

The Association between Vision Function and Task Performance of Learners with Low Vision Attending Inclusive Schools in Kakamega County

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ABSTRACT

Background: One area of concern with successful implementation of the inclusive school system in Kenya was assessment of the adequacy of vision function for task performance by learners with low vision in inclusive schools.

Objective: This study aimed at investigating the association between vision function of low vision learners attending inclusive schools in Kakamega County and task performance.

Methods: A census survey identified 21 learners with low vision who had been assessed and placed in 11 primary public inclusive schools in Kakamega County, out of whom 19 (90.5%) were assessed. Participants underwent standard low vision assessment tests and were guided to respond to the LV Prasad Functional Vision Questionnaire. Data was analyzed using inferential statistics and presented using tables.

Results: The best recorded visual acuity was 0.33 decimal notation at far and 0.02 and 0.01 in the right eye and the left eye respectively at near. The vast majority, 94.7%, had reduction in stereopsis, while 42.1% had defects in colour vision, 20% reduced contrast sensitivity and 15.8% had visual field impairment within the central 20 degrees. This resulted in poor performance in the activities of daily living among the participants, which included difficulty in participation in sports and games (78.9%), reading (89.5%) and orientation and mobility (57.9%).

Conclusion: The quality of vision function significantly affects task performance of learners with low vision attending inclusive schools in Kakamega, Kenya.

Contribution

Findings of this study elicited relevant information that would inform policy towards improving the vision-related components and needs that will address the increasing dropout rate of learners with low vision from mainstream schools.

Keywords

Low Vision, Task Performance, Kakamega County.

Introduction

Previous studies have attempted to associate the various aspects of vision function to task performance. One study found out that distance visual acuity did not affect the academic performance of

children aged 9 to 10 years [1]. Research has shown that children with better visual acuity express better motor skills than those with low vision [2]. Furthermore, visually impaired youth and adults have been proved to have reduced dynamic stability than their normal sighted peers [3]. Both contrast sensitivity and visual acuity impairments independently negatively affect task performance [4].

Good stereopsis leads to good performance on motor skills [5]. Degrading of binocular single vision lowers performance on fine motor tasks which require speed [6]. Low vision patients may have trouble with climbing stairs hence the need for systems that can enhance performance of tasks that demand depth-perception. Reduced stereopsis is very common in patients who are amblyopic [7]. Reduced stereopsis affects performance of tasks that involve tracking of multiple objects [8]. All these studies speak to the need for good stereopsis amongst children to improve their task performance.

Contrast sensitivity plays a role in participation in activities of daily living for patients who are glaucomatous [9]. Impaired contrast sensitivity reduces the ability of low vision learners to visualize texts hence the best visual outcome is attained on black and white background [10]. Contrast sensitivity has an association with quality of life of low vision individuals [11].

Colour vision loses many aspects of children's life including sports, education, discrimination, and safety [12]. Color vision defects deprive an affected individual of some aspects of visual functionality like recognition and memory recall. This also includes students who have colour vision deficiency since it affects their performance of activities of daily living that are related to colour at school [13].

Many low vision patients who have central vision deficits are flexible enough to adjust to eccentric fixation after undergoing training [14]. These patients are also slow in grasping objects when presented to them. Clinical tests usually give only an estimate of the ability of a low vision patient to read. Deficits in the visual fields result in limitations in performing certain activities of daily living like mobility, reading and writing [15]. A study performed on glaucomatous patients revealed that there was no relationship between visual field loss and task performance except for the area of mobility.

There can be a disconnect between self-reported difficulty in task performance and assessed visual function [16]. Some of the determinants of self-reported visual status include visual acuity, near vision and contrast sensitivity [17].

Understanding Inclusive Learning System

Inclusive learning system is a system of education in which physically impaired learners share the same classroom as other learners according to the Special Needs Education Policy. Behavior change in human beings can be brought about by introducing visual stimulations. This implies that learners in regular schools exercise their visual system when they learn as opposed to those in special schools trained to use braille since the latter are utilizing other senses other than the sense of sight. Some of the educational needs of low vision learners, include optical aids, computer use and braille [18]. When teaching low vision learners, it is important to give them instructions in nearly all areas of literacy-linked skills.

Visually impaired people, especially those who acquired the impairment at a given stage of life, need to get social, physical, emotional and practical support in order to cope up with the new way of living [19]. Appropriate teaching methods must be provided to visually impaired learners attending inclusive learning systems in order to make this system successful [20]. Prior to inclusive learning was integrated learning system which often employed use of electronics to convert written text into audio in order to benefit the visually impaired [21]. Some of the factors that can influence the successful psychosocial development in low vision patients include the environment: both at home and in the classroom, motivation and past success and ability of normal sighted peers to appreciate their condition [22].

Despite the effort to introduce e-learning to the blind and visually impaired learners, there are still barriers that influence implementation of inclusive learning education [23]. Learners who had access to e-learning scored well in a proficiency test for mathematics. There are challenges that hinder implementation of inclusive learning in Kenya such as inadequately trained teachers and lack of accessibility to resources needed for learning [24]. Other challenges are poor accessibility to transport services, very little funding from the government and increased demand for early assessment and intervention services [25]. Low vision learners who are integrated into the mainstream school system also face challenges with social acceptability by their normal sighted peers [26]. Contrary to the findings of these studies, in Windhoek, Namibia, a study found out that learners are comfortable in the inclusive school system and prefer it [27]. However, this is not conclusive that the visual function is well addressed especially for learners who are more delighted in social interaction and have little value for education in class. Since this study was done in Namibia, it does not necessarily apply in the Kenyan context.

Signs of depression, as observed in many visually impaired people, have been proven to lower the reading rehabilitation of low vision patients [28]. This could have an impact on visual function hence reduced visual performance in patients in regular schools. Intelligence tests given to visually impaired children proved that they scored higher on verbal tests than written tests suggestive that they are utilizing other senses when learning. It is not clear whether teachers in regular classrooms consider this diversified way of learning for the visually impaired learners. Dekker's study was conducted twenty-five years ago, and we do not know if this is still the trend today. In Singapore, distance visual acuity does not affect the academic performance of children aged 9 to 10 years [1].

Implementation of inclusive school system in Kenya continues to face many challenges which include inadequate trained teachers, inaccessibility to required training resources, increased demand for early intervention and assessment services [24,25]. Although these challenges being experienced are hindrances to establishment of the inclusive school system in Kenya, this school system has been well established in other nations like Namibia where studies have shown that visually impaired learners are more comfortable

in inclusive than in special schools for the visually impaired and prefer the inclusive school system [27].

Methods

Study Area

This research was conducted in inclusive schools in Kakamega County which were purposively selected. Kakamega County is in western Kenya and has many public primary and secondary schools where learners with low vision have been placed to learn in the same classroom as other students.

Study Design

This research employed a school-based observational cross-sectional study design.

Study Population

All the learners with low vision attending inclusive schools in Kakamega County, aged 10 to 21 years, formed the study population for this research.

Inclusion Criteria

All learners aged 10-21 years old in inclusive schools had low vision (Visual acuity of less than 6/18 in the better eye up to 3/60 or a visual field of less than 10 degrees from the point of fixation after best correction). This was to ensure the participants were able to respond to the LV Prasad Functional Vision Questionnaire.

Exclusion Criteria

Learners with multiple disabilities were excluded from the study. Furthermore, low vision learners aged below 10 years were excluded from this study because they would not be able to respond effectively to the questionnaire. Furthermore, learners.

Sample Size Determination

There being a very small number of low vision learners in Inclusive schools in Kakamega County, the entire population of low vision learners aged above 10 years and placed into the respective schools through the Educational Assessment and Resource Center (EARC) were recruited into this study. A census survey identified 21 low vision learners, 19 of whom consented and were involved in the study. There was also a purposive selection of the schools in which these learners had been placed.

Sampling Technique

This study employed a census survey whereby all schools in which low vision learners had been placed after assessment by the EARC were selected. All low vision learners in the selected schools, who meet the WHO classification of low vision, formed the sample size for this study. Twenty-one low vision learners from eleven public primary schools who met the inclusion criteria for this study were purposively selected.

Procedure for Data Collection

Medical records of the participants were retrieved from the administration and used to elicit the diagnosis and visual acuity

of each participant at the time of admission. The various aspects of vision function were assessed, which included Visual acuity at far and near, stereopsis, contrast sensitivity, color vision and visual fields.

The LV Prasad Functional Vision Assessment (FVA) questionnaire was adopted and administered to the learners who were assisted to fill out before other clinical tests were conducted. The researcher guided the learners on how to fill out the questionnaire and allowed them to make their own decision. After getting their feedback, the researcher would guide them where to tick against their responses.

Ethical Considerations

The researcher adhered to all the ethical protocols established by the institution by submitting the research proposal to the Masinde Muliro University of Science and Technology Institutional Review and Ethics Committee (IREC) for review prior to obtaining approval to go ahead and collect data. Furthermore, a research permit was obtained from the National Commission of Science and Technology (NACOSTI), License number: NACOSTI/P/20/5161, prior to data collection. The researcher also got permission from the heads of schools that were selected.

Only participants who consented to participate in this study by signing the information document were recruited into the study. Participation in this study was voluntary and optional. Furthermore, any learners who wished to withdraw from the study at any stage were free to do so without victimization. The researcher ensured that while compiling data, study participants were kept anonymous, and each participant was assessed privately.

Presentation of Results

The Relationship Between Vision Function and the Various Aspects of Task Performance

Sports Participation

The findings of this study showed that there were no significant associations between all the aspects of vision function and sports participation of low vision learners in inclusive school set-up. This is because the level of significance for all the aspects of vision function was above 0.05 (Table 1).

Orientation and Mobility

There was a significant relationship between colour vision and orientation and mobility. This is seen from the significance value of 0.02, which is below 0.05. The rest of the other aspects of vision function were not significantly associated with orientation and mobility (Table 2).

Reading

The results indicated that there was no significant relationship between vision function and reading. All the p values were greater than 0.05 (Table 3).

Table 1: The relationship between vision function and sports participation.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.177	9.417		.231	.821	-18.550	22.904		
	Distance VA Left Eye	-.122	.631	-.068	-.193	.851	-1.511	1.268	.426	2.347
	Distance VA Right Eye	.115	.492	.074	.234	.819	-.967	1.198	.539	1.855
	Near VA (LogMAR)	.049	.354	.050	.137	.893	-.731	.829	.398	2.513
	Contrast sensitivity	.854	.770	.340	1.109	.291	-.841	2.550	.570	1.755
	Stereopsis (Seconds of arc)	-.054	.842	-.021	-.064	.950	-1.908	1.799	.507	1.974
	Visual Field	1.560	1.212	.382	1.287	.224	-1.108	4.228	.608	1.644
	Color Vision	-1.589	.835	-.463	-1.903	.083	-3.426	.248	.905	1.105

a. Dependent Variable: Sports.

Table 2: The relationship between vision function and orientation.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	13.133	11.589		1.133	.281	-12.374	38.640		
	Distance VA Left Eye	-.554	.777	-.218	-.713	.490	-2.265	1.156	.426	2.347
	Distance VA Right Eye	-.265	.605	-.119	-.437	.670	-1.597	1.067	.539	1.855
	Near VA (LogMAR)	-.223	.436	-.162	-.512	.619	-1.183	.736	.398	2.513
	Contrast sensitivity	.278	.948	.078	.293	.775	-1.808	2.365	.570	1.755
	Stereopsis (Seconds of arc)	-.989	1.036	-.267	-.954	.360	-3.270	1.292	.507	1.974
	Visual Field	1.628	1.492	.279	1.091	.298	-1.655	4.911	.608	1.644
	Color Vision	2.705	1.027	.552	2.634	.023	.445	4.966	.905	1.105

a. Dependent Variable: Orientation

Table 3: The relationship between vision function and reading.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	23.104	17.158		1.347	.205	-14.661	60.869		
	Distance VA Left Eye	-1.395	1.150	-.481	-1.213	.251	-3.927	1.137	.426	2.347
	Distance VA Right Eye	-.007	.896	-.003	-.008	.994	-1.979	1.966	.539	1.855
	Near VA (LogMAR)	.075	.646	.048	.116	.910	-1.346	1.496	.398	2.513
	Contrast sensitivity	-.503	1.403	-.123	-.359	.727	-3.592	2.586	.570	1.755
	Stereopsis (Seconds of arc)	-1.386	1.534	-.328	-.903	.386	-4.763	1.991	.507	1.974
	Visual Field	.900	2.208	.135	.408	.691	-3.961	5.761	.608	1.644
	Color Vision	.631	1.521	.113	.415	.686	-2.716	3.979	.905	1.105

a. Dependent Variable: Reading.

Discussion

Association between Vision Function and Task Performance of Low Vision Learners within the Inclusive School Set-up

The poor visual acuity of low vision learners in this study tends to agree with the self-reported difficulties in conducting activities like reading, sporting, and mobility. This is similar to the findings of previous studies which reported that children with better visual acuity express better motor skills than those with low vision [2]. It has also been established that poor visual acuity affects task performance [4]. However, the inferential statistics reported no significant relationship between visual acuity and task performance.

Research has shown that good stereopsis leads to good performance on motor skills [5]. The poor stereopsis recorded among low vision learners in this study was, therefore, likely to result in poor performance of activities of daily living at school. Although the findings of this study showed that most low vision learners had self-reported difficulties in conducting activities of daily living that demand good depth perception, the regression analysis did not find any significant relationship between stereopsis and any of the tasks highlighted in the questionnaire.

Although a previous study highlighted that contrast sensitivity played a role in participation in activities of daily living for patients who are glaucomatous, this only agreed with the self-reported difficulties of low vision learners but there was no significant association between contrast sensitivity and task performance. Impaired contrast sensitivity reduces text visualization and affects quality of life [10,11] and this supports the self-reported difficulties amongst learners who had reduced contrast sensitivity.

Both the self-reported results as well as the regression analysis revealed a significant relationship between colour vision and orientation and mobility. These findings are partly synonymous to findings of a previous study which mentioned that colour vision loss affects many aspects of children's life including sports, education, discrimination and safety [12]. Although there was no significant relationship between colour vision and sports, the aspect of safety speaks to orientation and mobility. These results were similar to a previous study performed on normal sighted students who had colour vision deficiency and this affected their performance of activities of daily living that were related to colour at school [13].

Central vision loss was not significantly associated with task performance amongst low vision learners in this present study. These could be attributed to the fact that many low vision patients who have central vision deficits are flexible enough to adjust to eccentric fixation after undergoing training [14]. These findings further agree with a study performed on glaucomatous patients revealed that there was no relationship between visual field loss and task performance except for the area of mobility. In this present study however, mobility was not significantly affected by visual field since only central visual field was assessed. On the contrary, another study reported that deficits in the visual fields result in limitations in performing certain activities of daily living

like mobility, reading and writing [15]. Again, this speaks to general loss in visual field, different with this present study which concentrated on central visual field.

There was an overall disconnect between the self-reported difficulties in conducting activities of daily living and the findings from the regression analysis. While many low vision learners had self-reported difficulties in conducting activities of daily living at school, the regression analysis reported no significant relationship between most of the aspects of vision function and task performance of low vision learners. This disconnect could be attributed to the possibility that the model used for regression was not statistically significant and so it might be needful to run a regression in a larger sample size to see if the trend is the same. A previous study has reported that there can be a disconnect between self-reported difficulty in task performance and assessed visual function [16]. Some of the determinants of self-reported visual status include visual acuity, near vision and contrast sensitivity [17].

Conclusion

The learners' participation in activities of daily living at school was affected. The mostly affected activities were reading and participating in games and sports. These are very important in the life of a school going child since they affect the primary reason for which learners go to school.

Recommendation

Assessment of vision function should be conducted during placement of low vision learners into the inclusive school system and regularly too to detect and address the challenges that these learners are likely to face in the inclusive school set-up.

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