Chapter 6

Effects of CCTV training on quality of life

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Abstract

Purpose
In addition to performance-based measures, vision-related quality of life (QOL) and other subjective measures of psychosocial functioning are considered important outcomes of training in the visually impaired. In a multicenter masked randomized controlled trial, subjective effects of training in the use of closed-circuit televisions (CCTV) were investigated.

Methods
Patients (n = 122) were randomized either to a treatment group that received usual delivery instructions from the supplier combined with concise outpatient training, or to a control group that received delivery instructions only. Subjective outcomes were the Low Vision Quality-of-Life Questionnaire (LVQOL), EuroQOL 5 Dimensions, Adaptation to Age-Related Vision Loss and the Center of Epidemiologic Studies Depression scales. Linear mixed-models, were used to investigate treatment effects. Differential effects of patient characteristics were studied by implementing higher order interactions into the models.

Results
From baseline to follow-up, all patients perceived significantly less problems on the reading and fine work dimension (-28.8 points; p < 0.001) and the adjustment dimension (-4.67 points; p = 0.04) of the LVQOL. However, no treatment effect was found based on the intention-to-treat analysis.

Conclusions
This study demonstrates the effect of having received a CCTV on two vision-related QOL dimensions; however, outpatient training in the use of CCTVs had no additional value.
Introduction

In clinical practice, it is often suggested that the need for rehabilitation programs for visually impaired adults is self-evident. However, to develop an understanding of effective healthcare interventions for visually impaired patients, and to work towards the development of integrated and effective care, it is necessary to draw on relevant scientific evidence. An important reason for measuring health-related quality of life (QOL), also in low-vision rehabilitation, is the growing interest of governments and health-insurance companies in these outcome measures as parameters for quality of care.\(^1\)\(^2\)

In multidisciplinary rehabilitation centers (MRCs), the available training programs are often conducted by occupational therapists who specialize in working with low-vision patients. Reading is one of the major rehabilitation needs,\(^3\) and there are training programs that aim to teach visually impaired persons how to use low-vision aids (LVAs), such as magnifiers and closed-circuit televisions (CCTVs). A CCTV electronically enhances vision,\(^4\) is mainly prescribed to patients with severe low vision,\(^5\) and may contribute to overcome reading disability. Training has shown to improve CCTV reading performance.\(^6\)\(^-\)\(^15\) In addition to reading performance, it is important to investigate the outcomes of training on subjective measures such as quality of life (QOL), depression or adjustment to vision loss. In general, there is little evidence for the effect of low-vision rehabilitation or specific skills training (such as learning how to use a CCTV) on these outcome measures.\(^16\)\(^-\)\(^20\) Furthermore, better scores on these types of outcomes may indirectly be the result of improved ability to perform certain skills (i.e., reading). Being able to read again may give a visually impaired person who lost this skill a sense of retrieved self-supportiveness, and may actually contribute to prolonged independent living. However, better scores on subjective outcomes may also partially reflect the attention given by rehabilitation workers who may (together with reading skills training) provide information on how to cope with a visual impairment and empathize with the visually impaired person, which may in turn have therapeutic value. Another reason to investigate subjective outcome measures is that feelings of depression may interfere with low-vision rehabilitation outcomes. Depression can affect a person’s learning capacity or ability to retain information, and may result in a disturbance of thought processes, difficulty in making decisions, or difficulty in orienting towards achieving goals.\(^21\) Therefore, depression may interact with training and other subjective outcomes (e.g., vision-related QOL).

A standard training protocol has recently been developed for and with trainers involved with CCTV training in the three main MRCs in the Netherlands.\(^22\) In addition to previously reported performance-based measures (i.e., reading performance),\(^23\) the purpose of the present study was to investigate the effect of this outpatient training program on vision-related QOL and other subjective outcome measures in a multicenter randomized controlled trial (RCT).
Methods

Design and patients
In the present study, a multicenter masked RCT was conducted to estimate the treatment effect of training in the use of CCTVs. The study focused on CCTVs with stand-mounted cameras and/or displays, since these are the types that are most commonly prescribed in the Netherlands. In addition to stand-mounted CCTVs, there are ‘mouse’ style CCTVs and CCTVs with handheld or head-mounted cameras. A detailed description of the methodology of the trial, the randomization process, the training protocol (intervention), and patient characteristics are provided elsewhere and are summarized here. At nine sites of the three main MRC organizations in the Netherlands, low-vision specialists screened patients for eligibility and invited them to participate in the study. Eligible patients were aged ≥18 years, had a good understanding of the Dutch language, and had no absolute indications of cognitive deficits. They received an envelope with study information, an informed consent form, and a questionnaire in large print. Informed consent was obtained from all participants. The study protocol was approved by the Medical Ethics Committee of the VU University Medical Center in Amsterdam, and conducted according to the principles of the Declaration of Helsinki.

The questionnaire (baseline measurement) was administered independently by the participants or with help from significant others (e.g., a spouse, family member or friend) or a research assistant. The questionnaire was returned before the delivery of the CCTV. It consisted of socio-demographic variables and different subjective outcome measures. Participants were then randomized into a treatment or control group. As soon as possible after the delivery of the CCTV (usually within two weeks), a research assistant conducted the first home visit to measure reading and task performance. Reading performance was assessed with the Dutch version of the Radner Reading Charts, which have shown a high reliability in patients with normal and low vision. Task performance in daily living was assessed with the Dutch version of the Activity Inventory. Results on these outcome measures are reported separately. Three months later, when participants were visited for the follow-up measurements on reading and task performance, the questionnaire was distributed again to be filled in at a convenient moment. If necessary, the research assistant or proxy helped the participant with administration. Therefore, all patients had received and used their CCTV at the time they filled in the follow-up questionnaire.

Intervention
All participants received the usual instructions from the various suppliers when the CCTV was delivered. The control group received only these instructions and no further training. The treatment group received the usual instructions and, in addition, received training in the use of the device. At the time the study was conducted, the exact content of the instructions suppliers provided when they delivered CCTVs to
patients’ homes was unknown. Information about these instructions was obtained from the participants. Suppliers were not informed about the study, to avoid them starting to over perform on their usual instructions. Therefore, participants were expected to receive care as usual. The control group was offered training after the follow-up measurement had been performed (3 months after baseline), but this was often declined by participants. The protocol was based on scientific literature, and on the experience/expertise of the trainers and clinical physicists (with whom focus group discussions were held). The final protocol, which was approved by the trainers, focused on various aspects and consists of the following chapters: ergonomics (e.g., posture, working distance); basic CCTV operating instructions (e.g., on/off switch, magnification, image contrast, tracking skills); reading (e.g., basic assignments such as reading words and small sentences, reading newspapers, books, magazines, postcards, medicine labels); looking at pictures and photographs; writing (e.g., basic writing assignments, writing on virgin and zoned paper, signing checks, filling in forms); hobbies and other skills (e.g., painting, sewing, drawing). Throughout the training program, participants practiced with the easier assignments before they tried the more difficult ones. Hands-on training was given with direct feedback to the participants. The low-vision therapists (usually occupational therapists) scored the patient’s progression by registering all the assignments patients were able to perform and those considered difficult. The duration of active training in one session was 60 minutes and was separated by a break of 15-30 minutes. The frequency of training was once a week. The amount of training depended on the learning strategies of the individual patients. Patients were trained until they had practiced with every assignment, or until no further improvement in reading ability was to be expected.

In the present study, the mean number of training sessions in the training group was 2 (range 1-7); 73% received one or two training sessions, 11% three sessions and 16% four to seven sessions.

Outcome measures

In addition to reading and task performance in daily living, the focus of the present report is on vision-related QOL measured with the Low Vision Quality Of Life questionnaire (LVQOL). Other subjective outcome measures (i.e., adjustment to vision loss, depressive symptoms, and health-related QOL) were measured with the Adjustment to age-related Vision Loss (AVL) scale, the Center for Epidemiological Studies Depression scale (CES-D) and the EuroQOL 5-Dimensions questionnaire (EQ5D). These questionnaires all have been translated in Dutch and the Dutch versions have been validated.

Vision-related QOL was the primary outcome of this report and was measured with the LVQOL. The items on the LVQOL mainly relate to difficulties persons have in performing certain activities due to their visual disability, ranked on a 6-point Likert-type scale, with 0 being ‘No problem’ and 5 being ‘Not able because of vision’. In previous validation studies, dimensionality was investigated and an item response
theory (IRT) calibration process was followed to study the item performance of the LVQOL. The Dutch-version-LVQOL now consists of four dimensions, namely ‘Basic aspects’, ‘Mobility’, ‘Adjustment,’ and ‘Reading and fine work’. Four items were omitted from the questionnaire because of similar factor loadings on different factors and differential item functioning (e.g., between subgroups with different administration modes or gender. The adapted 21-item LVQOL was found to be appropriate for use in heterogeneous populations of visually impaired patients. In the present study, because effects on Mobility of CCTV training were not expected, this dimension was not taken into account. To facilitate interpretation of the results, it was chosen to report summary scores of the four domains (range in each dimension 0-100) instead of logits, which are used in IRT. Beforehand, the reliability of the LVQOL dimensions in this population was investigated at baseline. Cronbach’s alpha was 0.77 for Basic aspects (5 items), 0.67 for Adjustment (4 items) and 0.86 for Reading and fine work (7 items), reflecting satisfactory internal consistency reliability.

The CES-D consists of 20 questions reflecting possible depressive symptoms, such as depressed mood; loss of interest; regular crying; fatigue; eating, weight, and sleeping problems. A score ≥16 reflects clinically significant depressive symptoms (range 0-60). Cronbach’s alpha was 0.90.

The translated AVL consists of 14 items reflecting psychosocial adaptation to age-related vision loss, such as positive attitudes towards rehabilitation potential, and continuing relationships with family and friends. A score <14 reflects significant adaptation problems (range 0-42). Cronbach’s alpha was 0.79.

The EQ-5D is considered to be a generic measure of health status or ‘health-related quality of life’ and consists of five questions covering the dimensions ‘Mobility’ (walking about); ‘Self-care’ (washing oneself or getting dressed); ‘Usual activities’ (work, study, household, family, or leisure); ‘Pain or discomfort;’ and ‘Anxiety or depression’. Each dimension has three levels to describe the severity of problems, namely: 1) No problems, 2) Moderate problems, and 3) Severe problems. For every individual a single health state value, or utility, was calculated. These values are set on a scale ranging from 0 (worse than death) to 1 (perfect health). The EQ-5D has been extensively validated.

Statistical analysis
Differences between baseline characteristics of patients in both trial arms were analysed with $\chi^2$ tests and independent samples t-tests. Linear mixed models were used to estimate the treatment effects on the outcome measures. The treatment effect was defined as the treatment allocation (training or control) by time (baseline or follow-up) interaction. As data at both time points add to the preciseness of estimates, all data on measurements made at baseline (n=111) and follow-up (n=92) were included in the mixed models. Analysis was based on the method of maximum
likelihood. Assuming follow-up data were missing at random, this method yielded unbiased estimates. These ‘direct likelihood’ methods have been recommended for outcome estimation in trials instead of ‘complete case analyses’ or other methods in which data have to be imputed or deleted.37;38

Analysis was based on the intention-to-treat principle. However, to compensate for patients that did not receive the intervention as allocated, analysis was repeated according to the per-protocol principle (rearranging untreated patients from the treatment to the control group and vice versa).

Although the randomization process would have ruled out any differences between the treatment and control group, the outcome measures might interact with a variety of factors such as age, gender, visual acuity, presence of co-morbidity, adverse events in the past year, use of other LVAs, previous visits to MRCs, or training-related factors. These factors were further investigated by adding higher order interactions to the mixed models one at a time (i.e., to investigate differential effects). Furthermore, the primary outcome measures (i.e., reading acuity, reading speed, technical reading skills, and column-tracking time) were added to the mixed model analysis, because these objective outcomes may also interact with the subjective outcomes. Moreover, only interactions with a p <0.01 were considered statistically significant to correct for multiple testing. In addition to analyzing treatment effects, linear mixed models were used to estimate secondary effects of reading with and without a CCTV or changes in QOL from baseline to follow-up. Effect sizes were calculated for the treatment effects.39 All analyses were performed in SPSS version 15.0. To make objective measurements possible, investigators analyzing the data were unaware of the treatment allocation, in contrast to participants and trainers.
Results

Response and patients
A total of 168 patients were screened for eligibility: three patients were ineligible, one patient died before consenting, and 42 patients declined participation (Figure 1). Although participants were frequently reminded to return their questionnaire, not all participants committed. Of 122 randomized patients, 111 filled in the baseline and 92 the follow-up questionnaire, of which three did not have baseline measurements. Therefore, the analyses were performed on data of 114 patients (93.4%). The mean delivery time of CCTVs was 6.2 weeks; 89% of patients received instructions from the supplier. On a Likert-type scale these instructions were perceived as ‘good’ or ‘very good’ by 88% of these patients. Table 1 presents the baseline patient characteristics; there were no significant differences between the two groups.

Figure 1. Chart showing the progress of participants through the phases of the trial.
Table 1. Baseline characteristics of the study population by treatment allocation.

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>Treatment group (n=62)</th>
<th>Control group (n=60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age* (years): Mean (SD)</td>
<td>75.6 (12.1); range [38.9 - 94.4]</td>
<td>79.1 (12.4); range [34.4 - 95.7]</td>
</tr>
<tr>
<td>Gender*: % female</td>
<td>58.1</td>
<td>58.3</td>
</tr>
<tr>
<td>Education* (years): Mean (SD)</td>
<td>9.8 (2.8); range [5 - 16]</td>
<td>9.9 (3.0); range [6 - 16]</td>
</tr>
<tr>
<td>LogMAR visual acuity†: Mean (SD)</td>
<td>0.89 (0.37); range [0.05 - 2.15]</td>
<td>0.85 (0.31); range [0.22 - 1.52]</td>
</tr>
<tr>
<td>Primary cause of visual impairment‡: %MD</td>
<td>61.4</td>
<td>74.5</td>
</tr>
<tr>
<td>Marital status*: % living alone</td>
<td>46.3</td>
<td>50.9</td>
</tr>
<tr>
<td>Independent living*: %</td>
<td>85.7</td>
<td>83.6</td>
</tr>
<tr>
<td>Comorbidity*: % with co-morbid conditions</td>
<td>69.1</td>
<td>74.5</td>
</tr>
<tr>
<td>Stressful life event past year*: %</td>
<td>45.5</td>
<td>30.4</td>
</tr>
<tr>
<td>CES-D*: Mean (SD) range [0-60]</td>
<td>14.6 (9.9)</td>
<td>13.2 (9.0)</td>
</tr>
<tr>
<td>EQ-5D*: Mean (SD) range [0-1]</td>
<td>0.76 (0.22)</td>
<td>0.77 (0.19)</td>
</tr>
<tr>
<td>LVQOL*: Mean (SD) range [0-100]</td>
<td>59.7 (17.1)</td>
<td>57.6 (19.0)</td>
</tr>
<tr>
<td>- Basic aspects</td>
<td>39.3 (21.0)</td>
<td>35.7 (23.6)</td>
</tr>
<tr>
<td>- Adjustment</td>
<td>70.0 (18.8)</td>
<td>62.5 (21.7)</td>
</tr>
<tr>
<td>- Reading and fine work</td>
<td>18.4 (6.9)</td>
<td>21.6 (14.8)</td>
</tr>
</tbody>
</table>

* Age, gender, education level, comorbidity, and other relevant characteristics were assessed by self-report.
† Visual acuity was assessed at the low vision examination and device evaluation.
‡ Disease specifics were taken from the ophthalmologist’s referral letter, which was in the patient files at the MRCs.

Outcomes of CCTV training

Table 2 shows the treatment effect based on the intention-to-treat analysis. The treatment effect is the mean difference from baseline to follow-up in the treatment group compared with the mean difference from baseline to follow-up in the control group, (i.e., [treatment group follow-up minus baseline values] minus [control group follow-up minus baseline values]). Although patients from the treatment group perceived less problems on each of the dimensions of the LVQOL, showed less depressive symptoms and were more adjusted to vision loss than patients in the control group, treatment effects were not significant.
Table 2. Treatment effects based on the intention-to-treat principle of CCTV training versus no training

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Baseline measurement Treatment group</th>
<th>Follow-up measurement Treatment group</th>
<th>Difference follow-up vs. baseline Treatment group</th>
<th>Baseline measurement Control group</th>
<th>Follow-up measurement Control group</th>
<th>Difference follow-up vs. baseline Control group</th>
<th>Treatment Effect*</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVQOL: range [0-100]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Basic aspects</td>
<td>59.78</td>
<td>54.70</td>
<td>-5.08</td>
<td>57.18</td>
<td>58.32</td>
<td>1.14</td>
<td>-6.22 (p=0.07)</td>
<td>-0.34</td>
</tr>
<tr>
<td>• Adjustment</td>
<td>39.81</td>
<td>31.87</td>
<td>-7.94</td>
<td>35.81</td>
<td>34.42</td>
<td>-1.39</td>
<td>-6.56 (p=0.14)</td>
<td>-0.30</td>
</tr>
<tr>
<td>• Reading and fine work</td>
<td>69.91</td>
<td>37.30</td>
<td>-32.61</td>
<td>62.23</td>
<td>37.18</td>
<td>-25.05</td>
<td>-6.56 (p=0.23)</td>
<td>-0.32</td>
</tr>
<tr>
<td>CES-D: range [0-60]</td>
<td>14.59</td>
<td>12.38</td>
<td>-2.21</td>
<td>13.25</td>
<td>13.16</td>
<td>-0.09</td>
<td>-2.42 (p=0.13)</td>
<td>-0.24</td>
</tr>
<tr>
<td>AVL: range [0-42]</td>
<td>18.30</td>
<td>21.00</td>
<td>2.70</td>
<td>21.60</td>
<td>20.86</td>
<td>-0.74</td>
<td>3.44 (p=0.13)</td>
<td>0.36</td>
</tr>
<tr>
<td>EQ-5D: range [0-1]</td>
<td>0.76</td>
<td>0.78</td>
<td>0.02</td>
<td>0.76</td>
<td>0.73</td>
<td>-0.03</td>
<td>0.05 (p=0.15)</td>
<td>0.26</td>
</tr>
</tbody>
</table>

* The treatment effect is the mean difference from baseline to follow-up in the treatment group compared with the mean difference from baseline to follow-up in the control group (i.e., [treatment group follow-up minus baseline values] minus [control group follow-up minus baseline values]). The higher the score on the LVQOL the more problems on vision-related QOL, thus the negative values in column 4 and 7 mean improvement and the positive values deterioration. The higher the score on the CES-D, the more depressive symptoms (negative values mean improvement); the higher the score on the AVL, the less adaptation problems (positive values mean improvement). The higher the score on the EQ5D, the better the perceived health-related QOL (positive values mean improvement).

However, per-protocol analysis revealed a positive treatment effect on health-related QOL. Patients in the treatment group perceived an improvement in health status, whereas patients in the control group showed a decline in health-related QOL. In the per-protocol analysis, the treatment effect was 0.09 (p=0.01). Of all variables that were considered, only the number of reading mistakes interacted with a treatment effect. The more reading mistakes made, the lower the score on health-related QOL (-0.11 per extra mistake; p <0.01). None of the other factors significantly altered the effect or the direction of the effect.

As shown in Table 3, the total group (n=114) showed significant improvement on the Adjustment and Reading and fine work dimensions of the LVQOL from baseline (patients had not yet received their CCTV) to follow-up (patients had received and used their CCTV). The effect on the latter dimension was large (Figure 2). This dimension consisted of questions regarding difficulty with reading large, normal and small print; reading handwriting; and writing. The mean sum-score of all patients at baseline was 66.0 out of a maximum score of 100 (indicating severe problems), compared to 37.2
points at follow-up (few to moderate problems, mean difference -28.8; p <0.001). On the Adjustment dimension the mean difference was -4.67; (p=0.04).

Table 3. QOL with and without CCTV, data of the total group.

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>QOL without CCTV (mean baseline and follow-up)</th>
<th>QOL with CCTV (mean baseline and follow-up)</th>
<th>Difference between all follow-up and all baseline measurements (MD*)</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVQOL:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Basic aspects</td>
<td>58.48</td>
<td>56.51</td>
<td>-1.97 (p=0.26)</td>
<td>-0.11</td>
</tr>
<tr>
<td>• Adjustment</td>
<td>37.81</td>
<td>33.15</td>
<td>-4.67 (p=0.04)</td>
<td>-0.21</td>
</tr>
<tr>
<td>• Reading and fine work</td>
<td>66.07</td>
<td>37.24</td>
<td>-28.83 (p &lt;0.001)</td>
<td>-1.20</td>
</tr>
<tr>
<td>CES-D:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• range [0-60]</td>
<td>13.92</td>
<td>12.72</td>
<td>-1.15 (p=0.16)</td>
<td>-0.13</td>
</tr>
<tr>
<td>AVL:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• range [0-42]</td>
<td>19.95</td>
<td>20.93</td>
<td>0.97 (p=0.39)</td>
<td>0.1</td>
</tr>
<tr>
<td>EQ-5D:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• range [0-1]</td>
<td>0.76</td>
<td>0.76</td>
<td>-0.002 (p=0.88)</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

Effect sizes are expressed in the dimension of measurement.

*MD = mean difference between all follow-up measurements (patients had used their CCTV) and all baseline measurements (patients had not yet received their CCTV); the difference was interpreted as the effect of receiving and using a CCTV.

Figure 2. Reading and fine work dimension scores in both treatment arms.

Dots on the X and Y axes represent Reading and fine work scores for patients with a missing value either at baseline or at follow-up.
Discussion

The present study investigated the effect of CCTV training on vision-related QOL and other subjective outcome measures. The baseline questionnaire investigated QOL without CCTV, whereas at follow-up QOL was investigated for patients who did or did not receive training using their CCTV. Although there was a large effect from baseline (no CCTV) to follow-up (patients received and used their CCTV), intention-to-treat analysis did not yield effects of training in the use of the device. However, when corrected for patients that did not receive the intervention as assigned (per-protocol analysis), CCTV training proved to be effective on health-related QOL. Training seemed to have a protective effect on a decline in health-related QOL. However, the per-protocol results should be interpreted with caution, because the advantages of randomization are lost once deliberate changes are made to the initial random allocation. Furthermore, bearing in mind an earlier report on the primary performance-based outcome measures of this RCT (i.e., no treatment effect was found on reading performance outcomes), one might not expect a treatment effect on this subjective outcome. That is, if reading performance was significantly better in the treatment group compared with the control group, one might also expect a difference in treatment effect on QOL, as improvement on objective outcomes usually precedes improvement on subjective outcomes. However, there was no effect of treatment on the objective outcomes. Moreover, the training program is a specific skills training that focused on reading and not on health-related aspects such as those found in the EQ5D. Therefore, it might be assumed that mechanisms other than reading performance may have contributed to the treatment effect, such as attention given by the trainer (i.e., a Hawthorne effect). However, Reeves et al. did not find such an effect between patients who received conventional low-vision rehabilitation, or low-vision rehabilitation enhanced by home visits from a rehabilitation officer or a community care worker (the latter served as a control for contact time with patients). Not offering placebo-training might be a limitation of the study, in future studies, exploring the long-term effect of attention of and conversation with a rehabilitation worker may be warranted.

Furthermore, there was a differential effect of the number of reading mistakes on health-related QOL (i.e., making fewer mistakes seemed to protect patients from a decline in health-related QOL). It is possible that patients were slightly anxious during the performance measures, which may have biased the results. However, the number of mistakes did not interact with any of the other outcome measures.

The largest effect of the present study was the effect from baseline (no CCTV) to follow-up (patients received and used their CCTV) on the Reading and fine work dimension of the LVQOL. As a difference between the treatment and control group was not found, but a statistical significant improvement in vision-related quality of life from baseline to follow-up was found, it was assumed the impact of receiving and
using a CCTV or possibly of the instructions by the supplier was measured. Study findings seem to agree with the positive psychological impact of CCTV devices Strong et al.\textsuperscript{42} and Huber et al.\textsuperscript{43} found in patients receiving a CCTV without training in its use. Receiving and using a CCTV seems to contribute to improved subjective reading ability, which is consistent with results from the performance-based outcomes of this trial. Reading performance and task performance in daily living improved significantly when CCTV performance was compared to performance without CCTV. Also Mintz et al.\textsuperscript{44} state that one advantage of the CCTV over optical aids is that no specific training is required in its use other than simple technical skills. In this study, most patients (89\%) received basic instructions from suppliers delivering CCTVs and those were well received by many patients. Therefore, such instructions, in addition to effectively prescribing a CCTV to visually impaired patients, might be sufficient to improve reading performance and QOL.

In the present study, a small but significant effect of prescribing a CCTV was found on the Adjustment dimension of the LVQOL; however, this was not confirmed with improvement on the Adaptation to age-related Vision Loss scale. Furthermore, in a previous longitudinal study, the evidence of low-vision rehabilitation given by multi-disciplinary services showed an improvement in the Reading domain of vision-related QOL up to 1 year after rehabilitation, whereas the other domains, such as Adjustment, did not improve.\textsuperscript{30}

For rehabilitation practices, study results may imply that a thorough CCTV training may not be necessary, as the largest improvement in QOL was reflected in receiving the device. However, the lack of a treatment effect may be because the patients were aware of the treatment allocation, which may have led patients in the control group to practice more than they would have done without this study, as they knew they would be retested after 3 months. Furthermore, there is a possibility that patients have mentioned the ongoing trial to their CCTV suppliers, which may have resulted in a smaller treatment effect due to over performance by the suppliers. However, a treatment effect was still expected as offering extended training in addition to basic instructions (based on the delivery instructions as offered in the private sector), increased the treatment effect in the study by Goodrich et al.\textsuperscript{10} Scheduling a test to assess reading performance may be an equally effective (and cost-effective) option for rehabilitation centers. In the future, all patients who receive a CCTV could be contacted to establish that the delivery instruction was given and that they know how to operate the CCTV. This check may reveal that a maximum of 1 out of 4-5 patients requires additional help. The consensus-based training protocol may still provide an useful training strategy to effectively teach those patients how to use the CCTV. Goodrich et al. raised the concern that not providing CCTV training is an unethical practice because treatment of demonstrable value is being withheld from the patient.\textsuperscript{45} Their study compared a number of training sessions and durations on reading performance, but no control group was included. Combining the primary and secondary outcomes of
the present RCT, it may be concluded that the ‘demonstrable value’ of CCTV training is not enough and that empirical evidence now shows that training in the use of this device does not have additional value over delivery instructions and the patients practicing on their own. Also, Reeves et al. claim that one should be wary of proposing low-vision rehabilitation interventions without evidence of effectiveness.41 The CCTV training in the study of Goodrich et al. was given in an inpatient setting, whereas this study investigated an outpatient program. Outpatient rehabilitation centers typically provide minimal reading training compared to inpatient centers,7 which may have caused the differences in results. Supporting this study’s results, Pearce et al. found that functional ability improved by prescribing low-vision aids, but that an additional visit for device handling training resulted in no further improvement in self-reported difficulty with daily visual tasks, measured with Massof’s Activity Inventory46,47 at three time points (before prescribing the aids, and 1 and 3 months after the low-vision device evaluation).48 In this study an extra QOL measurement after delivery of the CCTV was considered at the first home visit, to distinguish the actual effect of prescribing a CCTV from the treatment effect. However, to limit patient burden, it was decided to concentrate on the primary outcomes during the first home visit. This approach is in line with the study of Lagrow et al., which showed that improvement in reading performance (which was considered to precede improvement in QOL) was mainly initiated when training was started and not by using the CCTV without training.14 Therefore, it seems that a difference between the treatment and control group at the follow-up measurement was to be expected.

**Conclusion**

Since there is no evidence that CCTV training has a clear positive effect, these costs could be invested in other rehabilitation programs or services that meet other rehabilitation needs of this group of patients. For this reason, rehabilitation centers may consider reallocating part of their funds.
References


