

Satisfaction of use of assistive devices for orientation and mobility of adults with visual impairment

Satisfação no uso de recursos assistivos para orientação e mobilidade por adultos com deficiência visual

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ABSTRACT: Visual loss or changes in visual functioning can prevent subjects from performing daily life activities, such as locomotion, which could be eased by assistive technology (AT). This study aims at investigating the use of AT devices for orientation and mobility (OM) of adults with visual impairment as well as their access and training regarding those devices, their user satisfaction, interest concerning similar equipment and the occupational roles the individuals played. This is a descriptive study of quantitative-qualitative approach carried out with 10 adults with visual impairment (VI) by applying a form for personal identification and on the used TA resources using the QUEST version validated in Brazil and the List of Identification of Occupational Roles. Results indicate that patients only used long cane and were really satisfied with this device. Most of them had access to the resource from a professional/specialized institution and underwent training for two months to one year; the adaptation process ranged from 15 days to one year. All of them showed interest in knowing new OM devices to improve their independent locomotion. We concluded that there is need for further study on AT devices regarding people with visual impairment to improve their locomotion quality of life and occupational roles.

KEYWORDS: Occupational therapy; Self-help devices; Orientation; Dependent ambulation; Visually impaired persons; Quality of life.

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RESUMO: A deficiência visual pode impedir a realização das atividades de vida diária como a locomoção, o que pode ser facilitado com recursos de tecnologia assistiva (TA). O objetivo foi investigar os recursos de TA utilizados para orientação e mobilidade (OM) de adultos com deficiência visual (DV), o acesso, treinamento, satisfação em seu uso, o interesse por outros recursos, e os papéis ocupacionais desempenhados. Estudo descritivo com abordagem quanti-qualitativa, amostra composta por 10 participantes e aplicação do formulário de identificação pessoal e dos recursos de TA utilizados, o QUEST e a Lista de Identificação de Papéis Ocupacionais. Resultados apontam que os participantes utilizam somente a bengala longa com um alto nível de satisfação. A maioria teve acesso ao recurso com algum profissional/instituição especializada, fizeram treinamento com duração de 2 meses até 1 ano e o processo de adaptação ao recurso variou de 15 dias a um ano. Todos relataram interesse em conhecer novos recursos para OM para melhorarem a locomoção independente. Conclui-se que se faz necessária a continuidade na realização de estudos sobre os recursos de TA para pessoas com deficiência visual de forma a propiciar benefícios à locomoção e à qualidade de vida no desempenho de seus papéis ocupacionais.

DESCRIPTORIOS: Terapia ocupacional; Equipamentos de autoajuda; Orientação; Deambulação com auxílio; Pessoas com deficiência visual; Qualidade de vida.

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INTRODUCTION

Visual impairment (DV) implies decreased visual response at ranging degrees because of blindness and low vision, even with medical and surgical treatment and/or use of conventional lenses¹.

In Brazil, the Decree no. 5.296, article 5, defines people with visual impairment being those with

Visual acuity equal or lower than 0.05 in their better eye, with adequate optical correction; low vision, which implies low visual acuity from 0.03 to 0.05 in their better eye with adequate optical correction; the sum of the visual measures of both eyes equal or lower than 60°, or the co-occurrence of any of the previous cases².

Currently, it is possible to estimate that there are 185 millions cases of some kind of visual impairment worldwide, 80% of which could have been avoided with prevention and adequate treatment³. In Brazil, there are 16.6 million people with visual impairment, which represents 57% of the disabled population⁴.

Sight is one of the most important human senses, contributing to human motor and cognitive development. Congenital or acquired visual impairment might affect personal, professional and environmental relationships, besides affecting activities related to people's daily life and independent mobility.

Thus, the lack of vision represents a break in the subject's routine, making it necessary to change their everyday activities according to their individual context⁶ to ensure a healthy life despite the functional limitation and its consequent losses⁷.

The adaptation process to the new condition and the techniques and mobility devices is slow and demands dedication, often coming up against difficulties such as insecurity and anxiety⁸. However, to overcome them might bring significantly positive results. Subjects that underwent the implementation process of Assistive Technology (AT) devices became able to perform similar tasks to the ones conducted by people with other disabilities after the learning process⁵.

The person with visual impairment might have its independent mobility affected even inside their own house, and while driving and using other means of transport, which implies a high demand for actions on OM⁹. Thus, people with VI need orientation on their

destination and to know the ways to get there to build a mental map of the place⁴.

There are several resources and techniques that can make this activity easier. One of the most well-known is the use of a sighted-guide, who ensures safety and comfort when accompanying the subject. There are also self-protection techniques for the individual's independent locomotion in a safer way, using their own body as a protection resource, comprising superior protection, inferior protection, tracking with the hand, framing, direction taking, and research method⁴.

Among AT devices, the long cane is one of the most used, considering it implies knowledge on specific techniques that require gradual teaching aimed at better detecting obstacles and independent locomotion¹⁰. There are several cane models made from different materials and on different sizes, which must be chosen and adapted according to users' needs, so that it can be as effective as possible. Wrong sizes, overly heavy materials and difficulties in use can lead to failures in obstacle detection, endangering the user¹¹.

There are also resources that influence sensory substitution, the mostly used being the visuo-tactile, which transforms real-time images and distances into electrical stimulation or vibrations in different parts of the body^{8,12,13,14}.

Regardless of the type of resource, the learning process of using AT equipment demands special attention, tests, reformulations and user participation in the decision-making process^{8,13,14}.

Thus, we defined a research agenda on assistive devices for orientation and mobility with adults with VI focused on the sensory substitution. We formed a partnership with two research laboratories associated with the Federal University of São Carlos that had a municipal program for this population and a NGO from Araraquara, a city nearby São Carlos, which also approached the matter. Both spaces trained individuals with VI to improve their mobility and showed interest in knowing new mobility resources.

Thus, the questions that guided this study were: would adults with visual impairment be interested in experimenting substitute sensory resources? Which aspects associated with the use of the utilized mobility resources contribute to this interest?

Our aim was to investigate which AT devices were aiding orientation and mobility (OM) of adults with visual impairment (VI) and the access of individuals to these devices as well as their training process, satisfaction and interest in using other devices and the occupational roles developed by them.

METHOD

This research is a descriptive study of quantitative and qualitative approach¹⁵.

Participants

Ten adults aged between 18 and 65 years who lived in the cities of São Carlos, Araraquara, and São

José dos Campos and had total visual impairment or low congenital or acquired vision participated in the research.

Exclusion criteria defined that subjects with multiple disabilities (physical or mental), who had cognitive impairments or could not answer to the research forms for any reason.

Table 1 presents the characteristics of the participants of the study.

Chart 1 – Identification of patients

Subject	Sex	Age (years)	Education	Profession	Blindness	OM device
S1	F	35	Graduated from High School	Administrative Assistant	Congenital	Long-cane
S2	M	46	Complete higher education	Economist	Acquired	Long-cane
S3	M	24	Complete higher education	Law intern	Acquired	Long-cane
S4	M	25	Complete higher education	Physical educator	Congenital	Long-cane
S5	M	46	Graduated from High School	Stockroom clerk	Acquired	Long-cane
S6	F	22	Complete higher education	Psychologist	Low congenital vision	Long-cane
S7	F	63	Not graduated from High School	Retired	Acquired	Long-cane
S8	F	41	Graduated from High School	Retired	Acquired	Long-cane
S9	F	54	Not graduated from High School	Retired	Acquired	Long-cane
S10	M	20	Graduated from High School	Apprentice	Congenital	Long-cane

Procedures and instruments for data collection

Data collection began after the approval by the Ethics Committee of Research with Human Beings of the Federal University of São Carlos, with no. 1,351,308, December 4th of 2015, and the signing of the Informed Consent Term by participants.

The research was conducted in the Human Activities and Occupational Therapy Laboratory of Research (HAOT) (Atividades Humanas e Terapia Ocupacional – AHTO) and in the spaces where the São Carlos municipal program of VI care and the NOG from Araraquara worked. We decided to not identify our partner institutions to ensure the participant’s anonymity implied in the informed consent term. A participant from São José dos Campos was also included in the sample thanks to the work of one of the researchers.

Data collection occurred at previously agreed appointments between the researcher and the participants

in places that ensured their privacy, such as a room at the HAOT laboratory and an office room at São Carlos. In São José dos Campos, data collection occurred at the participant’s house.

From an initial interview, instruments were applied in the following order: Form for Identification of People with Visual Impairment and Use of Assistive Devices for Orientation and Mobility elaborated by the authors; in positive cases of TA devices for OM, we applied the approved Portuguese version of the Quebec User Evaluation of Satisfaction with Assistive Technology – QUEST¹⁶. The List of Identification of Occupational Roles was also applied¹⁷. The Form for Identification of People with Visual Impairment and Use of Assistive Devices for Orientation and Mobility has been developed for this research and has collected information on the participant’s identification and history of use of assistive technology devices for OM, also identifying their interest to participate in trainings

for the use of a new sensory substitution device. The form comprises personal questions aimed at knowing more about the subject and if he or she uses AT or not, as well as what would lead him or her to consider start using new devices.

The approved version of QUEST¹⁶ assessed the participants' satisfaction level regarding the use of AT devices and associated services. As for the device, eight items were assessed: dimensions, weight, adjustments, safety, durability, ease of use, comfort, and efficiency. Regarding services, four items were assessed: process of delivery, adjustments and technical support, professional services, and follow-up services. In both categories, grades from 1 to 5 were assigned to each item (dissatisfied, somewhat satisfied, more or less satisfied, very satisfied, and fully satisfied). At the end, the average of valid answers generates maximum score of 5 in the categories Device and Service, and the average grade of all valid answers of the other items influences the final score. Among each of the assessed items, the person interviewed needed to choose the three most important.

The List of Identification of Occupational Roles¹⁷ allowed us to characterize the participants regarding the occupational roles developed by them in the past, present, and those they want to do in the future, such as: studying, working, volunteering, taking care of someone, doing household chores, being a friend or family member, pursuing hobbies and participate of organizations. The List of Identification of Occupational Roles comprised two parts: Application Guide, with explanations on how to use and apply the device, and Printed for Data Collection, in which the answers for the questions that assess the subject's perception on the occupational roles developed by them considering its level of importance and dedicated time are written. In the first part, the activities the subject has done, or has been doing or has been planning to do in the future are written. The second part assesses the level of importance that the subject assigns to each of these activities (irrelevant, somewhat important, or very important).

Procedures for data analysis

Data of the Form of Identification of People with Visual Impairment and Use of Assistive Devices for Orientation and Mobility were descriptively analyzed through thematic analysis that comprised the following categories:

1. Used OM device: Include the answers concerning the AT device type currently used by participants for OM;
2. Time of use: Indication in years of the time of use of the indicated AT device;
3. Access: Refers to how the device indication occurred;
4. Implementation: How the training for the use of the AT device occurred;
5. Knowledge: How the user got to know about the device, regardless of its indication;
6. Training: If there was a specific training on how to use the device.
7. Difficulties: Information on the difficulties of using AT devices;
8. Independence level: The user's perception on their level of independence when using the AT device;
9. Complete adaptation: Report on how much time the user took to achieve fully adaptation to the device, according to their personal perspective;
10. Interest in knowing new OM devices: In this category, participants could indicate the reasons why they would like to try a new OM device.

The QUEST and the List of Identification of Occupational Roles have their own procedures for the analysis of collected information, as both of them present their data in a quantitative and qualitative way, according to the size of the sample.

RESULTS

All participants used long-cane as an AT mobility device with time of use ranging from 2.5 to 25 years, besides also using an informal sighted-guide. Subject 10 reported he had gave up on using a guide-dog because it was hard for him to adapt to this device.

As for accessibility, eight participants reported that a professional/specialized institution had presented them the device and two (participants 1 and 3) had access to it through other people with visual impairment that already used it.

A total of eight subjects participated of the training for how to use the device for a period of two months up to a year. Those who underwent training reported having received tips from the "teachers" of OM, a term used by participants.

The complete adaptation process to the device ranged from 15 days to a year (average of 5.5 months). Most of them felt capable of using the device after training completion. In Table 2, we describe these results:

Chart 2 – Training and complete adaptation to the device use

Subjects	There was any training?	Time of training (months)	Time for complete adaptation (months)
S1	Yes	2	2
S2	Yes	6	2
S3	No	-	15 days
S4	Yes	6	6
S5	Yes	4	6
S6	No	-	5
S7	Yes	8	8
S8	Yes	12	12
S9	Yes	3	3
S10	Yes	Not reported	12

The main difficulty when using the long-cane was the obstacles such device cannot reach, such as pay

phones, trash cans, parking meters, among others “air obstacles” that can lead to serious accidents, according to subjects 1, 4, and 5.

The lack of access and respect show up in second place, being mentioned by subjects 1, 3, and 4.

Subjects 7 and 2 mentioned fear and acceptance, respectively. Subject 9 associates her struggles with her hearing loss and consequent changes in balance, which makes it harder to maintain the direction of the body. Only subject 8 reported not having difficulties during the process.

Subject 6 reported the perception of obstacles as one of her biggest difficulties, considering she did not undergo training. According to her, when compared to other people who underwent training, she had less ability to recognize the obstacles when using the long-cane, which negatively influenced her independent mobility. Table 3 illustrates these data:

Regarding independence level, subjects 4, 6, and 10 classified it as “very good,” while subjects 1, 2, and 8 classified it as “good,” and subjects 3, 5, 7, and 9 as “intermediate.”

All participants reported interest in knowing new AT devices for OM, the main reasons for it being curiosity and the chance of improving locomotion (n=7); these information are shown in Table 4.

Chart 3 – Data on the difficulties of using a certain OM device

Subjects	Lack of accessibility	Unreached obstacles	People who do not show respect	Fear of bumping into someone	Perception of obstacles	Acceptance	Balance	Following the body's directions	Space concept	Focus	Tact	None
S1	x	x										
S2						x						
S3			x									
S4		x	x									
S5				X								
S6					X							
S7				X								
S8												x
S9							x	x				
S10									x	x	x	

Chart 4 – Interest in knowing new OM devices

Subject	Has interest in knowing new OM resources		Reasons	
	Yes	No	Curiosity	Improve locomotion
S1	X			X
S2	X		X	
S3	X		-	-
S4	X		x	X
S5	X			X
S6	X			X
S7	X			x
S8	X		X	
S9	X			X
S10	X		x	x

Regarding the User’s Satisfaction Assessment with Quebec Assistive Technology (QUEST), we noted that from the 12 most important satisfaction items among which participants needed to choose only 3, “durability” was the most mentioned one (six people), followed by five participants who chose “ease of use” and four who chose “security.” Three people pointed out “dimensions,” “comfort” and “follow-up services,” and “weight,” “efficiency,” “repairs and technical assistance” and “professional services.” No participants pointed out “adjustments” as one of the most important items of satisfaction.

Chart 5 – Results of the QUEST

		SUBJECT									
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Scores	Device	4	4.25	3.62	3.25	4.87	4.12	3.12	4.37	4.37	3.5
	Services	4.5	3	0	4.5	4.75	3.5	4	4.33	5	3.5
	Final	4.16	3.72	3.62	3.5	4.83	3.91	3.36	4.36	4.5	3.5
Items with highest satisfaction	Dimensions	X				X			X		
	Weight								X		
	Adjustments										
	Safety			X	X		X			X	
	Durability		X		X		X		X	X	X
	Ease of use	X		X	X	X		X			
	Comfort		X				X				X
	Efficiency			X							
	Delivery							X			X
	Repairs/Technical assistance	X									
	Professional services									X	
	Follow-up services		X				X		X		

Table 5 presents the results of device *per* participant of the study.

Finally, regarding the List of Identification of Occupational Roles, all subjects associated the role “being a family member” to their past, present, and future, assigning “very important” to it. The role of “being a friend” also received “very important” from all participants, considering they associated it with past, present, and future, except for subject 1, who had only developed it in the past.

Subjects 1, 7, and 9 mentioned they had already taken care of family members. Only the subject 8 assigned “irrelevant” when referring to “studying”; others have assigned “very important” to it. A total of nine participants considered the role “working” as “very important,” while eight of them considered it “somewhat important.”

None of the participants currently developed the role of “volunteering,” despite all of them assigning “very important” or “somewhat important” to it. Subjects 1, 3, 6, 7, and 10 had already developed this role and showed interest in doing it in the future. Subjects 2, 4, 5, 6, and 9 also plan to do so, and only subject 8 had never developed it and showed no intention of performing it in the future.

As for “doing household chores,” all participants had already done it or plan on doing it, assigning “very important” or “somewhat important” to it. Only subject 3 assigned “irrelevant” to this role.

About “pursing hobbies,” only subject 3 does not plan at doing it in the future, attributing “irrelevant” to it, while the others had already developed in the past, present and want to keep doing it in the future. However, only subjects 2, 5, and 7 assigned “very important,” while the others assigned “somewhat important.”

Subjects 1, 2, 3, 5, and 6 reported they had been “participant of organizations” for a while, assigning “very important” or “somewhat important” to it. Subjects 4, 7, 8, and 9 had never developed this activity and showed no interest in doing it. Despite participants 8 and 9 assigning “irrelevant,” subjects 4 and 7 reported “somewhat important” and “very important,” respectively.

The “religious” role was mentioned when referring to the past, present and future by subjects 3, 5, 7, 8, and 9, who assigned “very important” to it, while subject 8 assigned “somewhat important” to it. Other subjects reported they had developed this role in the past and assigned “somewhat important” to it.

DISCUSSION

Regarding the used AT devices, there was the predominance of long cane, which corroborates with the findings by Ambrose-Zaken¹⁸, being the only one used by all participants. The long cane is a symbol of people with visual impairment, being part of their body and contributing to their identification, which enables them to get help from strangers, especially in public environments of great circulation¹⁹. When it comes to ease of use and price, this device is known for being the more accessible, considering that most participants started using it after the indication of professionals and services of the field.

We observed that most participants (n=8) received professional orientation before using the device. We located seven of the interviewed subjects through the VI specialized institution they attended. Out of them, only one did not receive OM training. Among the three interviewed participants who had no association with this institution, only one received training. The users in this study were not the only ones to point out the need for training. According to the literature, several professionals of the field have observed it in multiple environments²⁰.

Regarding the subjects’ satisfaction towards the used device, we identified that device-related scores were higher than those associated with services, which suggests that issues such as the delivery process,

technical assistance and professional and follow-up services are not satisfying. The lack of specialized assistance lead the users to do the needed adjustments in their long-cane by themselves. There is also the lack of professionals to carry out drug prescriptions, implementations and follow-ups.

Making them choose the most important items of satisfaction allowed us to understand the perspective of each subject, which contributed to the reflection on the importance of an adequate follow-up, considering they did not repeat the same item combinations. One could say that each subject has his or hers own criteria, showing a particular relation with the device and its use, which can vary according to the changes in their daily life activities.

We obtained the highest final scores from subjects that used the device for a long time (from 15 to 25 years). There is the possibility of users feeling more satisfied with the device with time and frequency of use, considering that practice makes locomotion easier. However, we obtained the highest general score from a subject that used the long-cane for only 2.5 years. Therefore, in addition to the time of use, the environment where the subjects make use of the device affects their level of satisfaction.

Participants considered items such as durability, ease of use, comfort and safety as the most important for their satisfaction, as also pointed out by Ambrose-Zaken¹⁸.

The results of the QUEST showed high levels of satisfaction, as *per* the data obtained by using the Form of Identification of People with Visual Impairment and Use of Assistive Devices for Orientation and Mobility, which show that despite being fully adapted to the device, not all of them had a high level of autonomy.

This study showed that despite the use of the long cane being very common among visually disabled people because of its dissemination and accessibility, besides its ease of learning, it is still not enough to ensure independent locomotion. “Air obstacles” were reported as participants’ main difficulties, considering that the long cane is not able to reach them. By not detecting these obstacles, visually impaired people might get into accidents, which is a risk that makes them avoid going out in the streets by themselves, hindering their autonomy.

The participants’ interest in knowing new AT devices for OM is directly associated with the flaws they find in the currently device used; by combining two technologies, they believe it would be possible to improve their locomotion, making it safer and more efficient.

As for the profile of the interviewed subjects, the List for Identification of Occupational Roles allowed us to verify which occupational roles they had developed in the past, present, and wanted to develop in the future as well as the importance they attributed to them.

All subjects highlight the importance of family in their daily life. In the context of visual impairment, family is extreme important in the development of people with congenital blindness, considering it is the first social context these people experience, being through its care and support that blind children consider searching for professional services for stimulation. In adulthood, both congenital and acquired visual disabled people view their families as a support network, which can affect their social and professional development, not to mention their autonomy²¹.

This study observed that all participants considered working as of huge importance. The insertion of these people in the job market is also important to make them feel capable, independent, and fulfilled, which are feelings that often get lost amidst disability, according to the literature^{22,23}. Therefore, including and integrating disabled people in the job market is essential, as is the need for encouragement through public policies. This could reduce stigma, which is one of the contributing factors to the unemployment **rate** among visually disabled people, which corresponds to twice the amount of unemployed people without disabilities²³.

When it comes to awareness and the **reduction of the stigma with disabled people**, participants reported that the lack of cooperation in the streets is one of the biggest difficulties for their independent locomotion. Hence, including disabled people in our society, such as schools and work, and the promoting efficient and safer access to these environments would bring more visibility to these people, thus decreasing stigma and prejudice.

FINAL CONSIDERATIONS

This study brought important contributions on the use of AT devices for OM by people with VI. The long cane was the main device mentioned by users, being very common among the VI population. The long

cane contributes to the possibility of a more effective and independent locomotion, varying nonetheless varies between subjects, depending on the implementation context, environment and time of use. In addition, most participants had access to the device through a professional/specialized institution and underwent training for a period between two months and one year. The complete adaptation process to the device ranged from 15 days to one year and participants expressed a high degree of satisfaction with it and its use. Despite being satisfied, they pointed out several flaws in the long cane device that can lead to feelings of insecurity and/or risks of accidents when using it to walk. Therefore, they showed great interest in knowing other sensory substitution AT devices for OM to make locomotion safer, easier and more effective, thus contributing to their autonomy.

It is important to highlight that this study has its limitations, since the sample only comprised 10 participants. Thus, one must be aware of this fact when considering its results. Consequently, we suggest further studies on this theme aimed at addressing the entire VI population of the region to confirm or refute the data here obtained, and at identifying new problems and trends. We suggest the discussion of this matter with the responsible political authorities of the region to create plans and strategies to improve accessibility in the city and public policies of awareness, visibility and integration of disabled people.

Another limitation was the lack of a more specific identification of contexts in which the subjects used their canes, as well as the lack of identification of the difficulties faced by each of the participants. Thus, there is a need for further studies on the subject to identify and create more specific intervention strategies with techniques that enhance the use of the long cane and the possibility of using other devices.

Finally, regarding new sensory substitution devices for OM, we consider it is worth investing in their creation, improvement and dissemination to improve daily life activities, thus promoting autonomy and better quality of life of people with visual impairment.

Authors' contributions: Gerusa F. Lourenço was responsible for study guidance, data analysis, and the writing and review of the text. Amanda Cristina Honório was responsible for data collection and the writing of the text. Mirela de Oliveira Figueiredo was responsible for the writing and review of the text.

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