

Evaluation of visual functions and their relationship to functional vision and falls in active elderly of the community

Avaliação das funções visuais e sua relação com a visão funcional e quedas em idosos ativos da comunidade

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ABSTRACT

Objective: To evaluate the visual functions of the elderly and the relationship with functional vision and falls. **Methods:** This is a cross-sectional study conducted in the municipality of Anápolis-GO with 46 elderly aged ≥ 60 years, who met all inclusion requirements. These were evaluated for functional vision, visual functions, overall functionality and self-reported falls. Statistical analysis was performed to verify the correlation between fallers and nonfallers with visual functions and functional vision. **Results:** There was a statistically significant correlation between self-reported falls and stereopsis in the elderly ($p=0.05$). Similarly, a relationship was found between functional vision and visual acuity ($p=0.023$). Fear of further falls affected the vast majority of the elderly. However, there was no correlation between self-reported vision and falls. **Conclusion:** The results show that there is a correlation between stereopsis and the incidence of falls, suggesting that deep vision may be directly related to the risk of falls. There was also a correlation between functional vision and visual acuity, suggesting that the ability of the eye to distinguish details, contours and shapes may influence the quality of activities involving vision.

Keywords: Functional overview; Visual function; Visual acuity; Accidental falls; Aged

RESUMO

Objetivo: Avaliar as funções visuais dos idosos e a relação com a visão funcional e quedas. **Métodos:** Trata-se de um estudo de caráter transversal, realizado no município de Anápolis-GO com 46 idosos de idade ≥ 60 anos, que cumpriram com todos os requisitos de inclusão. Estes foram avaliados quanto a visão funcional, funções visuais, funcionalidade global e autorrelato de quedas. Foi realizada análise estatística para verificar a correlação entre caidores e não caidores com as funções visuais e a visão funcional. **Resultados:** Houve uma correlação estatisticamente significativa entre o autorrelato de quedas e a estereopsia em idosos ($p=0,05$). Do mesmo modo, foi encontrado uma relação entre a visão funcional e a acuidade visual ($p=0,023$). O medo de novas quedas afetou a grande maioria dos idosos. Todavia, não houve correlação entre o autorrelato da visão e as quedas. **Conclusão:** Os resultados encontrados evidenciam que há correlação entre a estereopsia e a incidência de quedas, sugerindo que a visão de profundidade pode estar diretamente relacionada ao risco de quedas. Houve também, correlação entre a visão funcional e a acuidade visual, sugerindo que a capacidade do olho em distinguir detalhes, contornos e formas pode influenciar na qualidade das atividades que envolvem a visão.

Descritores: Visão funcional; Função visual; Acuidade visual; Acidentes por queda; Idoso

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INTRODUCTION

Population aging is a worldwide phenomenon. According to data made available by the World Health Organization (WHO) in the World Report on Aging and Health, most people can expect to live over 60 years old. ⁽¹⁾ Brazil has approximately 2.5% of all elderlies in the world and this number will place the country as the sixth oldest population by 2025. The Brazilian population has kept the growth pace in the number of elderly individuals in the country: it was 25.4 million in 2012, but it increased by 18% and reached more than 30.2 million individuals in 2017, which led to additional 4.8 million elderlies in Brazil within this period. This population will have increased by 15 times between 1950 and 2025, whereas the overall population will have increased by no more than 5 times in the same period. Such a significant increase can be explained by the increased life expectancy resulting from improved health conditions and decreased fertility rates. ⁽²⁾

Human aging leads to progressive changes in individuals' biological, psychological and social structure; they start before birth and persist throughout individuals' life. Aging is not a problem, but a life cycle process that must be lived in a healthy and autonomous way, as long as possible. ⁽³⁾ Elderly individuals present well-known features such as more chronic diseases, weaknesses and costs, as well as lesser social and financial resources. Aging involves some functional loss, even in individuals who do not have chronic diseases. Given the significant number of adverse situations, the care provided to elderlies should be structured in a different way from that structured for younger adults. ⁽⁴⁾

Having a long life is good as long as individuals can associate quality with complementary years of life. In order to do so, it is essential better understanding eye and visual disorders. The human visual system undergoes several changes as individuals get older, namely: reduced visual acuity and visual field, decreased contrast sensitivity, changes in light absorption and depth perception, also called stereopsis. In addition to changes inherent to aging, ophthalmological pathologies such as cataracts, glaucoma and macular degeneration are often observed in elderly individuals. ⁽⁵⁾ Despite being considered a public health issue, visual decline is poorly diagnosed in clinical practice, since most elderlies do not report visual deficits because, in their opinion, visual changes are age-related. ⁽⁶⁾

The visual system has the most complex and sophisticated set of senses in the human body. Human eyes are just part of this system, which is organized in well-defined pathways that extend from the retina to the parietal and temporal lobes. This system, which requires an integrated network of structures, accounts for collecting light generated by objects, which is sent to the posterior part of the eyeball, transformed into electromagnetic impulses and sent through the optic nerve to visual brain centers, where these stimuli are analyzed and processed in a coordinated combination of anatomical, sensory and motor features that result in image projections. ⁽⁷⁾ Pathways extending to the inferior temporal cortex account for identifying the contrast, shape, color and profile of different objects, whereas pathways extending to the posterior parietal cortex account for perceiving and identifying movements and depths. ⁽⁸⁾

Based on the assumption that visual function is different from functional vision, ⁽⁹⁾ visual function is defined as the way the eye works, whereas functional vision is the way individuals perform vision-related activities. ⁽¹⁰⁾ The main visual functions comprise visual acuity, visual field, contrast sensitivity, depth

perception (stereopsis) and light absorption. Functional vision can be defined as individuals' ability to see clearly during daily activities performed under different light levels. It comprises visual adaptation to different stimuli, visual exploration of environments and spatial perception. ⁽⁸⁾

Vision plays an important role in acquiring information about the environment and in guiding body movements. Much of the visual processing associated with movements and spatial relationships uses magnocellular and posterior parietal pathways of the brain; moreover, it is essential to enable postural control. Individuals' ability to maintain balance and postural control allows them to properly perform activities of daily living, as well as enables them to stand up and sit on a chair or go for a walk. ⁽⁸⁾ Besides causing complications such as falls or injuries, hindering body mobility and decreasing visual accuracy, visual function loss leads to different consequences for elderlies, at individual and collective level, and results in several psychological, social and economic issues that have direct impact on their quality of life. ^(11,12)

It is of paramount importance investigating the visual conditions of the elderly population by assessing their visual functions and to what extent they impair and/or influence their functionality in order to intervene and improve their eye health, autonomy and independence. ⁽¹³⁾ Several elderly individuals do not have access and do not even understand that some functional vision changes are susceptible to medical and/or physical therapy intervention for functional improvement purposes. Such a work guides individuals and clarifies about the importance of taking care of eye health to have better quality of life, as well as helps substantiating strategies to reduce risk factors. Thus, the aim of the current study was to assess visual functions of elderly individuals and their association with functional vision and falls.

METHODS

The current cross-sectional study was carried out in Anápolis County – GO. It was based on non-probabilistic sample comprising elderly individuals from the local community, in the age group 60 years or older, regardless of sex, race, religion or socioeconomic status.

Inclusion criteria encompassed active elderly individuals in the age group 60 or older, who presented independent gait, did not use auxiliary devices or have cognitive changes and who accepted to participate in the research by signing the informed consent form (ICF). Exclusion criteria comprised dependent and bedridden elderlies or those who had a hard time walking.

The study was approved by the research ethics committee of UniEVANGÉLICA, under Opinion n. 3.329.187. Elderlies who agreed in participating in the research have signed, and had a copy of, the informed consent form so they could ask questions and have their doubts clarified with the researchers or they could even take it home and read it together with someone they trusted and bring it back in another data collection day. The project was in compliance with National Health Council Resolution n. 466/12 and approved by the research ethics committee of UniEVANGÉLICA. Research subjects had their identity preserved and could withdraw from the research at any time.

Procedures

Overall functionality assessment

Participants answered a simple sociodemographic questionnaire prepared by researchers for sample identification purposes.

The previously validated Brazilian Multidimensional Functional Assessment Questionnaire (BOMFAQ) was used to assess reported difficulties in performing 15 activities of daily living (ADL), which comprised 8 physical activities of daily living (PAVD) such as lying in/getting up from bed, eating, combing hair, walking on flat floor, showering, getting dressed, going to the bathroom in time and cutting toenails; as well as 7 instrumental activities of daily living (IADL) such as climbing stairs (1 flight), taking medication at the right time, walking close to home, going shopping, preparing meals, getting off vehicles and cleaning the house. The total number of ADLs patients have reported to have a hard time performing was counted, i.e., the total number of compromised activities. BOMFAQ categorizes individuals' difficulty in performing daily tasks as "a lot" and "little"; however, the current study only took into consideration the presence or absence of difficulty in the referred activity. It was emphasized that the answer should be associated with participants' current ability, rather than with their use of performing a certain activity, since some instrumental activities involve cultural features traditionally linked to sex, such as preparing meals and cleaning the house. The purpose was to investigate whether participants had motor skills to perform the activities.

Functional vision assessment

The National Eye Institute - Vision Function Questionnaire (NEI VFQ) was developed based on the Vision Activities Questionnaire (VAQ), which is used to assess both quality of life and functional vision. NEI VFQ was designed to measure functioning and well-being fields classified as important by patients with eye diseases; thus, it defines specific vision impairments based on subjective scores. The simplified version of NEI VFQ comprises 25 questions (NEI VFQ-25) grouped into 13 subdomains (general health, vision, eye pain, near vision-based activities, distance vision-based activities, social aspects, mental health, activities of daily living, dependence, ability to drive a car, color vision and peripheral vision), which encompass one or more questions, each.

Visual function assessment

Visual acuity (VA) was assessed based on the Snellen Table (1862), which is the most used instrument that can be applied by any health professional. This assessment is widely used because it is easily applicable, has low cost and can be understood by both literate and illiterate individuals. The test was applied to individuals sitting five meters away from the table, which was fixed to the wall at participants' eye level. Individuals should indicate the direction (upwards, downwards, rightwards or leftwards) the open portion of letter "E" was pointing to. Visual assessment can be applied to each eye, in separate, or to both eyes at the same time, with or without corrective lenses, depending on measurement purpose. The room used to assess VA had the size recommended for the test, as well as proper lighting. Participants were properly positioned and the test only started when they could clearly see the first line. The present study has assessed participants' binocular VA, with and without corrective lenses; the best visual acuity value was selected.

Scoring was based on the last line where individuals managed to hit all "Es". Visual acuity values were described through decimal values displayed on the side of each line in the table. Among other description forms, one finds logarithmic description, which uses the logMAR system; fractional description, which uses the system in meters (3/60) or feet away (20/400)⁶. Standardization based on the equation $[0.1 \times \text{test distance in meters}/5]$, which provides the final value in decimal scores, was used to achieve equivalence between methods. Visual acuity classification was

performed based on the Brazilian Society of Low Vision, according to which visual acuity values ranging from 20/12 to 20/25 are considered normal; from 20/30 to 20/60, close to normal; from 20/80 to 20/150, moderate low vision; and from 20/200 to 20/400, severe low vision.⁽¹⁴⁾

The Face Test features simplified face sketches with 100%, 50%, 25%, 10% and 5% contrast. It is used to assess contrast sensitivity. Faces are presented to individuals at the distance of 1 meter; the last face they can see is recorded. The lower the face percentage, the better the contrast sensitivity.

The Butterfly Test, which comprises a two-sided book with pictures projected in duplicate and presents horizontal disparity between them, was used to investigate participants' depth perception (stereopsis) at close range. Participants had to indicate the "embossed" figures they perceived by using polarized glasses and the book positioned 30 to 40 cm away from their eyes. Embossed figure perception measures image disparity in seconds of arc ("). Results in this test can range between 20" and 400". The lower the numerical value in seconds of arc, the higher the stereoscopic acuity.

Statistical analysis

Results were described as mean, standard deviation, frequency and percentage. Chi-square test was used to check the association between variables. Significance level was set as $p < 0.05$. Data were analyzed in the Statistical Package for Social Science software (SPSS).

RESULTS

Forty-six (46) elderlies who met all inclusion criteria participated in the current study. Their mean age was 69 (± 5.9) years. With respect to marital status, 19 (43.5%) participants reported widowhood. Other information is described below (Table 1):

With respect to self-reported clinical conditions, 82.6% of participants reported to have arterial hypertension, whereas 65.2% had osteomioarticular diseases. As for the use of medication, 20 (43.5%) reported to take between 3 and 5 different medications a day (Table 2):

Participants were asked whether they fell in the previous

Table 1
Participants' sociodemographic features

Features	n	%
Sex		
Female	40	86.9
Male	6	13.1
Marital Status		
Married	19	41.3
Single	4	8.7
Widow(er)	20	43.5
Divorced	3	6.5
Schooling		
Less than 8 years	37	80.4
8 years or more	5	20.8
Family arrangement		
Lives with someone	31	67.4
Lives alone	15	32.6

Source: Elaborated by the author

12 months: 52.2% (n = 24) of them reported to not have fallen. However, even those who did not fall in the previous year reported to be afraid of falling: 36 (78.3%) participants answered “yes” to this question (Table 3).

Based on the self-reported eye assessment, 23 (50%) participants reported to have regular vision, whereas only 17 (37%) classified their vision as good. The use of glasses was observed in

Table 2
Participants’ clinical featuring

	n	%
Associated clinical conditions		
Diabetes Mellitus	4	8.7
Arterial Hypertension	38	82.6
Cardiovascular diseases	10	21.7
Hearing loss	5	10.9
Rheumatic diseases	7	15.2
Vestibular diseases	9	19.6
Hypercholesterolemia	15	32.6
Hypothyroidism	9	19.6
Osteomioarticular diseases	30	65.2
Others	11	23.9
How many medications do you take?		
None	1	2.2
1 to 2	15	32.6
3 to 5	20	43.5
More than 5	10	21.7

Table 3
Self-reported falls

	n	%
Did you fall in the last 12 months?		
Yes	22	47.8
No	24	52.2
Are you afraid to fall?		
Yes	36	78.3
No	10	21.7

Table 4
Self-reported eye assessment

	n	%
Vision		
Excellent	1	2.2
Good	17	37
Regular	23	50
Poor	5	10.9
Do you wear glasses?		
Yes	40	87
No	6	13
Do you have any of these diseases?		
Amblyopia	2	4.3
Glaucoma	3	6.5
Strabismus	1	2.2
Cataract	7	15.2
Conjunctivitis	2	4.3
Dry eye	13	28.3
Others	2	4.3
None	25	54.3

40 individuals, which corresponded to 87% of the evaluated sample. Ophthalmological pathologies are described below (Table 4).

With respect to visual acuity, 16 (34.7%) of the 46 assessed elderly had normal vision, 18 (39.1%) had vision close to normal, 9 (19.5%) had moderate low vision and only 3 (6.5%) showed severe low vision. As for stereopsis and contrast sensitivity, the assessed individuals recorded 129.65 seconds of arc and 7% contrast sensitivity, on average. Stereopsis was classified as regular; 40 seconds of arc was considered normal. With respect to contrast sensitivity, 40 (87%) elderly were able to identify the face presenting the lowest contrast rate, whereas only 6 (13%) had small difficulty to do so; therefore, this visual function was preserved in most participants.

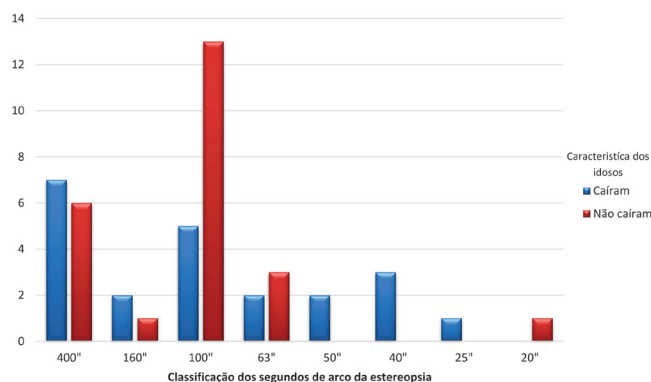
Based on the BOMFAQ questionnaire, participants’ visual impairment was considered mild (score equal to 1.9, on average). These elderly have reported from 1 to 3 limitations in their ADLs. There was statistically significant correlation between falls and stereopsis (p = 0.05); therefore, assumingly, depth perception may influence falls among elderly individuals. Graph 1 shows that the largest number of elderly individuals who reported falls had the worst performance in the stereopsis test (Figure 1).

The NEI-VFQ questionnaire, which assesses functional vision, i.e., how elderly use their vision during activities of daily living, has shown statistically significant correlation (p = 0.023) between its score and participant’s visual acuity. This outcome has suggested that participants eyes’ ability to differentiate details, profiles and shapes can influence the quality of vision-based activities. Based on Graph 2, the worse the visual acuity, the worse the result in the NEI-VFQ questionnaire, i.e., the worse the functional vision of elderly individuals (Figure 2).

The analysis of self-reported vision did not show statistically significant correlation between falling and non-falling elderly, neither did the correlation of visual acuity and contrast sensitivity to falls. Functional vision did not show statistically significant correlation to stereopsis and contrast sensitivity.

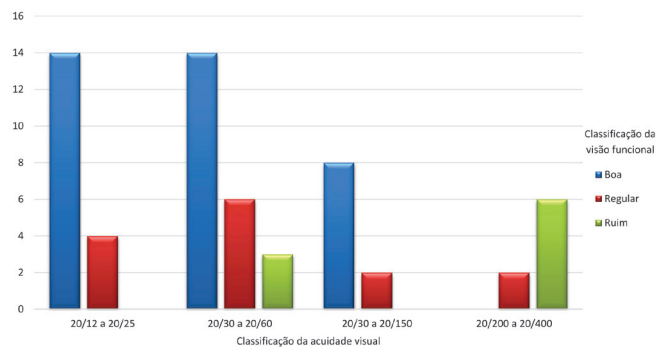
DISCUSSION

The present study has found correlation between self-reported falls and stereopsis in elderly individuals, as well as between functional vision and visual acuity. Self-reported falls remained at approximately the same average, both for those who fell and for



* Chi-square test was used to check association between variables. Significance level was set at p < 0.05. Data were analyzed in the SPSS software.

Figure 1: Correlation between falls and stereopsis in elderly individuals (p=0.05*).



* Chi-square test was used to check association between variables. Significance level was set at $p < 0.05$. Data were analyzed in the SPSS software.

Figure 2: Correlation between functional vision and visual acuity in elderly individuals ($p=0.023^*$)

the ones who did not; most participants reported to be afraid of falling. Other important findings lied on the use of visual correction by almost the entire sample and on the self-report of regular vision by half of the sample. Most elderlies presented normal or close-to-normal visual acuity, regular stereopsis and preserved contrast sensitivity.

More than half of participants had not experienced falls in the previous 12 months in comparison to those who had fallen. It is possible suggesting that this finding derives from the sample selection criteria, which only included active elderlies who did not use auxiliary devices. However, the fear of falls has even affected those who did not fall, which corresponded to 3/4 of participants. This result corroborates a study⁽¹⁵⁾ about the frequency of fear of falling and restriction of activities in 409 Belgian elderlies; 59.1% of them reported to be afraid of falling - this fear was often observed among those who fell, but it also affected the ones who did not fall. Sex, living alone and significant association between number of falls and fear of falling were also important findings in this study.

On the other hand, a study aimed at determining the prevalence of falls among 729 elderlies in the previous 12 months has found that 206 (28.3%) individuals had fell within this period; this index was lower than the one observed in the current study. Ninety-two (92; 44.6%) individuals had a fall episode, whereas 114 (55.4%) had two or more, i.e., recurrent falls. Individuals who depended on others for ADLs (35.7%) and who used auxiliary devices (40.0%) – which was an exclusion criterion in the current research - recorded the highest fall rates among those who had fallen.⁽¹⁶⁾

Falls are often associated with decreased functional capacity.^(1,17) Several intrinsic and extrinsic factors may be associated with factors that lead elderly individuals to fall, or even to be afraid of falling. Among these factors, one finds objects mirrored on the floor and irregularities in the environment where these individuals live in or move around, slips in the bathroom, impaired gait and use of auxiliary devices, postural instability, multiple comorbidities and use of medication, decreased visual acuity, among others.⁽¹⁸⁾ Elderly participants in the current study had self-reported comorbidities such as arterial hypertension, diabetes and osteoarticular disorders. Such diseases can influence the risk of falls in the investigated population.⁽¹⁹⁾

With respect to the association of falls with VA, contrast sensitivity and stereopsis, the present study has only found corre-

lation between falls and stereopsis. However, a study⁽²⁰⁾ focused on determining the most predictive function of falls in 156 elderly individuals within one year has also found correlation between falls and the other aforementioned variables. These elderlies were subjected to the same visual tests applied in the current study, as well as to analysis of sensorimotor function, which comprised strength, reaction time and balance. Results have shown strong correlation among VA, contrast sensitivity and stereopsis ($p < 0.01$) - stereopsis was the most significant risk factor for falls.

Studies available in the literature have shown that low visual acuity is likely an agent directly associated with fall episodes due to reduced balance, postural instability; or, yet, it is indirectly associated with falls due to decreased mobility and functionality.⁽²¹⁾ Elderlies also present decreased contrast sensitivity⁽²²⁾, which is associated with functional vision that, in its turn, affects daily living situations that require detecting projections of different sizes and contrast levels.⁽²³⁾ However, factors causing this impact remain poorly known, although elderlies often complain about having a hard time seeing clearly when driving at night, reading and finding objects in low light environments.⁽²⁴⁾

The current study has found significant correlation between functional vision and visual acuity, which consequently led elderlies to have a hard time performing certain vision-based tasks. The literature is consistent with this finding since elderlies have functional limitations due to low visual acuity.^(6,13) Thus, if one takes into consideration that the quality of life of elderly individuals with low visual acuity or blind is below the average, in comparison to that of individuals whose visual acuity is within functional capacity rates, the paramount importance of having good vision is notorious in individuals' lives.⁽¹³⁾

Although the current study did not find correlation between functional vision and contrast sensitivity or depth perception, it does not mean that these associations do not exist. Thus, further studies in this field should be conducted. The herein investigated elderlies have shown regular visual impairment; however, further studies should be performed with larger samples.

CONCLUSION

Results in the current study have shown statistically significant correlation between stereopsis and the incidence of fall episodes; this outcome suggests that depth perception may be directly associated with risk of falling. There was also significant correlation between functional vision and visual acuity in the assessed participants; this outcome suggests that the ability of the eyes to differentiate details, profiles and shapes can influence the quality of vision-based activities.

Some positive points can be highlighted in the present research; among them, one finds contact with a recent physical therapy field; the opportunity to learn new skills and to realize that issues identified at the time to assess the visual function of elderly individuals were in compliance with the literature - which reports negative impacts on the functionality and quality of life of active elderly individuals with visual changes - and improving the knowledge of professionals who work with elderly individuals. With respect to the economic sphere, the current study can substantiate the development of public policies focused on preventing and intervening in the herein addressed dysfunctions.

However, the present study has some limitations. The NEI-VFQ questionnaire presents its values in qualitative data; thus, it was necessary transforming them into numerical ones, and it can

generate measurement bias. It is also necessary taking into account that limitations in ADLs and fall episodes are variables that suffer different interferences. Thus, although they are slightly connected to each other, it is not possible establishing a cause-effect correlation between them, because the exact factor generating this influence remains unknown and because vision is not necessarily the most frequent, or only, factor accountable for this functional decline. Another point to be taken into consideration lies on the fact that the number of elderly individuals assessed in the current study did not reach the sample calculation; thus, it did not enable result extrapolation.

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REFERENCES

1. Organização Mundial da Saúde (OMS). Relatório Mundial de Envelhecimento e Saúde. Traduzido pelo Governo do Estado de São Paulo. São Paulo: OMS; 2015.
2. Instituto Brasileiro de Geografia e Estatística (IBGE). Número de idosos cresce 18% em 5 anos e ultrapassa 30 milhões em 2017. Brasília (DF):IBGE; 2017. [citado 2019 Fev 22]. Disponível em <https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/20980-numero-de-idosos-cresce-18-em-5-anos-e-ultrapassa-30-milhoes-em-2017>
3. Azevedo MS. O Envelhecimento Ativo e a Qualidade de Vida: uma revisão integrativa [dissertação]. Porto: Escola Superior de Enfermagem do Porto; 2015.
4. Veras RP, Oliveira M. Envelhecer no Brasil: a construção de um modelo de cuidado. *Cien Saude Colet*. 2018;23(6):1929–36.
5. Perracini MR, Gazzola JM. Balance em Idosos. In: Perracini MR, Fló CM, editors. *Funcionalidade e Envelhecimento*. São Paulo: Guanabara Koogan; 2013.
6. Luiz CL, Rebelatto JR, Coimbra AM, Ricci NA. Associação entre déficit visual e aspectos clínico-funcionais em idosos da comunidade. *Rev Bras Fisioter*. 2009;13(5):444–50.
7. Schimiti RB. Anatomia da órbita, do olho e dos anexos oculares. In: Costa MN, editor. *Kara-José N., editores. Oftalmologia para o clínico*. Rio de Janeiro: Cultura Médica; 2008. p. 271.
8. Macedo BG, Pereira LS, Gomes PF, Silva JP, Castro AN. Impacto das alterações visuais nas quedas, desempenho funcional, controle postural e no equilíbrio dos idosos: uma revisão de literatura. *Rev Bras Geriatr Gerontol*. 2008;11(3):419–32.
9. Chou HY. Avaliação funcional da visão do escolar com baixa visão. In: Sampaio MW, Haddad MA, Costa HA, Sialuly MO. *Baixa visão e cegueira – os caminhos para a reabilitação, educação e inclusão*. Rio de Janeiro: Cultura Médica: Guanabara Koogan; 2010. p 327–45.
10. Rossi LD. Avaliação da Visão Funcional (AVIF) para crianças de dois a seis anos com baixa visão: exame de confiabilidade e de validade [dissertação]. Belo Horizonte: Universidade Federal de Minas Gerais; 2010.
11. Mohapatra S, Krishnan V, Aruin AS. The effect of decreased visual acuity on control of posture. *Clin Neurophysiol*. 2012;123(1):173–82.
12. Ekker MS, Janssen S, Seppi K, Poewe W, de Vries NM, Theelen T, et al. Ocular and visual disorders in Parkinson's disease: common but frequently overlooked. *Parkinsonism Relat Disord*. 2017;40:1–10.
13. Bravo Filho VT, Ventura RU, Brandt CT, Sarteschi C, Ventura MC. Impacto do déficit visual na qualidade de vida em idosos usuários do sistema único de saúde vivendo no sertão de Pernambuco. *Arq Bras Oftalmol*. 2012;75(3):161–5.
14. Sociedade Brasileira de Visão Subnormal. Classes de Acuidades Visual Classificação ICD-9-CM(WHO/ICO): Acuidade Visual Snellen [Internet]. [citado 2020 Abr 16]. Disponível em < <http://www.cbo.com.br/subnorma/conceito.htm> >
15. Mendes da Costa E, Pepersack T, Godin I, Bantuelle M, Petit B, Levêque A. Fear of falling and associated activity restriction in older people. results of a cross-sectional study conducted in a Belgian town. *Arch Public Health*. 2012 ;70(1):1.
16. Nascimento JS, Tavares DM. Prevalência e fatores associados a quedas em idosos. *Texto Contexto Enferm*. 2016;25(2):e0360015.
17. Smith AA, Silva OA, Rodrigues RA, Moreira MA, Nogueira JA, Tura LF. Avaliação do risco de quedas em idosos residentes em domicílio. *Rev Lat Am Enfermagem*. 2017;25:e2754.
18. Teixeira DK, Andrade LM, Santos JL, Caires ES. Quedas em pessoas idosas: restrições do ambiente doméstico e perdas funcionais. *Rev Bras Geriatr Gerontol*. 2019;22(3):e180229.
19. Esquenazi D, Silv SR, Guimarães MA. Aspectos fisiopatológicos do envelhecimento humano e quedas em idosos *Rev HUPE*, 2014;13(2):11-20.
20. Lord SR, Dayhew J. Visual risk factors for falls in older people. *J Am Geriatr Soc*. 200;49(5):508–15.
21. Bicas HE. Acuidade visual. Medidas e notações. *Arq Bras Oftalmol*. 2002;65(3):375–84.
22. Sieiro RO, Coelho LM, Boas PC, Fonseca SC, Souza SR, Guimarães TP. Avaliação da função de sensibilidade ao contraste em diferentes faixas etárias nas médias e altas frequências espaciais. *Rev Bras Oftalmol*. 2016;75(4):296–9.
23. Parede TR, Torricelli AA, Mukai A, Vieira Netto M, Bechara SJ. Quality of vision in refractive and cataract surgery, indirect measurers: review article. *Arq Bras Oftalmol*. 2013;76(6):386–90.
24. Allan C, Coxon K, Bundy A, Peattie L, Keay L. DriveSafe and Drive-Aware assessment tools are a measure of driving-related function and predicts self-reported restriction for older drivers. *J Appl Gerontol*. 2016;35(6):583–600.

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