Developmental Trajectories of Selected Visual Functions

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Introduction

Developmental trajectories are used to reflect change in ability with increasing chronological or developmental age. Comparing trajectories is an alternative to group analyses, and can provide better insights into specific conditions, especially because different forms of delay will be detectable (Thomas, et al. 2009).

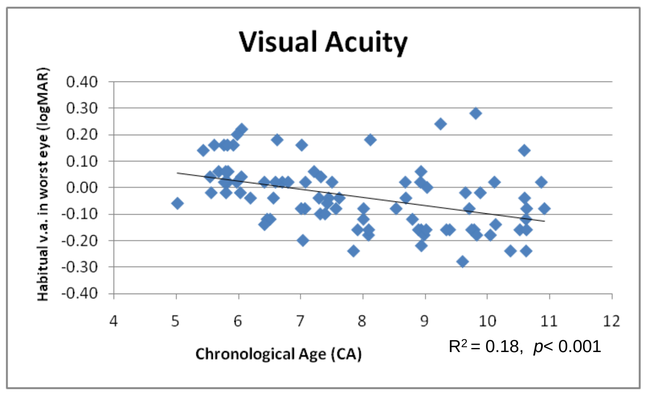
Studies concentrating on the development of visual function in schoolchildren are limited (Leat, et al. 2009) . In the ophthalmic literature, the term visual function is often restricted to visual acuity and/or fields, and these variables have been used for evaluating development in preschool children with vision impairments , (Hatton, et al.1997, Ophir-Cohen, et al. 2005). Indeed, there are reports that functions, such as visual acuity and global motion sensitivity, are fully developed by the age of 6 (e.g. Lewis & Maurer 2005).

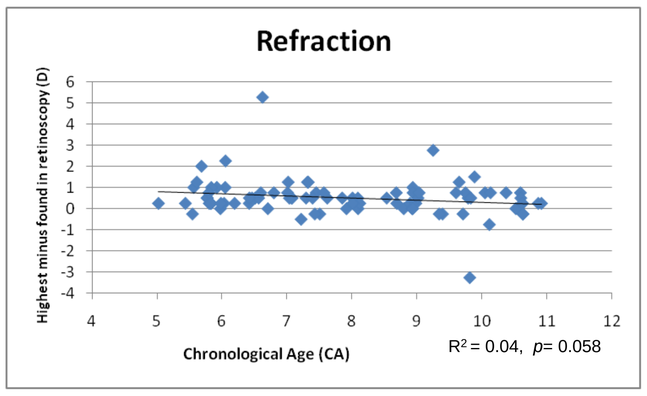
This study aimed to provide trajectories for a range of visual functions in typical children aged 5 to 10 years to provide baseline data for comparison with premature children as well as for clinical considerations.

Methods

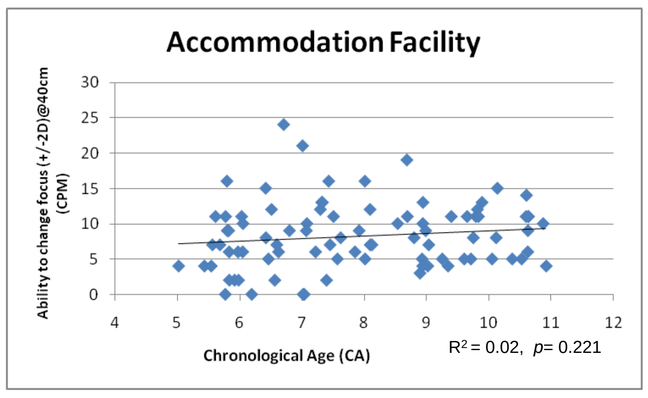
90 typical children aged 5-11 years were recruited from kindergartens and schools in the western part of Oslo, Norway as a control group for a research project investigating visual function in premature children. The children underwent an extensive range of vision tests in 4 main areas, of which 3 are included here: 1. Typical clinical tests, including visual acuity and refraction; 2. Functional tests, including tests of accommodation and binocularity; 3. Form- and motion coherence tests, believed to test parvo- and magnocellular visual function, respectively (Stein, 2001). Developmental trajectories for these data were computed. R^2 values for a variety of fits were calculated. The line of best fit is presented.

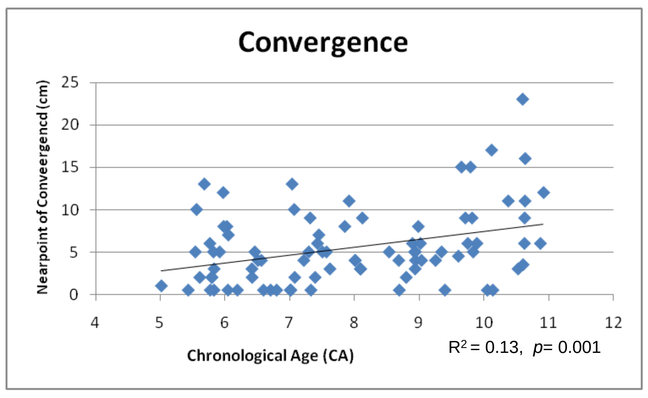
Results



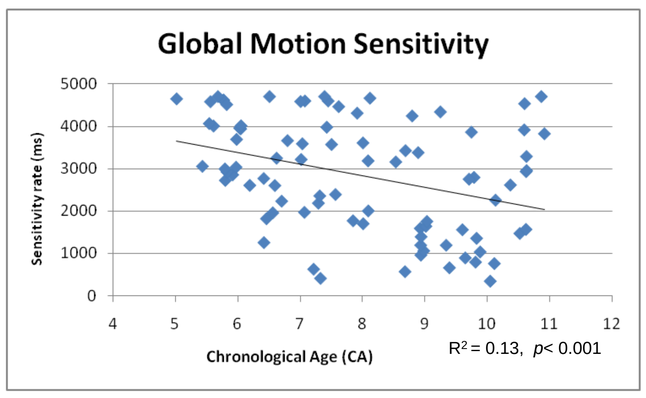


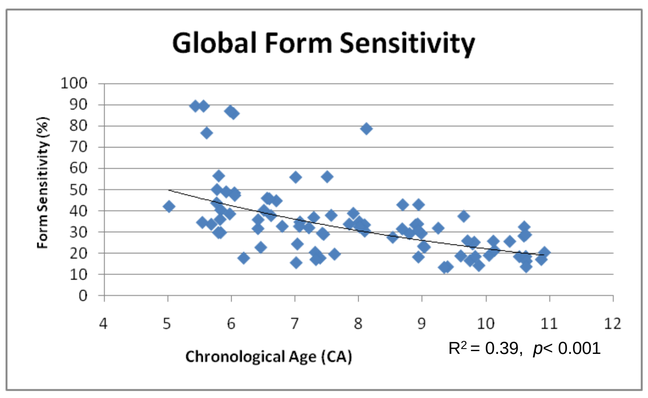
Minor improvements in certain typical vision tests with age.





Variable changes in some functional tests.
Note that convergence ability decreases with age (p= .001).





Significant changes (p< .001) in visual processing skills, in particular the ability to detect global form.

Discussion & Conclusion

Vision continues to develop in children between 5 and 11 years, though typical measures of vision are not very sensitive to these changes. It is possible that the child's level of cognition plays a part when more complex measurements are performed. However, the apparent deterioration in ability to converge with age calls for another explanation. One suggestion would be that increasing academic demands lead to more near work than the visual system is created for. This might result in disruption of this binocular function.

We cannot conclude that any of the variables shown are fully developed by the age of 6, as earlier suggested. This also challenges the range of assessments used to measure typical visual functions.

Some functions related to vision, especially visual processing skills, continue to develop after 5 years of age. These data provide normative values for a typical population in Norway.

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Presented at the Child Vision Research Society 2011 Conference, Royal Visio, The Netherlands

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