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AN EVALUATION OF VISUAL ACUITY LEVELS

Julie Loughhead, Assoc. Dip. O. (Cumb.), D.O.B.A. and Lyndal Priest, Assoc. Dip. O. (Cumb.), D.O.B.A.

This paper was written whilst the authors were third year students in Orthoptics at Cumberland College of Health Sciences, Lidcombe, NSW

Abstract

The aim of this paper is to demonstrate how a person with a visual acuity deficit can function in day to day living. This was achieved by using graded filters to simulate visual acuity levels ranging from 6/6 – 1/60. Then with each visual level, activities involved in daily living were performed. The results are summarised in table form and some experiences have been related.

We concluded, that although a person may be classified as 'blind', in most cases, there is some residual vision which may be used to improve the individual's independance and enjoyment of life.

Key words

Simulated reduced vision, activities of daily living, residual vision.

Introduction

In the past many people suffering from a visual impairment have been treated as though totally blind, although many retain some residual visual ability. This concept has recently come under criticism.[1–2–3] The majority of 'lay' people still believe that a person classified as blind lives in a world of darkness totally devoid of light stimulation. However we know this is not always the case.

Aim

The aim of this paper is to demonstrate how a person with a visual acuity deficit can function in the process of day to day living and in particular to emphasise the difficulties and potentially dangerous situations they may encounter. We feel there exists a need to emphasise the statement that residual vision is useable vision and thus should be exploited whenever possible to give the patient every opportunity to lead as visually normal a life as is possible.

This information may be relevant and of value to other therapists, by making them aware of the extent to which they can exploit their patients visual ability, no matter how minimal it may be, to improve their self reliance.

At the present time qualification for a blind pension is restricted to those individuals who have a visual acuity of 6/60 or less in the better eye, or having a visual field defect e.g. tunnel vision[4]. However it is only necessary to have a visual acuity of 6/24 or less in the better eye to be eligible to attend a school for the visually impaired.

One must remember, of course, that 6/12 vision does not represent an effective visual function of only 50%. The following table compares visual acuity levels with effective loss of visual function.

TABLE 1
Relation between Visual Acuity Notations and Percent of Macular Visual Efficiency

SNELLEN'S FEET	NOTATION METRES	VISUAL ANGLES IN MINUTES	VISUAL EFFICIENCY IN MINUTES	PERCENTAGE VISUAL LOSS
20/20	6/6	1	100%	0.0%
20/25	6/7.5	1.25	95.6%	4.4%
20/30	6/9	1.50	91.4%	8.6%
20/40	6/12	2	83.6%	16.4%
20/60	6/18	3	69.9%	30.1%
20/80	6/24	4	58.5%	41.5%
20/120	6/36	6	40.9%	59.1%
20/200	6/60	10	20.0%	80.0%
20/400	3/60	20	3.3%	96.7%
20/800	1/40	40	0.1%	99.9%

Method

A) Blurring Visual Acuity

1. A standard Snellens linear test type chart was placed at six metres and our visual acuity recorded uniocularly. We classified ourselves as the normal as we each have a visual acuity of 6/6 or better in both eyes at both near and distance testing.
2. In each case we totally occluded our non dominant eye with an opticlude face patch thus excluding all visual information to that eye.
3. Using the series of graded occluders we placed these directly before the dominant eye, using the vision chart and increasing the density of the occluder until the required visual acuity level was obtained, ranging from 6/9 to 6/60. We were unable to obtain a satisfactory blur using the graded occlusion for visual acuity levels 3/60 and 1/60, so we employed commercially available 'contact' on plano glasses.
4. We then secured the graded occluders before the dominant eye using adhesive tape in a similar fashion to face occlusion.
5. Various activities were then performed both inside and outside the home environment. The activities were chosen as we felt they were involved in day to day living, for example, watching television requires visual appreciation as well as auditory information. Each activity was performed with each visual acuity level and the ease or difficulty recorded.

Obviously, artificially blurred vision will not accurately convey the effect of one with a pathological defect; quite obviously a visual field defect will be totally different. Furthermore, one may argue that a strabismic amblyope will receive a vastly different visual impression than a person suffering from macular degeneration. As normal visual acuity is usually found in the non squinting eye it would seem that in undertaking occlusion therapy this patient will be better able to cope. Our experience revealed that due to our previous knowledge of shape, size and colour of objects we were better equipped with a vast visual memory which increased our chances of correctly identifying an object or aided our performance of a manual task. On the other hand, one could argue that a person who has had a visual impairment from birth or an early age may be better adapted as they have developed greater sensitivity of their other senses, particularly touch, which may more than adequately compensate for their lack of visual perception.

Secondly, as one eye was totally occluded we were placed in an abnormal situation with the absence of stereoscopic clues to depth. This may have hindered our judgement of distance. Negotiating stairs was particularly difficult as was boarding and alighting from public transport.

We have attempted to examine the problems in a chronological sequence to represent the activities involved in an average day.

Grooming

In most cases, even with 1/60 vision at close range we could distinguish labels, seams and hems to tell whether the clothes we were about to put on were inside out or not. Otherwise it was necessary to use tactile information.

When applying make-up it was much easier to use bright colours such as iridescent green rather than more subtle colours and skin tonings. Caution was needed when using mascara, eyeliner and eyelash curlers, especially concerning the lower lids as they simply couldn't be seen. We tended to cake on the blusher so it was visible and we finished up with lipstick all over our mouths and teeth. Now we know why one often sees little old ladies in the street looking as though they had just walked out of a clown circus act – they probably have cataracts or macular degeneration. Therefore, magnifying mirrors should assist these people. Both men and women should be cautious when shaving with impaired vision, taking care with moles, rashes, blemishes, etc. It was realised that one can part one's hair with any vision but unless one had 6/18 vision or better one can't tell whether the parting is straight or crooked.

Home Duties

Most of these experiences are related to VA 6/60 and less. When preparing food it was impossible in most cases to tell visually whether the food was good or bad (worm holes in apples, mould on bread). However, sometimes one can rely on smell (sour milk) and if all else fails one can always taste it!

One must always be careful with any visual level less than normal when eating fish as it is impossible to see the bones, instead it was necessary to feel with one's fingers. Therefore, never go to a restaurant with your friends and order fish – they won't be your friends for much longer.

To identify the required food in the fridge one must almost be sitting on the shelf beside the food before this is possible. When cooking food in a saucepan of water, e.g. rice, the only way to tell whether it was boiling dry was to put one's face

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into the saucepan and risk getting scalded by the steam, or wait until there is a burning smell. This may be overcome by periodically filling the saucepan with small amounts of water.

When using scales and measures it would be easier to use those with raised numerals, making use of tactile as well as residual visual information.

When pouring cold liquids one can rely on placing one's finger at the required level. However, when pouring hot liquids one must rely on the amount and time that one has to tip one's hand, from previous experience.

When washing up one relies almost solely on the sense of touch, i.e. feeling for loose food particles, therefore one can't wear rubber gloves and will develop dishpan hands. It is probably easier to buy a dishwasher.

As for vaccuuming, sweeping and dusting with less than 6/18 VA one is unable to see any dust or dirt even at close range. Therefore, the most sensible thing would be to carry out these tasks regularly, regardless.

It was relatively easy to identify a required key on a small bunch of variable shaped and sized keys but with decreasing vision it became markedly harder to fit the key in the lock.

Transport and Mobility

With less than 6/60 vision one of the biggest difficulties just walking down the street, apart from the lack of depth clues, was the lack of appreciation of contours of the footpath and road surfaces. For example, holes, stones, twigs, leaves, a step from the footpath to the road, and dog's messages. Often, inclined surfaces were difficult to differentiate from flat surfaces and one relied more on postural and proprioceptive clues. Walking up a hill, one's front foot hit the ground before the previous foot did and one tends to lean slightly forward and vice versa when walking downhill.

For identification of buses and taxis we tended to use colour clues from previous experience, e.g. taxis are white and red or red and yellow. However, with less than 6/60 vision one couldn't tell the destination of a bus at all and with 6/36 it wasn't possible until the bus was level or actually moving past. When on trains and being unable to read station names on the indicator board or station names on the platform from the train, it was necessary to count the stops for the station required. With 3/60 and 1/60 vision it was very difficult to tell whether the seats were vacant or not.

When crossing at a pedestrian crossing with 6/60 or less it was extremely difficult to tell whether there were any cars approaching and whether they were stopping. When crossing a street without a pedestrian crossing it was frightening and impossible to cross by oneself.

When crossing at traffic lights with VA less than 6/24 it was impossible to read the 'Walk' and 'Don't Walk' signs. Only a red blur was discernable. Thus, one could only tell when to cross when the red blur disappeared, the cars stopped and the people around moved off the footpath. One didn't notice the green blur for the 'Walk' sign appear.

Using escalators didn't prove to be very difficult as they provided clues of movement and colour, e.g. the yellow safety lines.

When going up the stairs the clues of light and shadow, height difference between steps and advertisement stickers on the face of the step, as well as on the railing, made them less difficult.

However, when travelling downstairs these clues were absent. With less than 6/60 VA it was difficult to distinguish individual steps, rather it appeared only as a downward slope. If there was a bend in the railing it gave a clue that the ground levelled out. As you could imagine, it was frightening going downstairs without a railing.

We noticed that many shop fronts consist almost completely of glass, especially those in arcades, and with less than 6/60 it was almost impossible to differentiate the doorways. Clues to the presence of a doorway were a lack of reflection and the absence of posters or stickers on the glass. Without these clues it would be easy to walk into the glass walls.

With low levels of VA we found it much easier to recognise objects that were moving rather than those that were stationary, particularly in the distance. Colours such as red, yellow, light blue and white were far more prominent than others. Thus, these two factors could be utilised in management of visually impaired people.

When travelling in a car a passenger with 1/60 VA cannot see side streets, lane markings on roads, traffic lights until level with them. With 6/18 VA the only difficulty was reading street names and number plates on cars.

Reading

It is just possible to read the blackboard writing sitting three rows from the front with 6/12 visual acuity. Therefore any child with a visual impairment should be placed in a position as close to the blackboard as is possible. We also found it much easier to read blackboard work written with white

chalk although yellow, green and blue shades were also seen, but red was hardly discernible.

Colour television we found easier to see than black and white as the colour conveys additional clues.

One of the biggest problems which we encountered when reading was the inability to scan linear print. This became obvious when we attempted to scan a menu with 6/18 visual acuity and found it almost impossible to do so.

The accommodation near point should also be considered as the visual acuity decreases. In order to create a larger retinal image the print is moved closer to the eyes. However, one may bring the print to a point in space closer to the eyes than the accommodation near point, thus print still remains illegible. It is bigger but is blurred. This problem is exaggerated in elderly patients and presbyopes wearing a near correction. Such people would benefit from using an optical aid, for example a hand held magnifier.

Another problem which became evident was one of crowding of the print due to the fine spacing between the letters of a word. This was particularly noticed whilst looking up phone numbers as in the position of maximal clarity there was insufficient space for the letters to be resolved and they appeared jumbled.

Dialling a phone number is a task which we all take for granted. However, this cannot be executed with 1/60 visual acuity relying on visual means. One is required to feel each hole in the disc and count the numbers along.

TABLE 2
Activities Associated with Home Duties

	6/6	6/9	6/12	6/18	6/24	6/36	6/60	3/60	1/60
Identifying stove controls, heat level etc.	P	P	P	P	12"	8"	4-6"	large label only	Red 'on' light only
Power points location Red 'on' dot	P	P	P	P	P	Locate on wall at 6'	1'	6"	Red 'on' only
Hot/Cold taps (not colour coded)	P	P	P	P	P	1'	4"	2"	just
Identify food (supermarket)	P	P	P	P	P	P	12"	*	*

TABLE 3
Identification of Transport

	6/6	6/9	6/12	6/18	6/24	6/36	6/60	3/60	1/60
Identifying a bus further than 20'	P	P	P	P	P	P	P	P	20'
Identifying bus nos – destination	P	P	30'	20'	10'	level	*	*	*
Identifying a taxi	P	P	P	P	P	P	P	colour only	by colour when level
Taxi vacant/engaged	P	P	*	*	*	*	*	*	*
Train indicators, time & desination platform nos.	P	P	P	P	P	5'	from below only	clock only	*
Station name from train	P	P	P	P	P	P	P	just	*
Station indicators names and lights	P	35'	20'	17'	12'	from below	lights only	*	*
Car numberplate	P	50'	30'	20'	level	*	*	*	*
Identifying stop – by display board	P	P	P	P	P	P	P	close range only	*

TABLE 4
Activities with Detail I

	6/6	6/9	6/12	6/18	6/24	6/36	6/60	3/60	1/60
BLACKBOARD WORK									
a) Back	P	P	Just P	*	*	*	*	*	*
b) Front	P	P	P	P	P	8"	6"	3"	½"
Dialling Phone	P	P	P	P	P	P	P	Feeling	Feeling
& Reading Instructions	P	P	P	P	P	Very Close	Very Close	*	*
Price Labels	P	P	P	P	P	10"	6"	2-3"	*
Banking	P	P	P	P	P	P	*	*	*
Money Identification	P	P	P	P	P	P	Colour and Size	Colour and Size	Colour only
NEWSPAPER									
a) Fine Print	P	P	10"	7"	6"	4"	*	*	*
b) Small headlines (6/60)	P	P	P	P	P	P	P	4"	2"
c) Big Headlines (>6/60)	P	P	P	P	P	P	P	P	P
Paperback	P	P	P	12"	8"	6"	*	*	*
CHILDRENS BOOKS									
a) first reader	P	P	P	P	P	12"	6"	2"	*
b) Beatrix Potter	P	P	P	P	10"	8"	4.5"	*	*
Womens Weekly	P	P	P	11"	9"	6"	*	*	*

TABLE 5
Activities with Detail II

	6/6	6/9	6/12	6/18	6/24	6/36	6/60	3/60	1/60
Phone Book Numbers	P	10"	8"	7"	6"	4"	names at 2"	*	*
Bus Timetable	P	10"	8"	7"	6"	4"	2"	*	*
Typing – Medicine	P	P	P	10"	8"	7"	5"	2"	*
Train Fare Table	P	P	P	11"	8"	6"	*	*	*
Bus Timetable	P	P	P	P	10"	8"	5"	*	*
Watch Face (tell time)	P	P	P	P	14"	12"	9"	4"	2" →*
TV at 8' with 24" screen	P	P	P	P	P	P	3'	10"	8"
Restaurant Menu	P	P	P	12"	8"	4"	*	*	*
Safety Instructions Dog Wash	P	P	P	P	just possible	*	*	*	*

It is also not difficult to imagine the problem a person with defective vision has when confronted by a row of medicine bottles.

The following tables summarise these experiences: P indicates that the task was possible, and completed without much difficulty. If the task could only be done at a closer range, the necessary distance is included. * indicates that the task was impossible at any distance.

In Australia today it has been estimated that the population classified as legally blind exceeds 26,000 people. A further 78,000 people have a severe visual impairment with an acuity ranging from 6/24 to 6/36, and yet another 196,000 have

a visual impairment with an acuity of 6/18. Of this number, approximately 50% are over the age of 60 years. However, there are only 5,000 people registered with societies for the visually handicapped, for example, The Royal Blind Society.

Conclusion

Admittedly, our results are largely based on subjective experience. However, they demonstrate that any residual vision is beneficial to an individual with a severe visual impairment if it is properly exploited.

It is also clear that each visual acuity level may be treated as a defineable entity particularly when comparing acuity levels less than 6/24. In fact, an acuity of 6/36 may be more of a handicap than we have previously thought. As would be expected there is a definite difference noticed between visual acuity levels which accelerates as the visual appreciation decreases. Yet significant improvement may be obtained with severe visual impairment by the use of optical aids which will allow the individual a measure of independence which may permit them to pursue their career and interests in life more effectively.

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