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Pregled
Review

THE ASSESSMENT AND REHABILITATION OF VISION IN INFANTS

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Visual impairment impacts child's development in a complex way. Therefore, it represents a large problem for a child that also affects the whole family and the community. Timely intervention based on appropriate stimulations can improve child's visual functioning and facilitate development in all areas. Early recognition and high-quality assessment of the child with problems in visual functioning is crucial to provide timely intervention. High quality assessment encounters assessment of visual functions, functional vision and other child's abilities. The aim of this review was to present basic visual functions and functional vision parameters that can be assessed in infants, and the basics of functional vision rehabilitation in infants. The differences in terms visual function and functional vision regarding assessment and rehabilitation of visual problems are described. In description of visual functions the emphasis is on functional problems that can occur as a result of impaired function. Four main areas of functional vision assessment are presented in relation to assessment of an infant. The special emphasis in this review is on the importance of assessing the whole child in all areas of development, and not only visual problems, because the effects of different impairments are mutually intertwined.

Descriptors: VISUAL IMPAIRMENT, VISUAL FUNCTIONS, FUNCTIONAL VISION, ASSESSMENT, REHABILITATION OF VISION, VISUAL DEVELOPMENT, CHILDREN

INTRODUCTION

Visual impairment is a large and growing socioeconomic problem. Although visual impairment and blindness among children is much less common than among adults, the potential lifespan of a child means that the lifelong impact of such impairment is very large (1). Observational and behavioral research has shown that early development of a child is constrained by impaired vision in a complex way (2-5). Examples include the integration and interpretation of input from the other senses, development of emotional bonding, personality and self-concept, social interactive skills, sound and tactile localization skills, fine motor and locomotor competence, object permanence, and the formation of language and other cognitive concepts (3, 6-10). This makes vision therapy, in order to encourage visual functioning, a crucial therapy in early life of a child with low-vision.

Much has changed in the last two decades, treatable or preventable disorders, such as cataract and retinopathy of prematurity (ROP) has become a less common cause of low vision in children (1, 11). On the other hand, the prevalence of visual impairment caused by genetic and untreatable neuro-ophthalmological disorders is increasing, as a result of increased survival of preterm and low birth weight children and improved diagnostic possibilities (1, 11-14). This complex etiology of visual impairment very often causes multiple disabilities in children. From all the comorbidities the most frequent are intellectual disability, motor problems and epilepsy (11, 15). Sometimes it is hard to estimate which impairment influence the function we observe. If a child keeps the head leaned on one side, is it because of visual problem (nystagmus, eccentric viewing) or is it because of motor problem (head or posture control)? Therefore, it is substantial to reconsider methods of visual assessment to be sure to measure exact function. We have to be able to distinguish the impairment that affects certain function, and the way it influences on the specific behaviors.

FUNCTIONAL VISION ASSESSMENT

Terminology related to visual function is different among the various professions. Under the aspect of visual functions, we measure parameters that define how the eye functions; these include visual acuity, visual field, contrast sensitivity, etc. We do this by varying one parameter at a time in a simplified, artificial environment (16-20). They are examined, with few exceptions, for each eye separately, because impairment can exist only on one eye (19). Under the aspect of functional vision, we must assess how the person functions visually. To do this, we must focus our attention on visual skills and abilities. Such tasks always involve multiple parameters, which can vary independently and cannot be separated (16-20). Assessment of functional vision does not apply only on one eye, because person can function well in vision related tasks with remaining vision in only one eye (19).

By assessing only structural changes on eyes it is impossible to indicate how the visual system is really functioning. Therefore, we have to assess visual functions of the entire visual system (visual pathways, cerebral visual functions), as well as eyes. Knowing the condition of visual functions does not provide complete information about performance of a person, so we have to assess the person's ability to function in vision related tasks (16). Functional vision assessment involves evaluations of all mentioned functions through observation of behaviors, answering questionnaires and solving different visual tasks. It can be done using non standardized materials and standardized tests while playing with the child. It is performed through assessment of visual functions and observing the child's ability and the manner of using its vision (20).

We were accustomed to measure, with several tests, what the child sees, but in early intervention, rehabilitation and special education we have to know how the child perceives and interpret his environment and tasks. With the newest scientific findings, combined with earlier works we can start asking ourselves why the child sees, as he seems to see? What is the nature of the vision loss (21)? Results of functional vision assessment give us information concerning remain visual functions and possibilities for vision therapy. This knowledge will guide the rehabilitation professionals in developing rehabilitation plans for the individual and recommending appropriate low vision devices (22). It can also be used for other purposes, such as prediction of problems in performance that are needed to determine the eligibility for disability benefits (23). Also, a vision rehabilitation assessment of vision related skills and abilities are the primary outcome measure for vision rehabilitation outcome study. Therefore, better assessment of functional vision is the most urgent (22). And, if we ask ourselves why the child does see how he sees it can help making the differential diagnosis between possible eye or/and cortical impairment.

ASSESSMENT OF VISUAL FUNCTIONS IN INFANTS

The basic visual functions assessed in infants almost from birth are: pupillary reflex, alignment of eyes, fixation, smooth pursuit eye movement, generation of saccades, eye convergence, grating acuity (visual acuity based on preferential looking), contrast sensitivity and peripheral visual field (22, 24-30). Later on, in preschool children who are able to understand matching tasks and follow simple instructions, almost all visual functions as in adults can be assessed: far and near visual acuity (based on recognition of optotypes), contrast sensitivity (presented by curve), color vision, dark adaptation, binocular vision (22, 24-30).

The pupillary reflex is the reduction of pupil size in response to light. Pupil reacts on direct light and also when the other eye is lightened (indirect light). The pupil response to light develops between 30 and 31 weeks' postmenstrual age in preterm neonates (31). The blink to light, a reflex dependent on functioning photoreceptors, is present in all babies at 26 weeks' postmenstrual age (32). During assessment direct and indirect papillary reflex is tested by swinging flashlight test. It is important to notice size and shape of pupils and how rapid they constrict on direct or indirect light. The papillary reflex can be inadequate because of damage on afferent or efferent pathways. If it is inadequate, especially because of efferent pathways, too much light can come through and cause photophobia.

In newborns the intermittent strabismus is frequently present, and at age of one month babies have normal alignment of eyes (33). Binocular corneal reflex, which we are estimating with penlight, is central on both eyes and symmetric very early in development of a child. In the case of asymmetric binocular reflex the cause has to be found. If asymmetric refractive error is the cause, corrective lenses are necessary to prevent amblyopia. For other conditions, amblyopic therapy should be considered. The critical sensitive period in the development of amblyopia begins within the first weeks of life and lasts until about eight to ten years of age (http://www.aafp.org/afp/1999/0901/p907.html - afp19990901p907-b3) and this is also the period during which amblyopia may be reversed by treating the cause and stimulating visual development of the affected side (33, 34).

Visual fixation is the maintaining of the visual gaze on a single location. Full term babies show evidence of visual fixation at birth or shortly afterwards (35). Duration of visual fixation in infants aged 6 to 20 weeks varies depending on object distance. It increases in time when objects are advanced to 30 centimeters (36). To estimate the position and steadiness of retinal fixation point we observe monocular corneal reflex. If the corneal reflex is central and steady we can assume that fixation is at or near macula where the vision is most distinct in daytime.

Smooth pursuit eye movements allow the eyes to closely follow a moving object. It is one of two ways that visual animals can voluntarily shift gaze, the other is saccadic eye movements. Smooth pursuit is present under two months of age. Development is most rapid during the first three months, but at six months it has still not reached the adult level (37). Stimulus characteristics can affect response rates and eye movement dynamics, particularly in young children (38). To avoid underestimation of eye movement performance in young children, it is important to use meaningful targets (38). Therefore, when assessing and comparing the ocular motor performance of children across studies, one must consider using targets such as human faces in increased contrast and objects form everyday use (mobile phone), because they are more meaningful to children and, therefore, more interesting to look at.

Generation of saccades is essential for redirecting the fovea at different visual targets. From the age of at least 2 months, infants generate saccades with speeds similar to or slightly higher than those of adults (39). In the early age they

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are very important for scanning faces in communication, and creating three-dimensional map of environment to plan an action. Eye convergence is the simultaneous inward movement of both eyes toward each other, usually in an effort to maintain single binocular vision when viewing an object (40). According to Aslin and Jackson, very young infants show inaccurate, inconsistent convergence to an approaching object but by three to four months their convergence is accurate and consistent (41). Convergence insufficiency can cause blurred, double vision, headaches, concentration problems, movement of print while reading, and if not treated on time, can influence other aspects of visual functioning skills like binocular vision (42).

The visual acuity of infants highly increases during the first 6 months postnatal. In infants, young children and adults with intellectual disability, visual acuity cannot be measured with optotype tests because of communication or intellectual difficulties (43). Then, an estimation of visual acuity can be made by using preferential looking tests. This method is based on a child's preference for black and white gratings over uniform field, depicted on cards with decreasing stripe widths. The location of the left/right position of the test stimulus has been randomly chosen. Assessor observes child's reaction looking at its eye or head movements. Looking of the child in the direction of lines indicated positive visual reaction to the stimulus. The threshold of acuity was considered as the finest stripe width for which the child consistently responds correctly. Acuity values are expressed in cycles per degree and can be compared to normative data reported in the literature (44, 45). Visual acuity in infants can also be tested by visually evoked potentials (VEP). Both techniques give meaningful and reliable, although a bit different, estimates of visual acuity in infants (46). Some more recent studies report about existence of larger difference between those techniques. Psychophysical measurements generally yield lower absolute values in the preverbal age group (47).VEP acuity and preferential acuity for phase alternating gratings develop at different rates, converging to nearly equivalent levels by 12 months of age (48). Therefore, considering the child's fatigue, intricacy and costs of using VEP to evaluate visual acuity, preferential looking tests seem to be preferable for the purpose of functional vision assessment, especially in children older than 12 months of age.

The assessment of visual acuity in infants is important and necessary in determining treatment plans for children and also for evaluating the outcomes (49). Contrast sensitivity measures the ability to see details at low contrast levels. Visual information at low contrast is especially important in visual communication, orientation and moving, everyday tasks and near vision tasks (50). There appeared to be two phases in the development of contrast sensitivity and acuity. Between four and nine weeks overall contrast sensitivity increases by a factor of 4-5 at all spatial frequencies. Beyond nine weeks, contrast sensitivity at low spatial frequencies remains constant, while sensitivity increases systematically at higher spatial frequencies (51). In preverbal children, contrast sensitivity, as well as visual acuity, can be evaluated by preferential looking tests. Child is looking at black/white faces over a uniform field, depicted on cards with decreasing contrast. That testing in infancy and childhood gives important information about the distance at which the child can see facial features (52). Although, according to recent study, patients implanted with orange-tinted, yellow-tinted, or clear intraocular lenses displayed similar contrast sensitivity values, with no statistically significant differences at any spatial frequency, contrast sensitivity was found to be significantly improved with yellow filter glasses (53, 54). In functional vision assessment of infants, the assessment of contrast sensitivity gives us guidelines on how to adapt environment in order to be "easier to see".

The binocular visual field of infants, ages 6-7 months, is similar to that of adults tested with the same apparatus (55). Area of the infants' binocular field is 93% that of the adults' (55). However, the infants' monocular fields are smaller than those of adults, averaging 74% of the adults' monocular field area (55). Dobson et al. studied visual fields in infants using kinetic and static-kinetic perimetry. Kinetic perimetry yielded larger, more adult-like fields, which approached adult levels around 17 months, whereas static and hybrid static-kinetic perimetry yielded smaller visual fields, approaching adult levels only at 30 months (56). Conscious vision in the peripheral visual field is severely limited. Infants could discriminate faces in the periphery, and the clutter impairs this ability (57). The effective spatial resolution of infants' visual perception increases with age, but only half that of adults (58). For purposes of functional vision assessment in infants assessing visual filed using confrontation method is sufficient.

ASSESSMENT OF VISUAL FUNCTIONING IN INFANTS

The measurement of visual functions can only provide an estimate of functional vision. The present visual acuity values and visual field recordings, which are used for classification, do not always correctly depict visual functioning even in older children (58, 59). Although visual functions influence functional vision, more factors impose the performance of vision related tasks. Those factors can be person's non-visual abilities, such as motivation and level of activity, sensory processing (integration), level of intellectual functioning, physical development, personality, other co-impairments etc. Environmental factors can also influence visual functioning, for instance surrounding luminance, visual crowding, colors, shadows etc. Therefore, assessment of functional vision should be based on direct observation of how well various vision related activities can be performed by a child.

The International Classification of Functioning, Disability and Health (ICF) for classification of functioning in adult people lists several functional areas that need to be considered: learning and applying knowledge, general tasks and demands, communication, mobility, self care, domestic life, interpersonal interactions and relationships, major life areas, community, social and civic life (58, 60). Only five of the functional areas, domains of the ICF are functional

areas of children (58). These five are the same as where used in the WHO 93.27. It recommends assessment of vision in four main areas of functioning of children that exist in all cultures and in all age groups: communication and interaction, orientation and movement, activities of daily living (ADL) and sustained near vision tasks like reading and writing (58, 61). Visual functioning and abilities need to be assessed in each of these four areas in order to obtain solid foundation for planning early intervention and special education services (58). For each area of functioning we can describe behaviors of a child as "using blind techniques", "low vision techniques" or "sighted techniques" (62). Although, some very young children did not have time to develop compensatory techniques, so it is more important to answer basic questions we already mentioned: what, how and why?

During assessment of communication we observe eye contact, facial expression, shared interest in objects, size, distance, gestures, signs, visual, tactile, auditory, and vocal language (62). These results are consistent with the idea that an ontogenetically early and primitive bias to orient towards face-like patterns with relevant configural and contrast information influences the early stages of cortical face processing (63).Very young infants, even before three months of age are interested in looking human's face mimic. A child reacts on different facial expressions and starts to smile at a person. The social smile is a developmental milestone that most infants reach when they are one to two months old. Not having a social smile by six months of age is commonly considered to be an early sign of autistic spectrum disorder. However, we should not jump to this conclusion, because there could be numerous reasons for lack of social smile: reduced contrast sensitivity, high refractive error, disorder in visual processing, and others, not related to vision. Therefore, answering our basic questions can get us to right conclusion. Knowing "what" the child is able to see, assessed through visual functions, can help us make assumptions about specific visual functioning. If visual functions results are within the normal limits, the answer to "how" could clarify the problem of not having social smile. Sometimes a child looks at a person, but smiles only on verbal and auditory cues and not on visual ones, than we have to consider the visual processing problems. And, when we are able to answer the question "why" we can make appropriate therapeutic and (re)habilitation suggestions, such as adapting environment, prescribing lenses, treatment of social interaction problems etc.

Research on infant spatial orientation, typically investigates infants' ability to relocate a target following some form of bodily movement and/or reorientation (64). Visual and vestibular information are most important for space orientation and movement control. In recent study Bremner et al. (2011) reports that in normal environments visual input provides veridical information about the relationship between the individual and environmental features, providing direct information about the spatial relationship between self and the targets of action (64).

During functional vision assessment in infants we have to observe the child's awareness of an object's positions in relation to their own body and to objects in surroundings. Within the functional area of orientation and movement we are, also, assessing child's reaching movement. A reaching movement requires a certain level of interaction between infant and the environment, and represents an improved perception of the world and recognition of some gamut of possible actions (65). There are researches about infant's reaching movement in light and dark. Visual feedback of the hand facilitates the age of reaching onset, but when the reaching movements become sufficiently stable, infants perform equally well with or without visual trajectory feedback of the hand (66). According to Berthier and Carrico, infants at 6 months of age reach faster in the dark, and at 1 year of age faster in the light (67). Babinsky et al. also did not find any effect of the glowing condition compared to full vision on infant reaching movements (68). These results suggest that infant's reaching movements only become compromised when the target is not visible at all (66-68). At younger ages reaches are corrected on the basis of proprioceptive information and sight of the target object (67). Although infants reach for the larger object earlier and with higher velocity than for the smaller object, the reach and grasp planning differentiate with object size at about 9 and 12 months of age (66, 67).

Functional area of orientation and movement in infants also include orientation on their own body, a body concept and awareness of midline movements. The basic questions have to be answered again. Result of grating acuity estimates "what" (what size of an object) a child can detect in surroundings, although it does not always mean the child is going to look at the object that size. Stimulus characteristics can affect response rates and eye movement dynamics, particularly in young children. As mentioned before, to avoid underestimation of eye movement performance in young children, it is important to use meaningful targets (38). Through observation of a child's reactions towards objects, and ability to move around we notice "how" the child perceives and using visual cues for orientation. At the end we have to think "why" the child is not reaching, if a child has some problem in functioning. Is it because of reduced visual acuity, or impaired binocularity? Is it because of non-meaningful target? Perhaps a child has a problem in action planning or motor execution? Once we answer these questions, we should be able to determine what treatment aspects would improve the whole functioning, such as reaching and grasping. Do we have to treat visual problems, adapt objects in surroundings, practice motor skills, or perhaps, all the mentioned?

Activities of Daily Living (ADL) is a term referred to daily self-care activities within an individual's place of residence, in outdoor environments, or both. Activities of daily living are the functions that are least well taught to visually impaired children in nursery schools and mainstream grade schools. It is not understood that visually impaired children need to learn special techniques to master situations that sighted children learn by watching what older children and adult people do (62). Very young infants does not have, of course, acquired skills of self-care, but we can still observe feeding situation, sensitivity of hands and mouth, function of hands and vision in everyday activities. As mentioned before, assessment of functional vision should be based on direct observation. However, it is sometimes impracticable or almost impossible to observe situations such as feeding, especially bathing or other, during the functional vision assessment. Therefore, we have to ask parents about visual functioning in those situations. Questions have to be concise and simple. The basic questions "what", "how" and "why" always have to be in mind of an assessor, so the right questions can be asked.

Near work requires the activation of the accommodation and vergence systems to achieve clear and single binocular vision. Studies have shown that sustained near fixation induces adaptation of the accommodation and vergence systems (69-71). When sustained near vision tasks are mentioned, most people are considering reading and writing, but in infants we have to observe other near vision activities. We are interested in small details a child can see on playthings. How does the child look at them and how small these details are? Also, parent's information about development of interest in picture books, television, videos and observation of child's "reading" pictures would give us better insight in child's visual functions and functioning.

During assessment of visual functioning, especially sustained near vision tasks, we have to consider child's ability of keeping visual attention. There are three main types of visual attention: spatial attention, which can be either overt, when an observer moves his/her eyes to a relevant location and the focus of attention coincides with the movement of the eyes, or covert, when attention is deployed to relevant locations without accompanying eye movements; feature-based attention (FBA), which can be deployed covertly to specific aspects (e.g., color, orientation or motion direction) of objects in the environment, regardless of their location; and, object-based attention in which attention is influenced or guided by object structure (72). Attention shows development over the human lifespan, and much of that development is due to concomitant changes in the brain areas controlling attention (73). In the early period of infancy, attention is directed primarily to salient characteristics of the environment and, by two or three years of age, comes under subject-directed control (73). The attention system comes under control of the child's executive functioning and is used in the service of cognitive, social, and emotional tasks (73). There are numerous researches in the last four decades about infant's visual attention (72-74). Nevertheless, in assessment of visual functioning is important to notice which objects attract child's attention and how long does the child keep the attention on an object? It, also, has to be observed is the attention easily distracted by other stimuli, such as tactile, auditory, proprioceptive etc.?

REHABILITATION OF VISION IN INFANTS

Early detection and prompt treatment of visual functioning disorders in children is important to avoid lifelong visual impairment. The conceptual framework of early intervention is based on both neurobiological issues and developmental theories (75). Various neurobiological and neuroanatomical theories support the view that visual functions can be recovered (75). Developmental processes of the brain maturation persist after birth, particularly during the first years of life. These mainly apply to the processes of cortex organization that enables reorganization after brain injury, and therefore, functional recovery. This unique neurobiological process, the brain plasticity, seems to be confined to the first years of life. Rehabilitation and therapy can encourage brain plasticity and improve recovery of impaired function (76-81). Plasticity can be defined as the adjustment of the nervous system to changes in the external milieu (through sensory inputs) or internal milieu (through the effects of damage to the system) and appears to be mainly a property of the cerebral cortex rather than subcortical structures (82). In the planning of the treatment it is important to know the developmental window for the structural-functional plasticity of the most severely affected neural systems (79). Kostović and Judaš propose that an optimal time for an intensive treatment is at the end of the developmental window for a given neuronal system (79). As well as other brain functions, the development of vision occurs most rapidly during the first years of life. Myelin in the optic nerve became fully developed by the age of seven months (83). Different cortical circuits develop at different rates but at eight months after birth, basic circuits are in place (84).

Normal visual development requires environmental factors (i.e. sensory experience) and molecular programs that are genetically determined (85). The continuous sensory experience induces activity dependent tuning of synaptic connections (85). Visual experience is necessary for normal visual development (85, 86). We know that children born with congenital cataracts have permanent low vision and are unable to recognize objects and forms if cataract removal is delayed until after age ten (85). Nearly half a century ago, Hubel and Wiesel were exploring functional organization of cortex: the repertoire of different cell layers and columns. From their study of cats and monkeys visual cortex, the idea that the experience could contribute to constant and large changes in neural circuits emerged (87-92).

A review of trials, form Spittle et al. (2007), suggests that early developmental intervention programs post hospital discharge are effective at improving cognitive development in the short to medium term (up to preschool age) for preterm infants (93). There is limited evidence that early developmental interventions improve motor outcome or long term cognitive outcome (up to school age) (93).

Several authors studying rehabilitation of vision in children with perinatal brain damage, found that visual stimulation treatment improves attention and fixation times, pursuit movements and the capacity to perform precise saccades, as well as the acquisition of environment scanning strategies, even grating acuity and contrast sensitivity (20, 76, 94).

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Therefore, treatment of visual problems, using individual visual stimulation helps children with perinatal brain damage to improve functional vision, especially the visual attention and visual communication, but also to achieve better fixation and pursuit (20).

There is no clear consensus on an exact definition of vision therapy. Vision therapy, also known as visual training, vision training, or visual therapy, is a broad group of techniques aimed at correcting and improving binocular, oculomotor, visual processing, and perceptual disorders (95). Successful vision therapy outcomes are achieved through a therapeutic process that depends on the active engagement of the ophthalmologist, the vision therapist, the patient and in the case of children their parents. Overall, the goal of vision therapy is to treat vision problems that cannot be treated successfully with eyeglasses, contact lenses and/or surgery alone, and to help a child in achieving clear, comfortable binocular vision (96). It includes visual stimulation in early age and visual training later on in development.

The term visual stimulation could be defined as using of visual stimuli to make an infant or a child aware of vision. The objectives of visual stimulation programs are improvement of specific visual functions and functional vision. They are designed for each child individually according to functional vision assessment and according to the assessment in other developmental areas. In overall assessment we sometimes notice that it is more important to facilitate head and posture control than fixation or following eye movements.

Materials and methods for stimulating the vision are also chosen according to assessment results. Different kind of stimuli can be used, considering child's visual functions and functioning:

- stimulation with everyday objects and familiar faces under normal lightning conditions;
- stimulation with bright colors and high contrast objects; using everyday objects, pictures, faces and toys with intensified colors and high contrast (made especially for visual stimulation);
- stimulation with objects under the UV light (different bright color and high contrast objects are shown to the child in front of the black surface under the UV light which increases brightness and contrast);
- stimulation with lights and lighting objects (bright and dim lights and lightning objects such as flashlights, light snakes and others are used in the dark room) (20).

The child with low vision, as we noticed from our clinical work, has to be stimulated visually everyday to achieve optimal visual development. Therefore, the parents have to be active partners in treatment and involve the visual stimulation in all everyday activities. Objects in use have to be adapted to stimulate using of vision. Low vision therapist must follow-up the child's visual development, evaluate and modify objectives and methods of stimulation and support parents emotionally during the treatment. Children who may be actively involved in solving the tasks can do visual training. Visual training is the practice of exercising the eyes with the aim of overcoming vision disorders. The tasks in visual training are designed according to child's abilities, not only visual, but also cognitive, gross and fine motor skills, communicational capabilities and others.

CONCLUSION

To be able to make right conclusions and to determine the most effective therapy, we have to observe the "whole child" during the assessment of functional vision. We have to be able to comprehend all areas of the development, because change in one function can cause altered functioning of the other, and it is sometimes very hard to identify the core reason for the specific functioning we see. The knowledge about the visual development, impact of visual impairment on other developmental areas and possibilities of vision therapy and rehabilitation is crucial for professionals working with infants and children with risk for developmental delays. These knowing will enable timely commence of rehabilitation that will support optimal development within the child's neurobiological capabilities.

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Sažetak

PROCJENA I REHABILITACIJA VIDA U RANOJ ŽIVOTNOJ DOBI

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Oštećenje vida u ranoj dobi ima vrlo složen utjecaj na djetetov razvoj. Stoga predstavlja veliki problem djetetu, no isto tako utječe i na cjelokupnu obitelj i zajednicu. Pravodobna intervencija bazirana na potrebitim stimulacijama može potaknuti djetetovo vizualno funkcioniranje i razvoj na svim područjima. Rano prepoznavanje i kvalitetna procjena djeteta s problemima u vizualnom funkcioniranju ključna je za pružanje pravodobne intervencije. Kvalitetna procjena obuhvaća procjenu vidnih funkcija, funkcionalnog vida i drugih djetetovih sposobnosti. Cilj ovog rada bio je prikazati osnovne vidne funkcije i parametre funkcionalnog vida koji se mogu procjenjivati u ranoj dječjoj dobi, te osnove funkcionalne rehabilitacije vida u djece. Opisane su razlike u definicijama vidnih funkcija i funkcionalnog vida. U opisu vidnih funkcija naglašeni su funkcionalni problemi koji proizlaze iz poremećaja određene funkcije. Prikazana su četiri glavna područja procjene funkcionalnog vida u ranoj dječjoj dobi. Zbog međusobne isprepletenosti utjecaja različitih oštećenja, poseban naglasak stavljen je na važnost procjene cjelokupnog djetetovog razvoja, ne samo problema u vizualnom funkcioniranju.

Deskriptori: OŠTEĆENJE VIDA, VIDNE FUNKCIJE, FUNKCIONALNI VID, PROCJENA, REHABILITACIJA VIDA, RAZVOJ VIDA, DJECA

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