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# THE ORTHOPTIST AND DRIVING SKILLS

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**Abstract**

*The focus of this paper is on a new role for the orthoptist using orthoptic skills in assisting a client with physical limitation to gain a driver's licence. The paper also highlights a way in which orthoptists can liaise with occupational therapists to help the client.*

**Key words:** *Driver rehabilitation, interdisciplinary role, Klippel Feil Syndrome, vision and driving.*

## INTRODUCTION

Visual function is an essential component of the driving skill. In New South Wales, the Road Traffic Authority[1] requires drivers holding an automobile licence to have a visual acuity level of 6/12 in either eye or two eyes together and a field of vision that extends 130° monocularly or binocularly. The additional ability to move the eyes fully into all positions of gaze while maintaining a single and clear image is not a legal requirement but is beneficial to safe driving. The best possible visual function for a person learning to drive will help the attainment of driving skills.

A case study of a client with Klippel Feil Syndrome who wanted to gain a driver's licence is used to illustrate this extension of the orthoptist's role. The paper will describe the physical features of the client and link them to the difficulties which were encountered in gaining driving skills. The adaptations that were made to the car to help the client will be described and the interaction between the orthoptist and the occupational therapist reported.

## CLIENT FEATURES

### 1. General Features

Carolyn, aged 18 years, contacted the Driving Rehabilitation Centre at Cumberland College with the intention of learning to drive. She was diagnosed as having Klippel Feil Syndrome, features of which are listed in Table 1. Specifically, Carolyn has a short stature and severe kyphoscoliosis (humped back and lateral curvature of the spine). She has severely restricted neck movement and very limited trunk movement in all directions. She has limited lung capacity and requires a respirator at night in order to maintain adequate breathing. Due to her physical status, her physical function was limited to gross body abilities i.e. she is unable to run effectively or carry out strenuous gross motor activities. She fatigues easily and is prone to shortness of breath.

Carolyn's cognitive capacity appeared normal, being educated to year 12 and gaining admission to university, she has led a relatively quiet life, with regular admissions to hospital. Being unable

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TABLE 1
Klippel Feil Syndrome (Duke Elder)[2]

Features:
- congenital condition
- fusion of a number of cervical vertebrae
- associated with elevation of the scapula
- spina bifida in the cervical region
- dysplasia of the cervical cord

Appearance:
- head appears to rise directly from the thorax
- some degree of torticollis
- head movements severely restricted
- bimanual synkinesia of the hands
- ocular signs:
  - — Duane's Retraction syndrome
  - — total external ophthalmoplegia
  - — congenital paralysis of conjugate lateral gaze

to carry out normal social and leisure activities, her level of maturity was quite young for her age.

2. Ocular Features

An orthoptic assessment revealed that Carolyn has:

(a) a right esotropia with hypotropia, with a face turn to the left (Figure 1). Carolyn could voluntarily change fixation to the right eye by adopting a face turn to the right or shutting her right eye. When fixing with the right eye she has a left esotropia with left hypertropia. Carolyn cross fixates.

(b) slight myopia. Her visual acuity with glasses is 6/9 RE, 6/6 LE and binocularly 6/6 corrected.

(c) ocular movements revealed a bilateral Duane's retraction syndrome with no abduction of either eye beyond the midline (Figure 2). Each eye retracted on attempted adduction. On attempted abduction the adducting eye elevated with the left eye, elevating further than the right eye. There was a torsional movement of the right eye on attempted dextro elevation.

The eyes could directly elevate and depress but the above limitations continued as the eyes moved into dextro and leavo elevation and dextro and leavo depression.

(d) The visual fields were full using the Goldmann perimeter. As each eye had limited mobility, the extent to which the eyes could follow into the peripheral field was plotted. The arc perimeter was used and the procedure modified so that Carolyn, with her chin in the middle of the two chin rests, followed a print target into the periphery. She was asked to state when the print went out of focus, denoting loss of foveal fixation. In Figure 3a, the solid lines show the extent to which the target could be foveated. The dotted line indicates the normal peripheral field tested with both eyes open. Comparison of Carolyn's responses with those of subjects with normal eye movements (Figure 3b) shows that, for Carolyn, the foveated field is considerably smaller. This confirmed the effects of her limited eye movements.

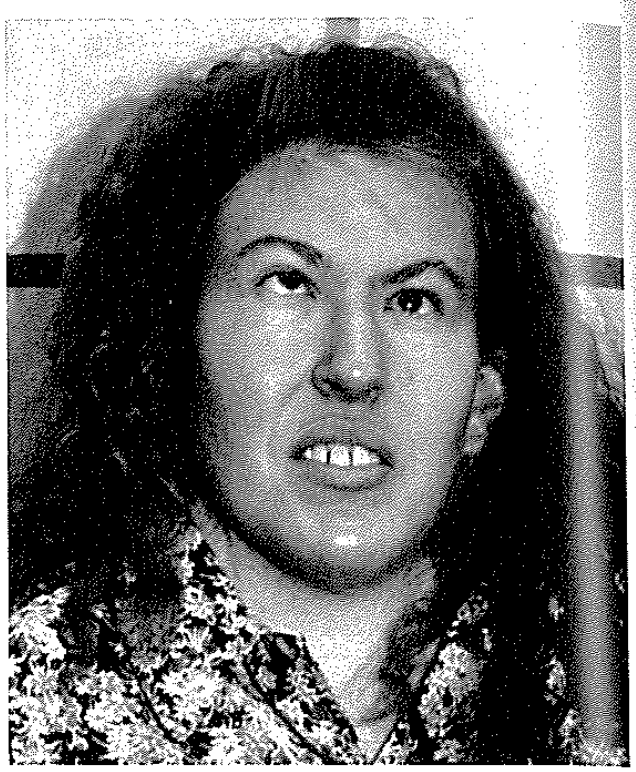

*Figure 1.*

## CLIENT ABILITY AND DRIVING

Carolyn has problems in the following areas:

- Visual

  With the aid of head movements she is able to cross fixate so that she uses the right eye to see the left field and the left eye to see the right field. By cross fixation, Carolyn is able to use the appropriate side mirrors. She is unable to use her eyes to see to the extreme

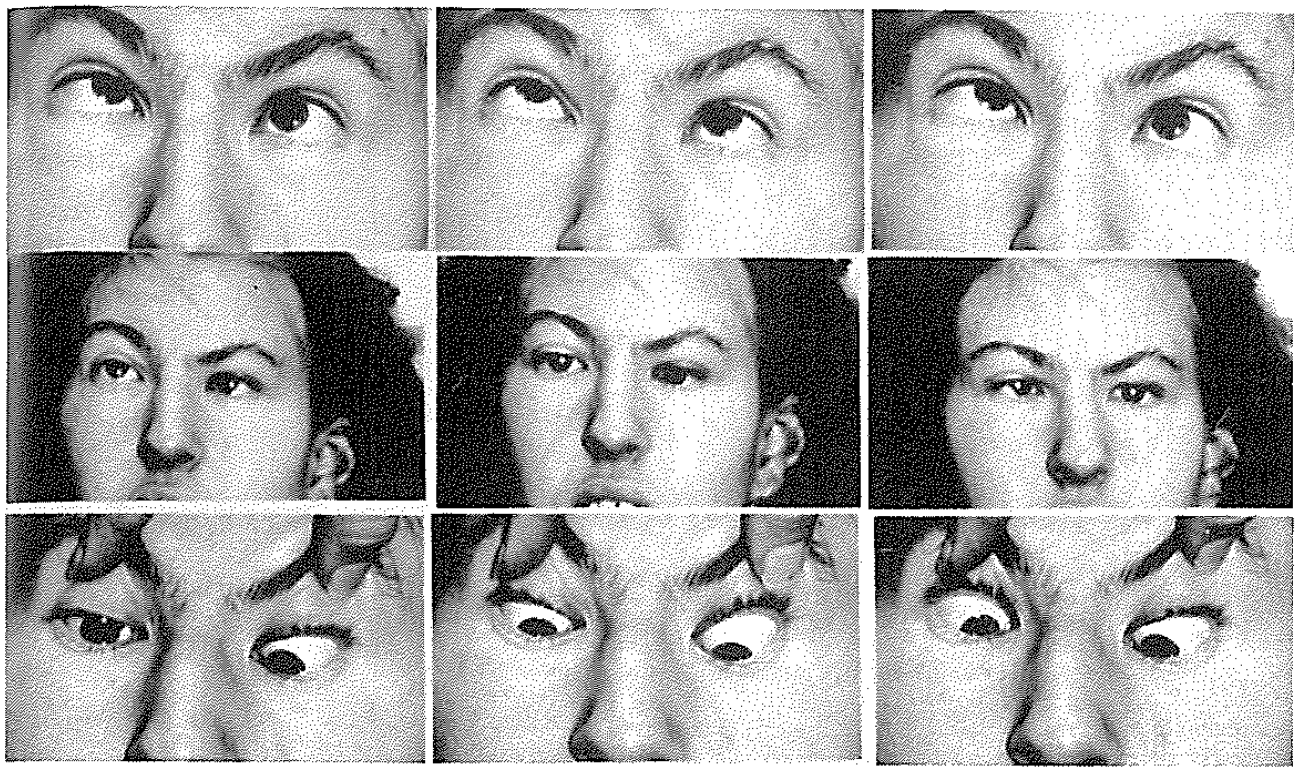

*Figure 2.*

right or left. Elevation movements to use the rear view mirror are adequate.

- Body Rotation
  Carolyn has limited head and body rotation. Physical support to gain visual information from the periphery is not possible.

An assessment by the occupational therapist revealed that:

- Sitting Posture
  Carolyn's short stature necessitates low seating with good back support to enhance comfort and reduce back pain. Any prolonged sitting in one position induces discomfort. Therefore, when driving, Carolyn needs to be well supported and be able to have regular postural changes.
- Driving Position
  Most car seats encourage hip flexion of less than 90°. This is most uncomfortable for Carolyn, so a seat adaptation is necessary to raise her pelvis to be in line with her knees. An extended back rest was also utilized, enabling good back and neck support and to prevent whiplash or back injuries.
- Physical Abilities
  Carolyn has limited upper limb strength, with reduced range of motion of both shoulders. Extensive physical effort induces back pain and fatigue. Lower limbs function is adequate for driving, with good strength and mobility of limbs.
- Endurances
  Carolyn tires easily, both physically and from the point of view of her lung capacity. Endurance is therefore limited and it was suggested she drive an automatic vehicle with power steering.
- Tolerance
  Initially, Carolyn developed back pain and shortness of breath after only 10 minutes of driving. Following an extensive programme and the reduction of back and neck strain with the use of mirrors, Carolyn can drive pain free for one full hour.

## ACTIONS TO ASSIST DRIVING

Following the initial assessment by the orthoptist and the occupational therapist, Carolyn was

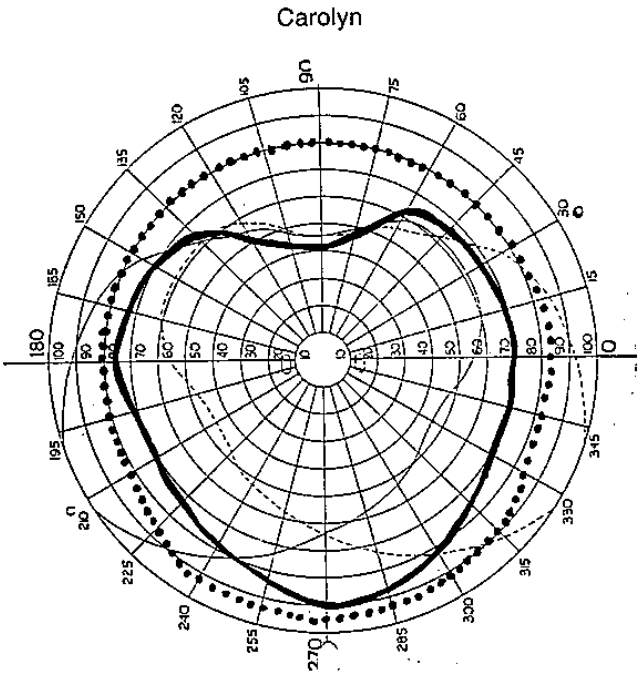


*Figure 3a.*

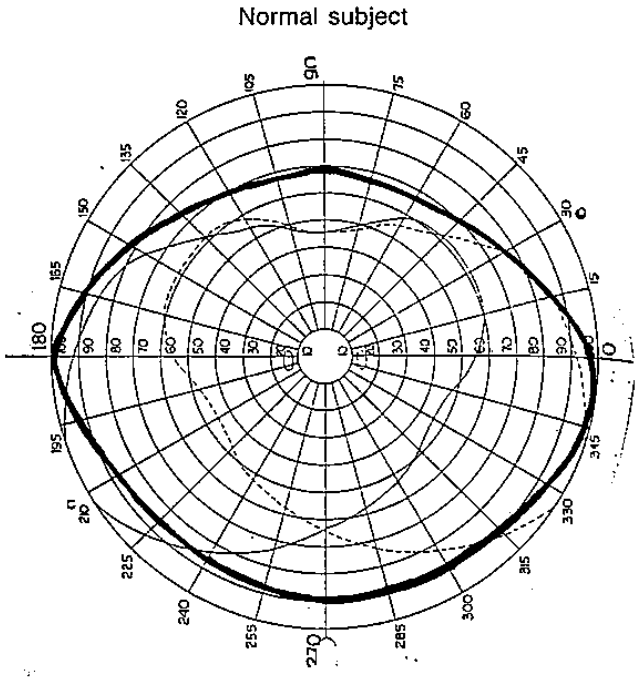


*Figure 3b.*

taken for an "on-road assessment" with a qualified driving instructor in a car with dual controls. The occupational therapist was present to observe, monitor and disclose the reasons for problems that occurred while Carolyn was driving. Following the assessment, modifications to her position were made. A driving programme was also designed to try and overcome Carolyn's difficulties.

At the initial on-road assessment, the orthoptist was also present to observe Carolyn's eye and head movements and to determine if her ocular limitations were hindering her ability to learn to drive. The orthoptist was positioned immediately behind the driver and observed the eye movements through the rear vision mirror. The head movements were directly observed.

It was noted that Carolyn has difficulty at intersections when she has to look to the extreme right and left to see if the road is clear. She was observed to sit forward using the steering wheel for support and rotate her trunk to bring the visual area into view. While that is satisfactory when the car is stationary, for instance at cross roads, such an action when trying to change lanes means the steering wheel is rotated in the direction of the trunk movement and the car moves off into that direction.

To help overcome the ocular problem, two additional mirrors were positioned at the top of the windscreen directly in front of the driver (Figure 4). The mirrors were placed with the reflecting surfaces towards each other with the adjacent tips towards the windscreen. Carolyn was instructed to move her head and change fixation, to use the mirrors to gain a view of the extreme right and left. In order to see to the right, she had to fix with her right eye and look into the left mirror. To see to the left she fixed with the left eye and used the right mirror. Figure 5 demonstrates Carolyn's normal field of vision plus the effect of the special mirrors.

Trunk rotation also caused some discomfort and it was felt advisable to try and avoid the action. The occupational therapist advised an adjustment in the height and position of the

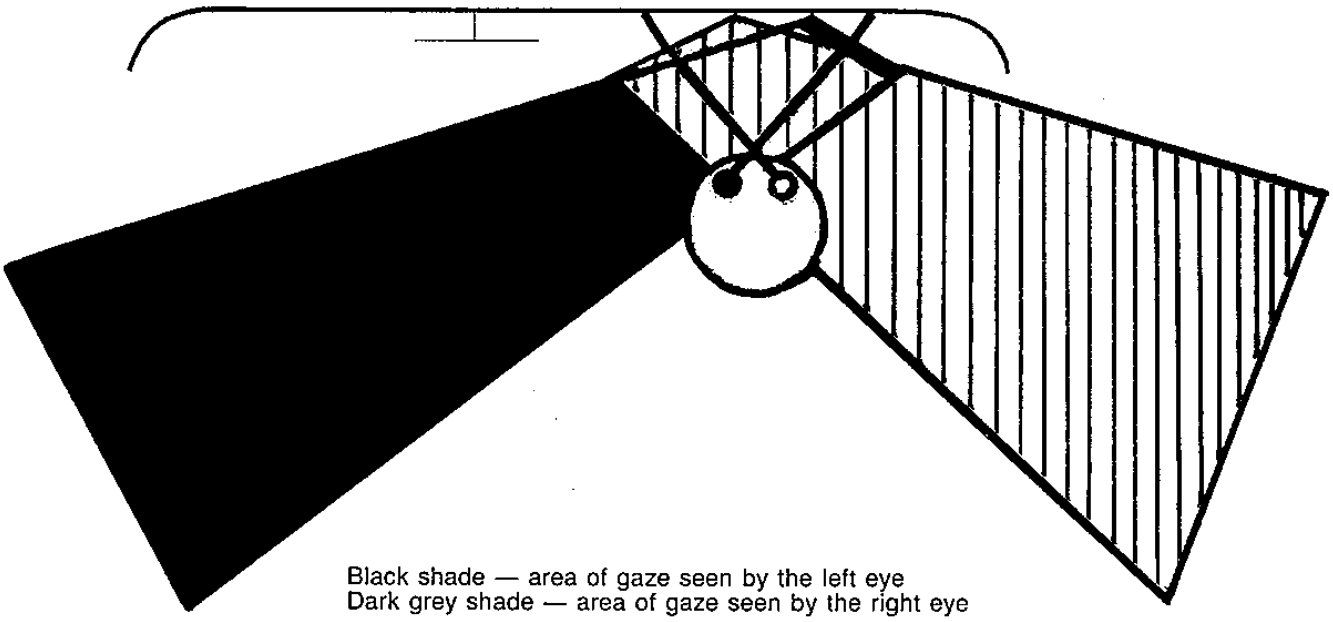


*Figure 4:* Mirrors positioned to allow appreciation of extremes of gaze without head movements.

driver's seat to enable Carolyn to work with the controls and increase her comfort.

The driving instructor followed up all the guidelines given by the orthoptist and the occupational therapist, ensuring that they were carried out during the instruction period.

To encourage Carolyn's eye movements she was set the task of practising fast fixation change e.g sitting with her back to the television and looking into a mirror to see the picture, then changing fixation to some printed material placed in front of her.

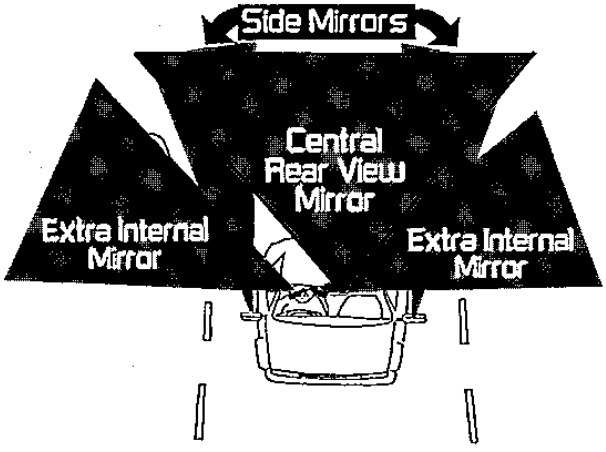


*Figure 5:* Representative of visual information gained by rear view, side mirrors and additional internal mirrors.

As part of the routine with the Driving Rehabilitation Centre, follow-up assessments were carried out with the occupational therapist present as well as the driving instructor. On one other occasion, the orthoptist was present to evaluate Carolyn's progress.

With the aid of the team approach Carolyn gained her driving licence.

## DISCUSSION

The fact that Carolyn successfully gained her driver's licence serves as a good example of team work involving the liaison between the orthoptist, the occupational therapist and the driving instructor.

This is a new area for orthoptists. Conventional skills were used to demonstrate the capabilities and limitations of a client who has many problems to overcome in achieving a personal goal: to drive a car. The orthoptist's knowledge applied to the client's need lead to a variation in assessment approaches, assessment in an environment outside the conventional clinical setting and the development of approaches which adapted the conventional driving set up to enable the client to drive safely and comfortably within the requirements of the Roads and Traffic Authority.

In addition to the benefits for the client, the orthoptist developed an additional role, which is to educate the occupational therapist on how to detect the presence of eye conditions which may limit an individual's driving skills. This has lead to a heightened understanding of the need for, and value of, orthoptic guidance on ocular function in driving.

The orthoptist's involvement with the occupational therapist has highlighted the complexity of the driving process and the need to consider the many components involved in becoming a licensed driver. The orthoptist has gained knowledge about the physical requirements for the driver and the need to integrate the ocular skills with these requirements. Liaison with the occupational therapist has lead to the development of mutual respect for each other's profession and an increased knowledge of the requirements for driving skills.

The Driving Rehabilitation team at Cumberland College includes an orthoptist when there is indication that the ocular function of a client is outside normal limits. In these situations, an orthoptic assessment is carried out and guidance provided about the effects of any existing ocular condition on driving skills. Should any orthoptic treatment be required, the client is required to seek ophthalmological assessment.

The involvement of a team whose members have expertise in recognising the components that are necessary for driving, namely the occupational therapist for physical and cognitive skills, the orthoptist for visual skills and the driving instructor for teaching the driving process. The team provides a good model for members of the public who have special needs and who wish to drive.

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