

# The Introduction of Bioptic Driving in the Netherlands

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**ABSTRACT** *Background:* In many US states, people with moderately reduced visual acuity (eg, 20/50–20/200) can legally drive with the aid of a small, spectacle-mounted (“bioptic”) telescope. We conducted a demonstration project to assess the viability of implementing bioptic driving in the Netherlands. In this article, we describe the framework of the project from conception through to realization of our primary objective—the introduction of bioptic driving as a legal option for visually impaired people in the Netherlands. *Methods:* The project was based on bioptic driving programs in the United States, which were adapted to fit into current driving training and assessment practices in the Netherlands. The project convened a consortium of organizations including the Netherlands Bureau of Driving Skills Certificates, service organizations for the visually impaired, and research departments at universities investigating driving and vision. All organizations were educated about bioptic driving and participating professionals were trained in their specific aspects of the project. Media publicity led to significant interest and helped recruitment that enabled the screening and selection of potential participants. *Outcomes:* The project demonstrated that people with moderately reduced visual acuity can be trained to achieve an adequate level of proficient and safe driving (as assessed by the local official driving licensing professionals) when using a bioptic telescope for the road conditions in the Netherlands. Based on the successful project outcomes, a request was made to the minister to allow bioptic driving in the Netherlands. This request has been accepted; the legal procedures for implementation are in process.

**KEYWORDS** Bioptic driving, fitness to drive, impaired vision, driving, license

## INTRODUCTION

Bioptic telescopes are small telescopes mounted at the top of a regular spectacle lens that are permitted as a driving aid in 36 of 51 jurisdictions in the United States.<sup>1</sup> They are used by people with moderately reduced visual acuity to enable them to see the details of distant objects such as traffic signs and street names. Most of the time the user looks through the regular spectacle lens, taking occasional glances through the telescope to examine distant objects when necessary.

The use of a bioptic telescope for driving was first suggested by William Feinbloom in 1958,<sup>2</sup> and the results of the earliest study of bioptic driving were published by Korb in 1970.<sup>3</sup> An overview of the developments of bioptic driving will be presented in a review article (Melis-Dankers, Kooijman, Brouwer, et al., in preparation).

Although bioptic driving is well established in the United States and is a rehabilitation option that has the potential to significantly improve quality of life for people with visual acuity loss,<sup>4</sup> it is currently not permitted in any country in Europe and has never been evaluated within a European setting. We designed and implemented the first demonstration project of bioptic driving in the Netherlands. The primary objective was to establish an evidence base that could be used to demonstrate the viability of introducing bioptic driving in Europe.

## **A Pilot Bioptic Driving Training Program in the Netherlands**

Building on earlier research on driving with impaired vision carried out in collaboration with the Netherlands Bureau of Driving Skills Certificates (CBR),<sup>5-8</sup> we developed a pilot bioptic driving training program in the Netherlands to determine whether visually impaired people were able to achieve satisfactory driving performance using a bioptic telescope in an on-road fitness to drive test. The purpose of this paper is to describe the process needed to set up such a demonstration project with a fair chance to get the rules changed. Of course the project had to demonstrate that bioptic drivers could be considered to be safe drivers by the local driving evaluation experts. We describe the framework of the demonstration project from conception through the realization of our primary objective—the introduction of bioptic driving as a legal option for visually impaired people in the Netherlands. Details of the assessment and training procedures used in the project, along with study results are described below (Melis-Dankers et al., this issue).

## **METHODS**

Because professionals in Europe had no prior experience with bioptic driving, the project required adequate education and training of all relevant professionals and the assurance of inclusion of all appropriate organizations and authorities. Initial reaction was frequently that bioptic driving was not feasible because traffic in the

United States was considered to be more relaxed and less aggressive than in the Netherlands.

## **Project Consortium Formation**

The project manager J. M. D. Witvliet, together with the Project Supervision Team W. H. Brouwer, B. J. M. Melis-Dankers, and A. C. Kooijman, initiated the project. They consulted with R. A. Bredewoud, head of the medical department of the CBR, regarding the prospects of bioptic driving in the Netherlands and the recommended procedures to gather convincing evidence that people with reduced visual acuity could drive safely with the aid of a bioptic telescope. A draft of the project protocol was written and professionals from all of the involved disciplines were invited to become partners in the project. In particular, the participation of the CBR was essential to assure an approach that would fit within the current practice of assessing practical fitness of people with impairments to drive. The project consortium included Viziris (Joint Societies of the Visually Impaired and Blind People in the Netherlands), CBR, the Netherlands Society of Ophthalmology, Visio, and the University of Groningen.

## **Professionals**

The roles of each of the professionals involved in the project are summarized in Table 1. To educate the collaborating professionals about bioptic driving and to train them in the various aspects of preparing visually impaired clients to become bioptic drivers, we organized an obligatory 2-day course in March 2004. This comprehensive course attended by the 20 project members addressed the theory and the practical procedures of bioptic driving, as well as the legal and social aspects of driving with impaired vision. Project members also received information and practical training about their specific role within the project, including lectures and workshops on fitting bioptic telescopes, vision and neuropsychological assessments relevant to bioptic drivers, and techniques for training patients in how to use bioptic telescopes for general and daily activities, as well as when driving.

## **Project Management**

A project of such wide scope required careful and continuous monitoring and evaluation, with mutually agreed adjustments. The supervision of this process was carried out by the project manager. The project group

**TABLE 1 Summary of professionals involved in the project**

Professional	Role	Organization
Project manager	Project supervision, assisted by project supervision team	Visio and University of Groningen
2 Counselors	Maintained a registration system of all candidates' information; main contact for the participants as well as candidates who applied for the project; maintained the continuity of communication between the participants and the project; addressed problems in cooperation with other members of the project group	Visio
2 Psychologists	Assessed speed of processing and divided attention (may be relevant to ability to use telescope while driving)	Visio
Low vision Optometrist	Fit participants with the bioptic and assessed visual function with and without the telescope	Visio
4 Orientation and mobility (O&M) instructors	Pre-driving bioptic training: training in the use of the bioptic in general mobility situations including using the bioptic as a passenger but not behind the wheel	Visio
Driving instructors	Instructors with special interests and skills in training people with limited physical or mental abilities instructed participants in driving with a bioptic	Driving schools
Driving assessment	Examiners specialized in assessing driving with special adaptations to compensate for various physical impairments	CBR

met every 2 months to synchronize the activities and the training phases of all members and to discuss intermediate results. Biannual meetings of a feedback committee assured that the development of the project complied with current practice and expectations in the involved organizations. The feedback committee consisted of members from each of the organizations in the project consortium.

## Participants

We preferred to stay close to the current vision requirements for driving in the Netherlands and the European Union (EU), requiring a decimal visual acuity of 0.5 (20/40) or better and a visual field width of at least 140° horizontally (EU: 120°). Therefore, our main inclusion criteria were a visual acuity of 0.5 (20/40) or better while using the telescope, the standard visual field requirement, and demonstration of adequate driving skills in a preliminary driving proficiency test.

Early in the project we added criteria to exclude participants with nystagmus. This was based on the driving instructors' observation that these patients had difficulty maintaining stable steering. Also, subjects who showed a "low aptitude for driving" were excluded. The reason for adding these criteria was to limit the number of driving lessons a participant needed to prepare for a successful driving test.

## Project Phases and Protocols

The bioptic driving training project included 10 phases, summarized in Table 2. The following sources were used to guide protocol development: reports of bioptic driving training programs in the United States; observation of the long-standing bioptic driving training program at the School of Optometry, University of California, Berkeley; and discussions with experts in the field and bioptic users during the International Bioptic Driving Conference 2004 in London, United Kingdom. The project's procedures were designed to fit within current vision rehabilitation and driving training and assessment practices in the Netherlands. Protocols were developed for each phase of the project. Additionally, entrance and exit criteria were defined for each phase, determining whether a participant could progress to the next phase.

### Phase 1: Press Releases and Recruitment

We established a dedicated telephone line and an e-mail address to enable potential participants, interested ophthalmologists, optometrists, and journalists to obtain up-to-date information about the project. Organizations of visually impaired people were informed about the project, either by information leaflets or by

**TABLE 2 Summary of the 10 phases of the project**

Phase	Description
1	Press releases to raise public awareness and aid recruitment
2	Candidate screening, based on information provided by the candidate. Selected candidates who passed the screening and were interested in participating were registered
3	Selected candidates received written information about all aspects of the project, and signed an informed consent to be included as a participant in the study
4	Functional assessment, including evaluation with clip-on bioptic telescope and preliminary driving evaluation
5	Bioptic telescope fitting
6	Pre-driving bioptic training
7	Driving training
8	Driving assessment
9	Data processing and analysis
10	Advice to the Ministry

oral presentations, and were asked to inform potential candidates about the project. Because many potential candidates were not in contact with any of these organizations, we used press releases to gain newspaper, radio, and TV exposure. The project manager coordinated all communications with journalists. The publicity in the newspapers, radio, and TV also served to inform the general public about driving with vision impairment and the opportunity for drivers with reduced visual acuity to use bioptic telescopes.

## Phase 2: Screening of Potential Candidates

All people who expressed interest in participating in the project were called by one of the counselors. The nature of bioptic driving was explained and they were told about the vision criteria for inclusion, the phases of the project, and the criteria to advance to consecutive phases. It was very important that the candidates realized the high investments in time and money required for participation. Before candidates decided to participate, the counselor also ensured that they understood that a positive recommendation in the final driving test might not provide them with a legal driver's license unless the legal rules were changed to allow bioptic driving. Following completion of the project, the counselors remained available for the participants while the new rules to allow driving with a bioptic were under consideration.

During the telephone interviews we determined that 30% of callers did not meet the inclusion criteria, and an additional 20% were not interested in participation once they had heard the details. The remaining 160 persons were registered as candidates.

## Phases 3–9

Details of phases 3–9 of the protocol are described B (Melis-Dankers et al., this issue).

## Project Funding

All expenses related to the assessments and the O&M training were paid by Visio, as well as the travel expenses to the driving lessons, but the individual driving lessons and the bioptic device had to be paid for by the participants themselves. In some cases, participants were reimbursed by their health insurance for the cost of the bioptic. The fitness to drive test of the bioptic driver was paid for by the state.

## RESULTS

Fourteen of them, resulting in 36 ( $\approx 22\%$ ) of the registered candidates completed the training program and 14 of them took the fitness-to-drive test. At the end of the project, 9 out of the 36 (25%) demonstrated satisfactory driving safety and fluency with a bioptic telescope, sufficient to warrant a driver's license.

## Implementation of Bioptic Driving into the Legal Rules

In September 2006, we sent a report describing the study results, titled "Fitness to drive with the use of a bioptic telescope,"<sup>9</sup> to the Minister of Traffic, Public Works and Water Management. The report also recommended a revision of the current rules for vision requirements to include a conditional opportunity to use a bioptic telescope while driving. Included in the

**Translation of the Revised wording of paragraph 3.2.1 of the “Rules Fitness requirements 2000” (Regeling eisen geschiktheid 2000)**

3.2.1 Corrected visual acuity

- a. Group 1<sup>a</sup>: The visual acuity of both eyes together, with correction if needed, should be 0.5 or better. In the case that the applicant has lost visual function of one eye completely, or uses only one eye (for example, caused by diplopia), the required visual acuity, with correction if needed, should be 0.6 or better.

*For a group 1 driver's license, drivers with visual acuity between 0.125 and < 0.5 will be allowed to use a monocular bioptic telescope to comply with the visual acuity requirement in 3.2.1.a. They can be stated to be fit to drive if they demonstrate the ability to safely and fluently drive in traffic with the use of this device during a fitness to drive test by the CBR. Driving certification will be limited to driving during daylight.*

*The limitation to daylight driving can be removed when the driver demonstrates the ability to safely and fluently drive in traffic at night with the use of this device during an auxiliary fitness to drive test by the CBR. It is not possible to apply for this auxiliary driving test within the first year after the aforementioned driving test.*

*A subject can only apply for the driving test if they completed a CBR-approved training program to use the bioptic telescope and can present a report of a recent ophthalmic assessment including cause, prognosis, and stability of the reduced visual acuity. This report is used to determine the period of the driver's license and other possible restrictions. Type and severity of the disease causing the reduced acuity can be related to problems in night driving by decreased light sensitivity or increased stray light disability. In case of doubt by the ophthalmic assessment, additional tests with an adaptometer and/or a C-Quant stray light meter have to be done. In compliance with article 3.2.5, the maximum decrease of light sensitivity allowed is 1 log unit. The maximum stray light value allowed is 1.5 log unit to be considered fit to drive in twilight and at night with the use of a bioptic telescope.*

**FIGURE 1** Translation of the revised explanation of the rules to enable bioptic driving (visual acuity values are given in decimal form: 0.5 = 20/40; 0.125 = 20/160). <sup>a</sup>Group 1 indicates drivers of motorcycles and private cars.

report was a proposed revised interpretation of the rule relating to visual acuity requirements (Figure 1). Based on the report, the Minister has decided that “bioptic driving” will be allowed in the Netherlands under the conditions described in the revised interpretation of the

rules. The official legal texts of the decision and regulations are expected to be published in the *Staatscourant* (state newspaper) in 2007. This expected publication will be the official legal act enabling a driver's license to be issued to a bioptic driver in the Netherlands.

## DISCUSSION

We designed and executed a demonstration project that has validated the viability of introducing bioptic driving in the Netherlands. We found that 25% of carefully selected candidates could be trained and were able to demonstrate satisfactory driving safety and fluency with a bioptic telescope to warrant a driver's license. All participating professionals of the various disciplines were able to carry out their respective part of the program within their regular work schedule, and the final test of practical fitness to drive was the regular test used by the CBR to evaluate people with other impairments.

Though rather uncommon in a study, we introduced 2 major changes to the exclusion criteria during the execution of the project. We added "nystagmus" and "low aptitude to drive" as exclusion criteria that might bias our study population toward participants who could achieve higher success rates. The decision to exclude people with nystagmus was based on the observations of our driving instructors. However, there is no evidence in the bioptic driving literature that people with nystagmus require more driving training or have particular difficulty maintaining a stable lane position (as was suggested by our driving instructors); evaluating these aspects was beyond the scope of our study. In fact, nystagmus is a very common diagnosis among bioptic drivers in the United States. When evaluating the suitability of visually impaired clients for bioptic driving, it may be helpful to advise that clients with previous driving experience take a preliminary driving test to evaluate their general driving skills. If the result of this pretest suggests a low aptitude to drive, the client might want to reconsider whether to proceed with bioptic training. However, a low aptitude to drive should not necessarily be considered as an exclusion criterion; a client, especially one with no prior driving experience, might still be a successful bioptic driver after additional driving skills training.

Our project demonstrated that some drivers with impaired vision can be trained to an adequate level of proficient and safe bioptic driving in the roads and traffic conditions common in a European country. This first

bioptic driving project in the EU might serve as a template for initiatives to introduce bioptic driving in other countries.

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