

## ORIGINAL ARTICLE

# Effect of hand-eye coordination and daily living activities' training on quality of life and functional vision in students with low vision

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**Purpose:** The study aimed to evaluate the effect of hand-eye coordination and daily living activities' training on quality of life and functional vision for students with low vision.

**Methods:** The study included 40 students with low vision studying in visual impairment schools in Ankara, and their mean age was  $10.88 \pm 2.17$  years. The Low Vision Quality of Life Questionnaire and LV Prasad- Functional Vision Questionnaire were applied to the students. Students were trained individually according to their visual acuity levels for hand-eye coordination and daily living activities in their schools according to the problems that they mentioned on questionnaires applied before intervention. All questionnaires were repeated after the intervention.

**Results:** When compared with the questionnaire results before and after intervention, only reading and fine work sections of the subtitles of the quality of life questionnaire were found to be statistically significant ( $p < 0.05$ ). Functional vision was not differed significantly after the intervention ( $p > 0.05$ ).

**Conclusion:** Quality of life and functional vision depend on different parameters besides the hand-eye coordination and daily living activities. Therefore, we believed that in addition to the program used in the training parameters; the intervention include the kinesthesia as sensory function, mobility as a physical function, orientation and communication as a cognitive function and academic skills training can have a positive effect on the quality of life and functional vision.

**Keywords:** Activities of daily living, Low vision, Quality of life.

## Az gören öğrencilerde el-göz koordinasyonu ve günlük yaşam aktiviteleri eğitiminin yaşam kalitesi ve fonksiyonel görmeye etkisi

**Amaç:** Bu çalışmanın amacı az gören öğrencilerde el-göz koordinasyonu ve günlük yaşam aktiviteleri eğitiminin yaşam kalitesi ve fonksiyonel görmeye etkisini araştırmaktır.

**Yöntem:** Bu çalışma Ankara'da bulunan görme engelliler okulunda okuyan, yaş ortalaması  $10.88 \pm 2.17$  yıl olan 40 çocuğu içermektedir. Öğrencilere Az görenler Yaşam Kalite Anketi ve LV-Prasad Fonksiyonel Görme Anketi uygulanmıştır. Öğrenciler eğitim öncesi görme keskinlik seviyelerine göre uygulanan anketlerde belirttikleri problemlere göre el-göz koordinasyonu ve günlük yaşam aktivitelerine yönelik okul ortamlarında bireysel olarak eğitim aldılar. Anketler eğitim sonrasında tekrarlandı.

**Bulgular:** Eğitim öncesi ve sonrası anket puanları karşılaştırıldığında yaşam kalitesine ait alt testlerden sadece okuma ve ince becerilerin bulunduğu alt testte fark bulundu ( $p < 0.05$ ). LV-Prasad Fonksiyonel Görme Anketi sonuçlarında da tedavi sonrasında bir fark elde edilmedi ( $p > 0.05$ ).

**Tartışma:** Yaşam kalitesi ve fonksiyonel görme el-göz koordinasyonu ve günlük yaşam aktiviteleri dışında farklı parametrelere bağlıdır. Bu nedenle eğitim programında kullanılan parametrelere ek olarak duyu fonksiyonlarından kinestezi, fiziksel fonksiyonlardan mobilite, kognitif fonksiyonlardan olan oryantasyon ve iletişim ve akademik becerileri içeren programın yaşam kalitesine ve fonksiyonel görmeye pozitif etkisi olacağı düşünülmektedir.

**Anahtar kelimeler:** Günlük yaşam aktiviteleri, Az gören, Yaşam kalitesi.

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Information via sensory stimulus, such as visual, hearing etc, which is collected by the extremities plays an important role in the daily living activities. Visual stimuli can cause deficiencies fulfilling daily activities in children. These difficulties include writing and reading at school, eating, and dressing themselves at home.<sup>1-3</sup> At the same time, these difficulties cause a negative impact on a child's developing abilities, which are related to daily living. Through the development of these capabilities with the interaction of hand with hand-eye coordination by teaching the individual can increase the level of independence in activities of daily living. In particular, in children with congenital low vision independent in activities of daily living is more important to carry out the roles of social life.<sup>4</sup>

Children also have different roles, such as the sibling role, friend role, and student role. Children with low vision will require special training to solve their problems so that they can perform their roles as independent individuals.<sup>4</sup> Such problems include functional abilities, like seeing the blackboard or finding an item on the ground.<sup>5</sup> Their success in these functional abilities forms their quality of life. As a result, their functional visual skills and quality of life are exhibited in their lives in school and at home, which can be used in positive reflections.<sup>6</sup>

Generally, quality of life is expressed as "well-being". Quality of life, health, socioeconomic status, family support and participation in society are closely associated with each other. Quality of life surveys are used for measuring health status. among the hardships of daily life, marks the most appropriate options.<sup>7</sup> There are many quality of life questionnaires used for low vision, such as the Vision Specific Quality of Life (VQOL) and the Low Vision Quality of Life (LVQOL) questionnaires.<sup>6,8,9</sup> Developed for elementary school students with low vision, quality of life survey has not been proven in terms of validity and reliability. However, Cochrane and his colleagues studied students with low vision to improve the quality of life questionnaire for the students and their families, and interviews with teachers have identified the problems faced by most. However, they have not yet completed the survey's validity and

reliability.<sup>10</sup> To improve their quality of life, therapists focus on children's school activities and interact with their teachers.<sup>11</sup>

Children with low vision do their school activities, like other activities, and need functional vision. Functional vision is included in skills which people exhibit during the day.<sup>12</sup> The National Eye Institute Visual Function Questionnaire (NEI-VFQ), Visual Function-14 (VF-14), Assessment of Function Related to Vision (AFREV), and Visual Function Questionnaires (VFQ) are used in the low vision people.<sup>12-14</sup> The questionnaires help to identify both children's functional vision problems and allow them to express their activity's problems.

The study aimed to evaluate the effect of hand-eye coordination and daily living activity training on quality of life and functional vision in low-vision students. Our hypothesis was based on this purpose and the hand-eye coordination and activities of daily living skills' training to increase the students' functional vision and their quality of life.

## METHODS

### Participants

Forty children with low vision aged from 7 to 14 years, took part in the study from Primary School for Blind. Mean age was  $10.9 \pm 2.2$  years. Twenty three (57.5%) boys and 17 (42.5%) girls were included. Informed consent was obtained from participants and their families. All survey and intervention procedures complied with guidelines for survey research created by the Hacettepe University Research Ethics Review Committee (Human Subjects Reg. No. LUT 07/47, 3 May 2007) and are consistent to the principles for human research established in the Declaration of Helsinki.

The inclusion criteria were that the child has low vision according to the ICD-10-CM (International Classification of Diseases, Tenth Revision, Clinical Modification),<sup>15,16</sup> attended same age in the same class, being aged 7 to 14 years and to be voluntary to participate in the study. Exclusion criteria for the study were having mental, and musculoskeletal problems, the late start to the school, and academic failure in the class.

### Instruments

LVQOL and The LV Prasad-Functional Vision Questionnaire test were used in our study. LVQOL has four sections. These sections included distance vision-mobility and lighting, adjustment, reading and fine work and activities of daily living. People with low vision responded to 25 items grading them between “5” (having no difficulty) and “1” (having a great difficulty) or “0” (no longer performed).<sup>6</sup> The daily living assessment tool is absent in the children with low vision. Therefore, LVQOL test section, which includes the activities of daily living was used.

The LV Prasad-Functional Vision Questionnaire (LVP-FVQ) was also developed for children with low vision. It can be completed in 10 or 15 minutes. This test includes 19 items. It is consisted of near vision, distance vision, color vision, and visual field. An additional question is related to self assessment of subject vision in comparison to her/his vision sighted peers. Responses for each item were rated on a 5-point scale. According to the child's responses “0” (no problem there) – “4” (a lot of problems) between the total score is obtained by scoring.<sup>13</sup>

Both two questionnaires are consisted of eye-hand coordination activities.

### Intervention

A physiotherapist (PT), experienced approximately fifteen years in the low vision rehabilitation field, planned the individual intervention program based on eye-hand coordination and daily living activities. Another physiotherapist, the second author, evaluated all children.

The training program was applied for three months, two days per week and 45 minutes per day and progressed according to the child's responses. At the beginning of the intervention students were trained with high-contrast background and equipment. Later, reducing the contrast has been switched to natural environmental conditions. For example, the contrasting color on the tablecloth made education activity, the activity of eating foods such as teaching the use of a contrasting color plate and cups. All the activities were as follows:

Hand-eye coordination training was provided that bead threading lengths, block design, ring of different colored bodies, review,

copying shapes, and puzzle making like activities. During training, children with low vision were firstly started to the training with beads of yellow and thick rope. Over time, they passed to the small beads. However, only the colors or shapes of blocks in the design of the classification of children with low vision training were the easiest stage because it was easier from the beginning. Then, it has been progressed to the classification of objects by passing the difficulty of classifying the degrees of the same color and shape. At the same time, other activities were also further graded as getting harder and harder. Students had problems about the daily living such as eating or dressing. They received individual training. For example, for any student who had problem with getting dressed, the first stage of training was with big buttons and large zippers which were replaced by small buttons and small zippers over time.<sup>17</sup>

### Statistical analysis

The values obtained from the study were presented as means and standard deviations. The pre and post training assessment's results were compared with Wilcoxon Signed Rank test. The difference between two means was provided with a 95% confidence interval ( $p < 0.05$ ).

## RESULTS

When the subtitles of the quality of life questionnaire and total scores compared before and after intervention the results were not statistically significant ( $p > 0.05$ ). Only reading and fine work section was statistically significant ( $p < 0.05$ ). Comparison of the quality of life test results and means were shown on Table 1. Functional vision were not statistically differed ( $p > 0.05$ ) (Table 1).

## DISCUSSION

The study aimed to evaluate the effect of hand eye coordination and daily living activities training on quality of life and functional vision in students with low visions that have difficulties in daily living activities causes of lack of visual cues. When we looked at our results all parameters score's were

Table 1. Comparison of quality of life visual function questionnaire's before and after treatment scores.

	Before treatment X±SD	After treatment X±SD	p
<b>Low Vision Quality-of-Life Questionnaire</b>			
Distance vision-mobility and lighting (0-60)	45.65±7.85	46.67±8.93	0.39
Adjustment (0-20)	14.95±3.73	15.7±3.8	0.37
Reading and fine work (0-25)	16.75±4.4	18.3±3.99	0.02*
Activities of daily living (0-20)	16.87±2.95	17.3±3.46	0.34
Total (0-125)	93.8±14.47	97.7±15.76	0.10
<b>LV Prasad-Functional Vision Questionnaire</b>			
Functional vision (0-40)	16.45±10.28	15.85±10.76	0.66

\* p&lt;0.05.

increased. However, only reading and fine work section was found statistically significant after training.

Quality of life, health, socioeconomic status, family support, and participation in society are closely associated with one another. Quality of life surveys ask people to mark the most appropriate answers about their health status among the hardships of daily life.<sup>18</sup> Hinds and colleagues emphasized that low vision rehabilitation has a positive effect on quality of life for people with low vision.<sup>8</sup> Wolffsohn and colleagues stated that the LVQOL questionnaire was too sensitive to the changes in people with low vision who had taken low vision rehabilitation. They found that people's quality of life had improved.<sup>6,19</sup> Contrary to Wolffsohn and colleagues,<sup>19</sup> our study group's quality of life scores, regarding only reading and fine work, had not changed, because children with low vision expressed that their life had improved after the intervention. However, they anticipated that the vision problems were completely eliminated, like their peers after the intervention.

Functional vision is defined as vision that can be used to perform task(s) involving sight.<sup>13</sup> Ganesh et al. searched low vision rehabilitation with their optical devices on functional vision performance in the low-vision children. Their low-vision rehabilitation program was included especially reading and writing training with firstly described optical devices.<sup>20</sup> They found that low vision devices, as a part of rehabilitation, improved children's functional vision. We used the questionnaires firstly to

detect the problems of the low vision children and then participants trained in line with their problems except them. The questionnaire is composed of functional vision especially academic activities. Our program did not consist of reading or writing activities. Therefore, we thought that our results were different from the findings of Ganesh et al. Whereas, Walter et al. found that visual rehabilitation increased the performance in activities of daily living and functional activities in people with low vision.<sup>18</sup> In contrary to Walter et al, we could not find any statistically significant difference after the intervention. The first reason might be because of the high number of participants in their study. The second reason was that they used 2 surveys: one was used to record the self-report of an adult and the other was given to the patients' families. However, in our study, we used the self-reported child questionnaire including his/her opinion about the family. The third reason was that their rehabilitation program was applied as multidisciplinary whereas ours included only physiotherapy. An the end, we should be noted that LVP-FVQ includes vision problems in primary school children's school activities,<sup>13</sup> and that questionnaire useful for students with low vision. May be any self-report for family can be used.

Physiotherapists focus on daily living activities in low vision rehabilitation, and they use visual aids. These approaches usually take place 2 days a week. The targeted therapy sessions are increased according to the

patient's motivation, qualifications, and goals. In addition, public education, teamwork, clinical success, activity selection, and the creativity of staff are important in the rehabilitation of low vision.<sup>18</sup> Therefore, in our study, in accordance with the student's lesson timetables; our training program was 2 days a week. We suggest intervention program is suitable in two days a week to physiotherapists work in the low-vision rehabilitation and these tests can be used easily in students with low vision.

At the same time, our results led us to believe that for a child to overcome deep-rooted problems, they needed long-term training from a very young age. Hence, this is missing in Turkey, and once again points out the importance of the need for school physical therapists.

#### Study limitations

The present study has a limitation that other parameters which were affecting the quality of life were not in our intervention program. As a result, we believe that we did not get the quality of life improvement. In addition to these parameters used in the intervention program which will affect the quality of life, sensory function such as kinesthesia, physical function such as mobility, cognitive functions such as orientation and communication training to take part in intervention might be presented.

#### Conclusion

We believe that if hand-eye coordination and activities of daily living training are investigated to learn how they affect quality of life and functional vision, long-term efficacy and a more mild intervention program can be done. Future research is necessary with increased sample size to understand the long term effects of rehabilitation in low vision.

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