipment, and stronger institutional policies to promote inclusive sports programmes in Kenyan universities.

Keywords: Inclusive Education, Ball Games, Visually Impaired Students, Adaptive Sports Programmes, Sports Participation, Kenyan Universities

Introduction

Around the world, higher education systems have increasingly recognized sports as a powerful platform for social transformation, resource equity, and the promotion of inclusive education (Nagy, 2025) ^[32]. In countries like the United States and Canada, modern updates to collegiate sports governance have focused on bridging systemic gaps in athletic resource distribution for students with historical vulnerabilities (Foster and Nite, 2022) ^[13]. Research by Lew, 2024 shows that structured adaptive athletic opportunities in higher education significantly enhance leadership, boost self-esteem, and dismantle deep-seated stereotypes surrounding physical capacity. These global developments demonstrate that intentional policy frameworks and innovative sporting formats are essential to fostering inclusive academic environments (Valivey *et al.*, 2025) ^[21].

In Europe, the evolution of university sports has increasingly integrated specialized adaptive disciplines to break down traditional ableist barriers and promote social integration (Depaw, 2023). Adapted ball games, which require specialized training and customized rules, have become a core fixture in continental university sports programmes for students with diverse needs. Studies indicate that sports requiring absolute cooperation between differently-abled groups actively reduce systemic bias and promote mutual respect on and off the field. These findings highlight that adaptive sports serve as a vital tool for structural social engineering within higher education institutions (Lynch, 2019; Bradbury *et al.*, 2025 and Arante and Estillore, 2026) ^[2, 6, 24].

In many Asian countries, universities are adopting diverse and skill-oriented sports frameworks to build social cohesion and address student wellness. Countries like Taiwan and

Corresponding Author:
Rickson Etindi
Alupe University, Kenya

South Korea have integrated inclusive, sensory-dependent sports into their university curricula and competitive structures to maximize participation and optimize campus spaces (Betancourt *et al.*, 2016) ^[5] Research reveals that adaptive sporting environments foster strong team synergy and emotional intelligence, as success depends on collective strategy rather than raw physical dominance. These international trends illustrate that integrating inclusive sports disciplines plays a major role in enriching the contemporary university experience.

Across Africa, university sports departments have traditionally been governed by highly segregated frameworks that mirror broader continental social disparities. In West African nations like Nigeria and Ghana, competitive university sports often prioritize mainstream, non-disabled disciplines, leaving adaptive tournaments underfunded and poorly publicized (Osougi, 2019). Studies show that this systemic imbalance limits student-athletes with disabilities from accessing elite training facilities and sports scholarships. Similarly, research in South Africa by Dodo *et al.*, 2019 indicates that the continuous focus on traditional, unadapted sports slows down structural inclusion and equity efforts within higher education athletic departments.

According to Kojana (2023) in Lesotho, visually impaired students in higher education experienced varying levels of access to institutional support services, with disability units being the most frequently utilized and valued services, while libraries, health centres, computer laboratories, and counselling services were underutilized due to inadequate assistive technologies, limited learning materials, and a lack of specialized expertise. The study further found that the absence of disability policies and guiding frameworks, coupled with challenges such as poor residential conditions, insecurity, and inconsistent attitudes from peers and staff, negatively affected students' academic and social experiences. Consequently, the study emphasized the need for comprehensive disability policies, improved assistive resources, and inclusive support systems to enhance the educational success and well-being of visually impaired students in higher education institutions (Kojana, 2023).

In East Africa, higher education regulatory bodies have started aligning university sports with regional and global disability equity treaties. However, translating these macro-level policies into practical, field-level inclusion remains a persistent challenge in countries like Tanzania and Uganda. Research highlights that deeply entrenched social stigmas and a lack of diverse sporting alternatives often discourage students with sensory impairments from participating in competitive athletics (Milimu, 2024) ^[28]. These structural hurdles emphasize the urgent need for East African universities to introduce innovative, adapted sports formats that accommodate all students equally (Wanderi *et al.*, 2016) ^[46].

In Kenya, university sports programmes are managed under the Kenya University Sports Federation (KUSF), which has historically featured heavily segregated and exclusive athletic paths (Kwevu, 2021) ^[20]. Traditional powerhouses such as soccer, rugby, and basketball receive skewed financial support, administrative priority, and media visibility, which are overwhelmingly directed toward fully-abled mainstream teams (Njororai and Omondi, 2023). Study by Abuya and Githinji, 2022 in Kenyan reveal that visually impaired students face immense sociocultural hurdles, institutional neglect, and limited resource distribution within university sports. These disparities result in a significant loss of diverse sporting talent and perpetuate a skewed, unequal athletic culture. According to Adongo (2023) ^[1] in Kenya, the inclusion of students with visual impairments in tertiary

institutions was supported through inclusive education policies, assistive technologies, environmental modifications, and adaptive teaching strategies. The study found that lecturers enhanced curriculum accessibility by providing Braille handouts, large-print materials, and tactile diagrams, while the institution utilized various assistive devices and ICT resources to facilitate learning. Despite these efforts, the available resources were insufficient to meet the growing needs of students with visual impairments, leading to challenges in effective service provision. Nevertheless, the institution maintained a supportive social environment that promoted inclusion and participation among students with and without visual impairments. The study therefore recommended increased investment in modern assistive technologies, including Braille note-takers, Orbit Readers, and embossing machines, to strengthen inclusive education and improve learning outcomes for students with visual impairments in tertiary institutions (Adongo, 2023) ^[1].

According to Khakali (2021) ^[19] in Kenya, institutional readiness for access to higher education by students with disabilities in public universities remained inadequate despite national commitments to inclusive education. The study found that most university infrastructure was not fully accessible and required significant modifications to accommodate students with disabilities. Additionally, many lecturers lacked specialized training in special needs education and had limited knowledge of assistive technologies, resulting in teaching approaches that were not sufficiently inclusive. The curriculum was also found to be inadequately adapted, particularly in relation to flexible timetabling, assessment procedures, and the availability of accessible learning materials. These barriers collectively limited meaningful access and participation in higher education for students with disabilities. Consequently, the study recommended the adoption of the Universal Design model in university infrastructure, curriculum development, and teaching practices to enhance institutional readiness and promote equitable access to higher education for students with disabilities (Khakali, 2021) ^[19].

Despite the Kenyan government and individual universities establishing inclusive education policies, these blueprints rarely translate effectively onto the sports pitch. Many public and private universities continue to operate without binding, operational guidelines that enforce equity in adaptive sports funding, accessible infrastructure, or specialized coaching recruitment (Hums *et al.*, 2021). Sociocultural norms also continue to frame competitive athletic spaces as domains of physical perfection, which alienates visually impaired students. This restrictive climate demands a structural alternative that re-socializes institutions to accommodate visually impaired students as absolute peers (Powis, 2020) ^[40]. To address these gaps, KUSF has recently taken progressive steps by introducing diverse sports formats into its national championship calendar. However, while grassroots clinics and certification courses have successfully been conducted at various institutions, adapted ball games for the visually impaired are still treated as optional exhibition matches rather than core, budgeted disciplines.

From a global perspective, theory provides competing predictions on how firm size affects performance. On the one hand, larger firms may enjoy scale economies, bargaining power, diversified revenue bases, and stronger resource bundles that raise efficiency and profitability (Tomas Žiković *et al.*, 2025; Latifi *et al.*, 2021). Larger scale can also support investments in technology, compliance systems, professional management, and innovation capability—channels frequently linked to stronger performance outcomes (Kijkasiwat & Phuensane, 2020; Latifi *et al.*, 2021). On the other hand, size

can also introduce bureaucratic rigidities, agency problems, and slower strategic responsiveness, potentially weakening profitability as firms grow beyond an efficient frontier (Canarella & Miller, 2021; Muthusamy & Kannan, 2023). Recent evidence from traditional U.S. industries, for example, suggests that the link between scale-related strategies and profitability can weaken over time under more volatile and knowledge-driven competitive conditions (Muthusamy & Kannan, 2023), reinforcing the idea that —bigger is not automatically —better for performance.

Empirically, international studies increasingly show that the size performance relationship is heterogeneous across sectors, institutional environments, and firm categories (OECD, 2025; Tomas Žiković *et al.*, 2025). In European wine firms, profitability drivers differ when SMEs are analyzed separately from large and very large firms, implying that the determinants of performance (and the returns to scale) vary substantially by size category (Tomas Žiković *et al.*, 2025). In corporate finance research, size also interacts with financial structure and agency costs: debt, R&D intensity, and governance frictions can affect performance differently in small *versus* large firms, producing non-linear outcomes (Canarella & Miller, 2021; Jaiswal & Elmarzouky, 2025).

Statement of the Problem

Despite national guidelines on inclusive education, Kenyan university sports infrastructure and schedules overwhelmingly favored non-disabled student-athletes, prioritizing mainstream sports with disproportionate allocations of funding, equipment, and administrative attention (McCarty, 2022). Visually impaired students faced severe structural marginalization, characterized by an acute scarcity of specialized amenities like tactile lines and auditory sound balls, which directly curtailed their constitutional right to recreation under Article 54 (Maingi, 2018). This physical exclusion was worsened by hazardous campus environments that increased injury risks, alongside deep-seated ableist stereotypes that mischaracterized these students as incapable of competitive play. Ultimately, the absence of data-driven, policy-enforced frameworks within the Kenya University Sports Federation (KUSF) left adaptive sports as underfunded pastimes rather than core varsity disciplines, thereby undermining inclusive education goals and reinforcing student isolation.

Objective of the Study

The general objective of this study is to examine the role of ball games for visually impaired students in advancing inclusive education and promoting equitable participation in sports within Kenyan universities.

Theoretical Review - Social Model of Disability

The primary theoretical anchor for this study is the Social Model of Disability, pioneered by Oliver (1983) and expanded by Shakespeare (2006). This framework differentiates between physiological "impairment" and systemic "disability," arguing that disability is not an individual medical deficit but rather a consequence of oppressive social, structural, and environmental barriers. In collegiate sports governance, this model shifts the analytical focus away from the visual limitations of the student and onto the failures of the university ecosystem to provide adapted alternatives. The model argues that a student is not disabled by their lack of sight, but rather by an unyielding sports department that refuses to purchase sound-guided balls or provide tactile pitch modifications (Barnes, 2019) [3]. Within the context of Kenyan higher education, the Social Model provides an essential framework for deconstructing

historical inequalities in varsity sports development (Byron and Chepyator, 2015). Historically, sports boards have operated under medical assumptions, viewing visually impaired students as medical liabilities suited only for passive recreation or academic isolation (Meier and Giese, 2023) [27]. By applying this model, the study evaluates how university athletic departments perpetuate exclusion by failing to proactively design inclusive spaces. The theory directly informs the investigation into structural changes, suggesting that genuine inclusive education cannot exist until physical infrastructure, training equipment, and administrative mindsets are modified to accommodate all students.

Self-Efficacy Theory

To complement the macro-structural perspective of the Social Model, this study integrates Bandura's (1977) Self-Efficacy Theory as a supporting framework to analyze individual psychological dynamics. This theory establishes that an individual's belief in their ability to execute tasks controls their motivation, behavioral patterns, and emotional resilience during challenges (Li, 2020) [22]. In adaptive sports, a student-athlete's self-efficacy is continuously shaped by performance accomplishments, vicarious experiences, social persuasion, and physiological states. When visually impaired students are systematically denied access to sports, their athletic self-efficacy drops, creating a cycle of learned helplessness and voluntary non-participation.

Integrating this supporting theory allows the researcher to evaluate how participation in adapted ball games acts as a tool for psychological restoration. While the primary model addresses physical barriers, Self-Efficacy Theory investigates how overcoming tailored competitive challenges enhances a student's cognitive confidence. When a visually impaired athlete successfully navigates an auditory court or scores using a sound ball, it strengthens their sense of personal mastery. This internal transformation creates a positive psychological spillover effect, improving their academic confidence, self-advocacy skills, and social interactions within the broader university community.

Conceptual Framework

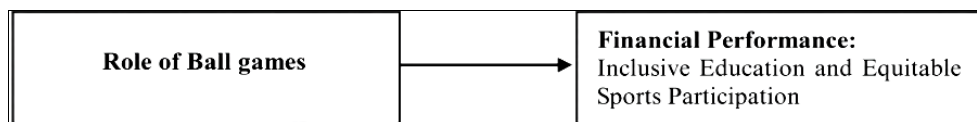
The conceptual framework of this study provides a structured foundation for examining the relationship between firm size and firm performance, with particular attention to both direct and indirect pathways through which firm scale influences performance outcomes. The framework is designed to illustrate how differences in firm size shape access to resources, organizational capabilities, and strategic choices that ultimately affect profitability and efficiency in the context of Kenyan Nairobi Securities Exchange Listed firms. Control variables in this study were Firm Age and Firm Leverage.

The conceptual framework of this study provides a structured foundation for examining the role of ball games in advancing inclusive education and promoting equitable sports participation among visually impaired students in Kenyan universities. The framework illustrates how the availability and accessibility of ball game programmes and facilities, as well as the level of participation in adapted ball games, influence the inclusion of visually impaired students in university sports programmes. It assumes that access to adapted equipment, accessible facilities, and appropriate sports opportunities enhances participation and supports inclusive educational outcomes.

The framework further recognizes that participation is influenced by several institutional and environmental factors, including funding, policy implementation, institutional support, awareness, and societal attitudes toward disability. These factors affect the extent to which visually impaired

students engage in ball games and benefit from inclusive sports programmes. The dependent variable is inclusive education and equitable sports participation, while Gender

and Type of University (Public or Private) serve as control variables.



Independent Variables

Dependent Variable Figure

Presents the conceptual framework showing the relationship between the independent and dependent variables.

Research Findings and Discussion

Biodata information

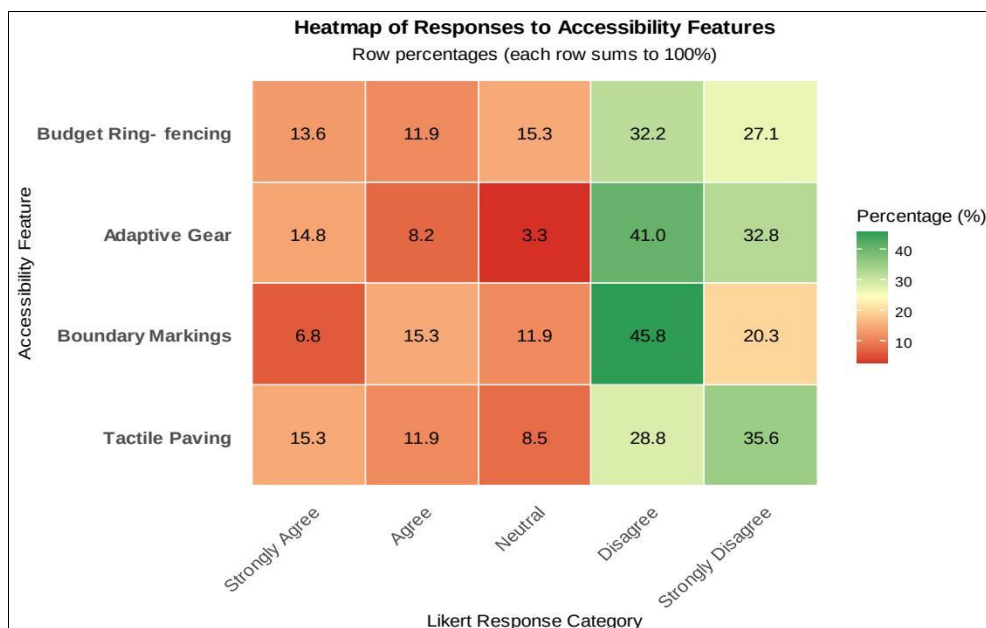
Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	21	50
	Female	21	50
University Category	Public University	23	54.8
	Private University	19	45.2
	Total	42	100.0
Current Role	Director	6	14.3
	Coach/Trainer	16	38.1
	Visually Impaired Student/Representative	20	47.6
	Total	42	100.0
Years of Participation	< 5 years	27	64.3
	> 5 years	15	35.7
	Total	42	100.0

Table: 1 shows that the gender distribution was perfectly balanced, with 21 males (50.0%) and 21 females (50.0%), allowing for equitable gender representation in the analysis. The study involved 42 respondents drawn from public and private universities. Public universities accounted for 23 respondents (54.8%), while private universities contributed 19 respondents (45.2%), indicating a slight predominance of public institutions. Regarding respondents' roles, the majority were visually impaired student representatives ($n = 20$, 47.6%), followed by coaches/trainers ($n = 16$, 38.1%), and directors ($n = 6$, 14.3%). This distribution ensured that the

perspectives of visually impaired participants remained central to the study. In terms of participation experience, most respondents had less than 5 years of involvement in university sports programmes ($n = 27$, 64.3%), while 15 respondents (35.7%) had more than 5 years of experience, suggesting a relatively youthful participation profile.

Facility Availability, Accessibility, and Resource Allocation

Accessibility features



Source: Researcher

According to Figure 4.1, the heatmap reveals a consistent pattern of negative perceptions across all four accessibility indicators. For the statement “Outdoor sports complexes

feature tactile paving and accessible walkways for visually impaired students,” the majority response is Strongly Disagree (35.6%), indicating that tactile infrastructure is largely unavailable. For “Clear boundary configurations,

contrast markings, and safety buffers are physically established on sports fields,” the dominant response is Disagree (45.8%), suggesting partial awareness of safety measures but clear inadequacy in implementation. For “The sports department actively provisions specialized adaptive gear (e.g., hand-stitched sound-emitting ball variants),” the most frequent response is Disagree (40.7%), accompanied by a substantial Strongly Disagree proportion (32.2%), reflecting limited availability of adaptive sporting equipment. Finally, for “Budget allocations specifically ring-fence funding for maintaining blind-accessible sports arenas (e.g., Goalball courts),” Disagree (32.2%) is the modal response, closely followed by Strongly Disagree (27.1%), indicating weak financial prioritisation for inclusive sports infrastructure. Overall, the heatmap demonstrates a clear dominance of disagreement across all indicators, confirming a perceived systemic deficiency in accessibility provisions for visually impaired students.

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Friedman Test Results and Descriptive Statistics for Accessibility Features (N = 42)

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Friedman Test Results and Descriptive Statistics for Accessibility Features

Accessibility Feature	Mean Rank	Median (IQR)	χ^2	df	p-value
Tactile Paving	2.44	4 (3-5)			
Boundary Markings	2.52	4 (3-5)			
Adaptive Gear	2.61	4 (3-5)			
Budget Ring-fencing	2.43	4 (3-5)	2.92	3	0.4035

(N = 42)

Source: Researcher

Note: Likert scale: 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree. IQR = interquartile range. The Friedman test assesses differences in ranked perceptions across related accessibility features.

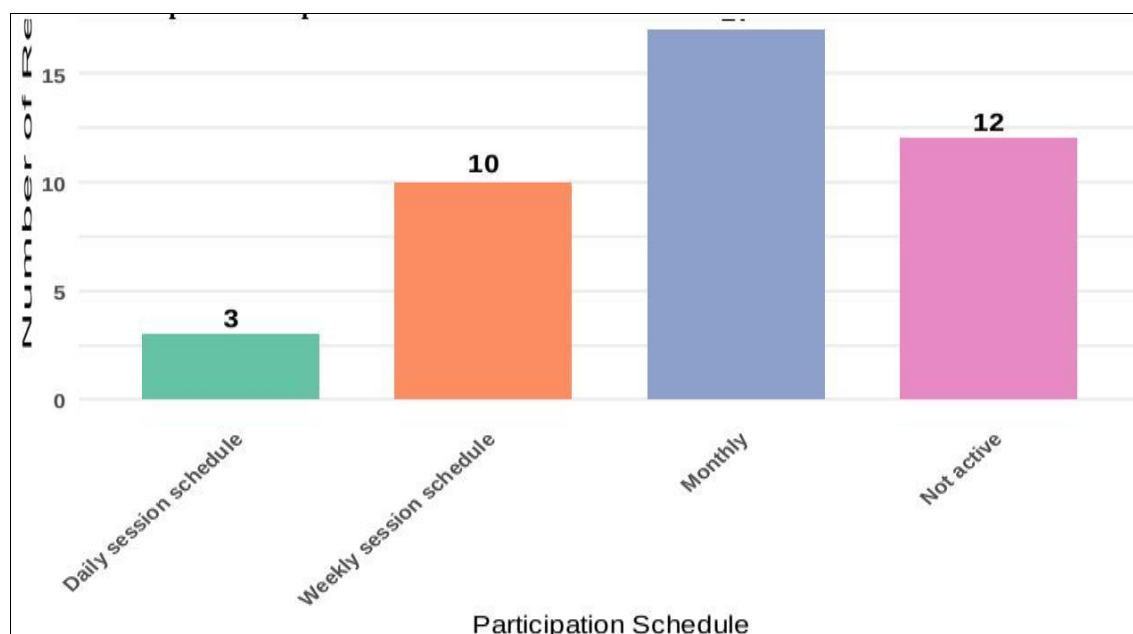
The Friedman test was conducted to examine whether there were statistically significant differences in respondents’ perceptions of four accessibility features: tactile paving, boundary markings, adaptive sports gear, and budget ring-fencing. The results indicated no statistically significant differences among the four features, $\chi^2_{(3)} = 2.92$, $p = 0.4035$. This suggests that respondents perceived the accessibility provisions in a relatively uniform manner, with no single feature being rated significantly higher or lower than the others. In terms of central tendency, all features recorded a median score of 4 (IQR = 3-5), indicating a general tendency toward disagreement that these accessibility measures are adequately implemented or effective. However, the ilarity in median values across all categories reinforces the Friedman test outcome that perceptions are consistently distributed rather than differentiated. Among the features, adaptive gear recorded the highest mean rank (2.61), suggesting it was slightly more positively perceived relative to the others, while budget ring-fencing (2.43) and tactile paving (2.44) recorded the lowest mean ranks, though the differences remain minimal and not statistically meaningful.

The findings disagree with the study by Khakali (2021) ^[19] on institutional readiness for access to higher education by students with disabilities in public universities in Kenya, which found that accessibility provisions across institutional systems were uneven and varied significantly in effectiveness. Unlike the current result, which shows no statistically significant differences among accessibility features such as tactile paving, adaptive sports gear, boundary markings, and budget ring-fencing ($\chi^2_{(3)} = 2.92$, $p = 0.4035$), Khakali (2021) reported that accessibility is highly differentiated across institutional domains. Specifically, infrastructure was found to be largely inaccessible and requiring substantial modification, lecturers’ competencies varied widely, and curriculum inclusiveness differed considerably in implementation across universities. This indicates that some accessibility dimensions were more developed than others, contradicting the uniform perception observed in the Friedman test results.

Similarly, the findings also disagree with Gebrehiwot (2015) ^[14], who emphasized that institutional support systems for visually impaired students differ significantly, particularly in funding, policy implementation, and availability of adaptive resources, further reinforcing the idea of unequal accessibility provision rather than uniformity across features. Overall,

while the current study suggests a systemic and uniformly perceived accessibility gap across features, prior studies highlight differentiated levels of accessibility across

institutional components, implying that accessibility challenges are often uneven rather than homogenous.



Source: Researcher

Active participation in sport activities

The bar chart above in Figure 4.2 illustrates the distribution of respondents according to their frequency of active participation in sports activities. The categories ranged from daily sessions to complete inactivity. As shown in the chart, the largest proportion of respondents engaged in monthly sessions, with a frequency of 17 respondents. This was followed by not active (12 respondents), weekly sessions (10 respondents), and daily sessions (3 respondents). When expressed as percentages of the total sample ($N = 42$), the distribution is as follows: monthly participation accounted for 40.5%, not active represented 28.6%, weekly sessions comprised 23.8%, and daily sessions constituted only 7.1%. These figures indicate that while a plurality of respondents participate at least once a month, a substantial proportion report no active participation at all. Very few respondents engage in daily or even weekly sports activities. From an inclusive education perspective, this pattern suggests that regular, structured sports engagement remains low among the target population. The high percentage of inactive respondents (28.6%) points to potential barriers such as lack of accessible facilities, adaptive equipment, or tailored programmes for visually impaired students. Furthermore, the low frequency of weekly and daily participation implies that existing sports offerings may not be sufficiently structured or accessible to support consistent engagement.

The findings disagree with the study by Keon Richardson (2020) ^[41], which found that regular participation in adapted sports such as blind football increases sustained engagement, physical health benefits, and social inclusion among learners with visual impairments. While the current results show that a large proportion of respondents are either inactive (28.6%) or participate only monthly (40.5%), with very low levels of weekly (23.8%) and daily (7.1%) participation, Richardson (2020) reported that structured and accessible adapted sports programmes encourage continuous participation once learners are exposed to inclusive sporting environments.

In contrast to the current study's implication of low and inconsistent engagement due to barriers such as inaccessible facilities, lack of adaptive equipment, and limited structured programmes, Richardson (2020) ^[41] emphasized that when appropriate opportunities such as blind football are provided, participation becomes more consistent and self-sustaining over time. The Zimbabwean study further highlighted that repeated exposure and positive sporting experiences help learners overcome initial barriers like fear of injury and lack of awareness, leading to higher retention in sports activities.

Predictors of Participation

Visually Impaired Students' Participation in Sports Activities

Table: Inferential Statistics for Visually Impaired Students' Participation in Sports Activities ($N = 42$)

Statement	Mean	Median	SD	t	df	p (t-test)	95% CI	χ^2	df	p (χ^2 GOF)
Utilize campus sports fields	3.26	4	1.56	1.09	41	0.284	[2.78-3.75]	8.24	4	0.083
Actively compete.	2.95	3	1.50	-0.21	41	0.838	[2.49-3.42]	2.76	4	0.598
Active, year-round league or training	2.69	2	1.37	-1.46	41	0.151	[2.26-3.12]	5.38	4	0.250

Note: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree. Likert scale: 1 = Strongly Disagree to 5 = Strongly Agree. CI = confidence interval. χ^2 GOF = chi-square goodness-of-fit test against equal distribution.

The results from both the one-sample *t*-tests and chi-square goodness-of-fit tests indicate that perceptions of visually

impaired students' participation in sports activities do not significantly differ from neutral expectations across all three

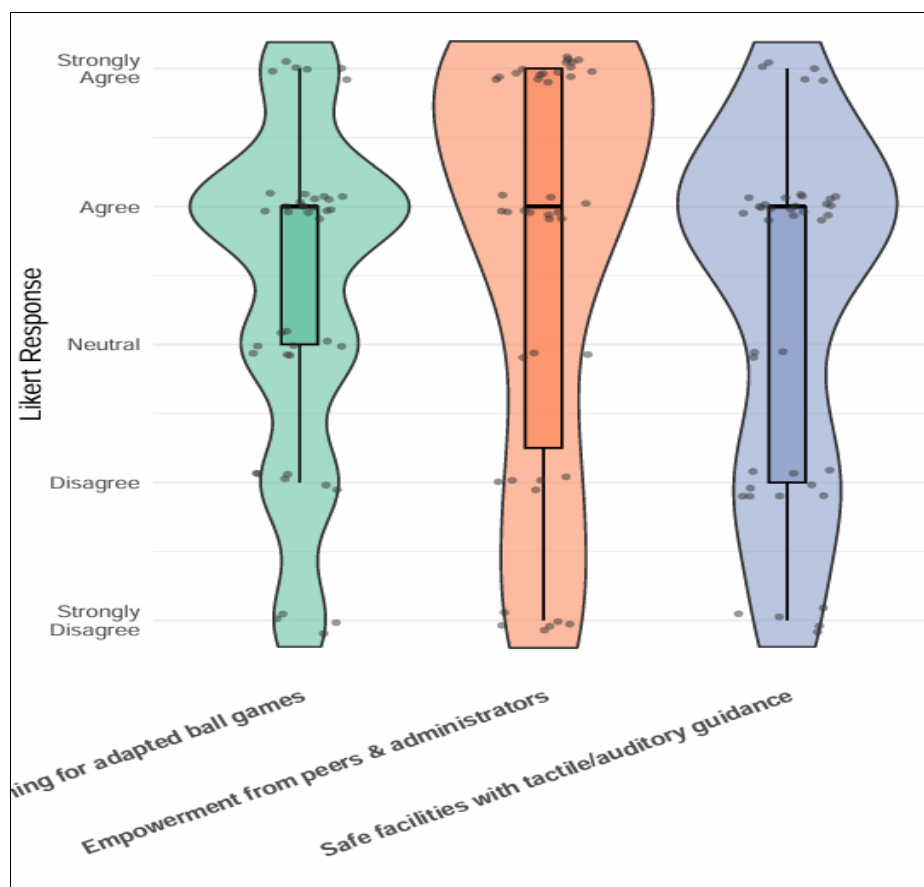
statements. For the first statement, the mean score ($M = 3.26$) is slightly above the neutral point, suggesting a mild tendency toward agreement that visually impaired students utilize campus sports facilities. However, this difference is not statistically significant ($t^{[41]} = 1.09$, $p = 0.284$). The chi-square result ($\chi^2 = 8.24$, $p = 0.083$) approaches significance, indicating some unevenness in response distribution, particularly a notably low neutral response count. The second statement yields a mean score close to neutrality ($M = 2.95$), with no statistically significant difference from the test value ($t^{[41]} = -0.21$, $p = 0.838$). The chi-square test ($\chi^2 = 2.76$, $p = 0.598$) further confirms a balanced distribution of responses across categories, indicating no dominant pattern of agreement or disagreement regarding participation in formal competitive events. For the third statement, the mean score ($M = 2.69$) and median ($Mdn = 2$) suggest a slight tendency toward disagreement, implying limited year-round structured participation in adapted ball games. However, this pattern is not statistically significant ($t^{[41]} = -1.46$, $p = 0.151$), and the chi-square test ($\chi^2 = 5.38$, $p = 0.250$) confirms that the distribution of responses does not significantly deviate from uniformity.

The findings indicate that while there are observable trends; slight agreement for facility use and slight disagreement for structured year-round participation; none of the observed differences are statistically significant at $\alpha = 0.05$. This suggests that perceptions of participation among visually impaired students are generally neutral and heterogeneous rather than strongly polarized in any direction. The findings

disagree with the study by Charles Ogu Okey and Chinaza Nwosu Kingsley (2018) ^[10], which reported clear and pronounced patterns in physical activity participation among learners with sensory impairments rather than neutral or statistically non-significant perceptions. In contrast to the current results, where one-sample t -tests and chi-square goodness-of-fit tests showed no statistically significant differences from neutral expectations across all three statements ($p > 0.05$), the Nigerian study found that participation in physical activity is strongly shaped by identifiable facilitators and barriers. These included motivation for fitness and enjoyment, social interaction, and psychological well-being as key facilitators, while stigma, lack of adaptive facilities, limited specialized equipment, and absence of trained personnel were reported as major constraints.

Unlike the current study's conclusion of generally neutral and heterogeneous perceptions regarding participation in sports activities among visually impaired students, Charles and Kingsley (2018) ^[10] demonstrated that participation patterns are more clearly influenced by environmental and socio-cultural conditions, leading to distinct tendencies either toward engagement or exclusion rather than neutrality.

To visually explore the distribution of Likert-scale responses across the three thematic dimensions, violin plots were generated for each indicator. The shape and density of each violin provide insights into the central tendency, spread, and response patterns among participants.



Perception of adapted ball games accessibility for visually impaired students

The violin plot for Resource Allocation and Coaching Capacity reveals a distribution that is strongly skewed toward negative perceptions regarding the provision of resources and specialized coaching for adapted ball games. The highest

concentration of responses occurs within the disagreement categories, indicating that most respondents perceive existing financial support and coaching expertise as inadequate. Although a small proportion of participants expressed neutral

or positive views, the median response remains within the disagreement range. The unimodal distribution, accompanied by a slight positive tail, suggests that while isolated instances of support may exist, resource allocation and coaching capacity for visually impaired students are generally perceived as insufficient.

A pronounced concentration of responses for; Accessibility and Safety of Sports Facilities at the lower end of the scale characterizes perceptions of facility accessibility and safety. Most respondents disagreed that sports facilities, pathways, and playing areas are adequately adapted to accommodate visually impaired students. The limited number of neutral responses indicates a strong consensus regarding the inadequacy of tactile and auditory guidance systems. The distribution highlights persistent environmental barriers that restrict safe and independent participation in sports activities. Overall, the findings point to substantial deficiencies in accessible sports infrastructure within the university environment.

The distribution of responses regarding social and institutional encouragement exhibits a bimodal pattern,

reflecting divergent experiences among respondents. While a considerable proportion reported limited support from peers, sports administrators, and campus culture, another group expressed positive perceptions of encouragement and inclusion. The presence of these two distinct response clusters suggests that inclusive practices are not uniformly experienced across the university. Although examples of effective support exist, the predominance of negative responses indicates that empowerment and encouragement for visually impaired students remain inconsistent. These findings underscore the need for more coordinated institutional efforts to foster an inclusive sporting culture.

Chi-square Test of Homogeneity Across Accessibility Dimensions

While the violin plots suggest descriptive differences in response patterns, a chi-square test of homogeneity was conducted to determine whether the distribution of Likert-scale responses differed significantly across the three accessibility dimensions. The results are presented in Table.

Table: Chi-square Test of Homogeneity for Responses Across Accessibility Dimensions

Statistical Test	χ^2	df	p	Cramér's V	Effect Size
Chi-square test of homogeneity	12.565	8	.128	.188	Small

Note: The null hypothesis (H_0) states that the distribution of Likert-scale responses (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree) is the same across the three dimensions of resource allocation and coaching capacity, accessibility and safety of sports facilities, and institutional and social support for participation.

Based on table, the chi-square test of homogeneity yielded a value of $\chi^2_{(8)} = 12.565$, $p = .128$. Since the p -value exceeds the conventional significance level of .05, the null hypothesis was retained. This finding indicates that there is no statistically significant difference in the distribution of responses across the three accessibility dimensions. In practical terms, respondents exhibited similar patterns of agreement and disagreement regarding resource allocation, facility accessibility, and institutional support.

The effect size, measured using Cramér's V, was .188, indicating a small effect. This suggests that any observed variations among the three distributions are relatively weak and lack substantial practical significance. Consequently, the response patterns may be considered largely homogeneous across the dimensions examined.

The violin plots revealed some descriptive differences in response distributions. Resource allocation and coaching capacity displayed a negatively skewed unimodal distribution, accessibility and safety of sports facilities exhibited an even stronger concentration of negative responses, while institutional and social support demonstrated a bimodal pattern reflecting mixed experiences among respondents. Despite these visual differences, the chi-square test established that the distributions were not statistically different from one another.

The findings disagree with the study by Rebecca Butalanyi Khakali (2021) ^[19], which reported clear and meaningful differences in how various institutional components support students with disabilities. Unlike the current results, which show no statistically significant differences in the distribution of responses across accessibility dimensions ($\chi^2_{(8)} = 12.565$, $p = .128$) and only a small effect size (Cramér's V = .188), Khakali (2021) found that accessibility is uneven across

institutional systems in Kenyan public universities.

In particular, Khakali (2021) ^[19] highlighted that infrastructure accessibility, lecturer competencies, curriculum inclusiveness, and institutional support structures vary significantly in their level of implementation. For example, infrastructure was generally found to be poorly adapted, while lecturer preparedness and curriculum flexibility showed inconsistent levels of inclusivity across institutions. This contrasts with the current study's finding of broadly homogeneous response patterns across resource allocation, facility accessibility, and institutional support dimensions. Furthermore, while the current study suggests that differences in accessibility dimensions are weak and not practically significant, Khakali (2021) emphasized that such differences are critical in shaping the lived experiences of students with disabilities, indicating that institutional barriers are not uniform but vary across functional domains.

Institutional, Environmental, and Cultural Bottlenecks to Participation

The qualitative responses indicate that participation in campus ball games among visually impaired students is hindered by inadequate funding, limited adaptive sports programmes, and a shortage of trained personnel. Respondents also highlighted inaccessible sports facilities, lack of tactile and auditory guidance systems, and weak inclusion practices among peers and administrators. These barriers collectively limit opportunities for active and sustained participation.

Structural and Policy Reforms for Sports Inclusion

Participants emphasized the need for formal institutional policies that promote inclusive sports participation. Key recommendations included dedicated funding for adapted sports, provision of specialised equipment, training of coaches, and enforcement of accessibility standards in sporting facilities. Respondents further called for monitoring and accountability mechanisms to ensure effective implementation of inclusion policies.

The qualitative findings support the quantitative results,

which revealed predominantly negative perceptions regarding resource allocation, facility accessibility, and institutional support. Both strands of evidence indicate that barriers to participation are systemic and require coordinated interventions involving policy reform, infrastructure improvement, and greater institutional commitment to inclusive sports.

Summary of Findings

This study examined the availability and accessibility of adaptive ball game facilities, institutional resource allocation, and factors influencing sports participation among visually impaired students in Kenyan universities. Data were collected from 42 respondents comprising visually impaired student representatives, coaches/trainers, and sports directors. Most respondents had less than five years of involvement in university sports programmes.

The findings revealed widespread dissatisfaction with accessibility provisions. Heatmap analysis showed that Disagree and Strongly Disagree were the dominant responses across all accessibility indicators, including tactile paving, boundary markings, adaptive equipment, and budget allocation. The Friedman test confirmed that perceptions of these accessibility features did not differ significantly, indicating a consistent pattern of negative perceptions.

Participation levels were generally low, with monthly participation being the most common pattern, while a considerable proportion of respondents reported complete inactivity. Violin plots further revealed negative perceptions regarding resource allocation and facility accessibility, whereas institutional support displayed mixed but predominantly negative responses. The chisquare test of homogeneity demonstrated that response patterns were statistically similar across resource allocation, accessibility, and institutional support dimensions.

Qualitative findings reinforced the quantitative results by identifying inadequate funding, lack of adaptive equipment, inaccessible facilities, insufficiently trained personnel, and weak institutional commitment to inclusion as the major barriers limiting participation among visually impaired students.

Recommendations

H₀₁ stated that there is no significant difference in the availability and accessibility of adaptive ball game facilities across public and private Kenyan universities. Although the study included respondents from both public and private universities, no statistical analysis was conducted to directly compare the two categories. The findings nonetheless revealed uniformly negative perceptions regarding accessibility across the sample. Consequently, there was insufficient evidence to reject the null hypothesis. H₀₁ was therefore retained, suggesting that accessibility challenges are perceived to exist across both public and private universities. H₀₂ stated that there is no significant relationship between institutional resource allocation and active sports participation among visually impaired students. The findings showed low participation rates alongside negative perceptions of resource allocation, coaching support, and adaptive equipment provision. However, no direct correlational or regression analysis was conducted to establish a statistical relationship between these variables. Consequently, the study lacked sufficient evidence to reject the null hypothesis. H₀₂ was therefore retained.

H₀₃ stated that there are no significant factors influencing

participation in ball games among visually impaired students in Kenyan universities. The study identified several barriers, including inaccessible facilities, inadequate adaptive equipment, insufficient funding, and limited institutional support. However, inferential analyses did not reveal statistically significant effects. As a result, H₀₃ was retained. While descriptive evidence suggests the presence of participation barriers, these factors were not statistically significant within the study sample.

Universities should establish and enforce accessibility standards for sports facilities, including tactile paving, contrast markings, and auditory guidance systems. Dedicated budget allocations should be created to support adaptive sports infrastructure, specialised equipment, and certified coaching personnel. Institutions should also develop structured participation programmes that encourage regular engagement in adapted ball games. In addition, coaches, sports administrators, and support staff should receive continuous training on inclusive coaching practices and disability awareness to improve service delivery.

Universities should establish inclusive sports committees comprising students with disabilities, sports administrators, and disability support personnel to oversee implementation of inclusion initiatives. Peer mentorship programmes and awareness campaigns should also be strengthened to foster supportive attitudes and encourage greater participation among visually impaired students.

Future studies should directly compare accessibility provisions between public and private universities using larger and more representative samples. Research employing correlation and regression analyses is also recommended to establish relationships between institutional resources and participation outcomes. Longitudinal studies examining the impact of adapted sports interventions on participation and inclusion are necessary. Additionally, in-depth qualitative investigations would provide richer insights into the experiences, challenges, and opportunities encountered by visually impaired students within university sports programmes.

This study demonstrates that visually impaired students in Kenyan universities continue to face substantial barriers to participation in adaptive ball games. Although all three null hypotheses were retained, both quantitative and qualitative evidence consistently pointed to shortcomings in accessibility, resource allocation, and institutional support. The findings highlight the need for comprehensive policy reforms, investment in accessible infrastructure, provision of adaptive equipment, and the promotion of inclusive sporting cultures. Addressing these challenges is essential for ensuring equitable participation and advancing inclusive sports education within Kenyan universities.

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