The role of Sports Vision in high performance programmes

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Introduction
Generalized visual training programmes have been popularised by many authors but scientific evidence indicating the usefulness of these programmes in performance enhancement in sport are scarce. It is true that standardised visual parameters such as acuity, depth perception, accommodative and fusional ranges and flexibilities can be improved but the question is still whether this will result in improved sports performance. The bulk of the evidence clearly indicates that superior athletes do not perform better than the normal population on these visual abilities. These conflicting reports may be the result of a one dimensional view on the functioning of the visual system. Milner and Goodale suggest a "two visual system" hypothesis on the basis of an anatomical distinction that divides the visual system into one system that deals with perceptual presentation of information and a second system that is responsible for visuomotor control. We would postulate that with visual training programmes, the emphasis should be to deal with those visual skills that relate to visuomotor control in order to achieve improved sports performance.

Methods
This presentation reports on several studies. A sports vision testing battery consisting of 11 vision and vision related tests were employed. The aim of the studies were to determine how a normal population of students would compare to professional and/or amateur rugby players when subjected to these tests (p<0.05). The same tests were also done on two different age group rugby players (15 and 17 years of age). These players are all part of an elite rugby academy programme. A total of 923 subjects participated in these studies.

Results
Our research has shown that elite athletes do perform better than the normal population (p<0.05) only on those visual skills that 1. Require visuomotor performance (such as eye-hand coordination, eye-body coordination or visual reaction times) 2. Or visual skills that play a part in proprioceptive integration (such as visual adjustability and central –peripheral awareness). The professional rugby players also performed better than the amateurs (p<0.05) on these skills but not on the skills that could be classified as the normal "eye-test" procedures. In the study on the age group rugby players, the older boys also performed better than the younger boys (p<0.05) only on the visuomotor related tests. Furthermore we have found that when designing visual performance enhancement programmes to improve these skills, the best results were obtained when the visual skills exercises were made to be sports specific.

Discussion/Conclusion
Vision is often seen as the ability to perceive, select and to interpret information presented to the system. But when investigating the role of the visual system in sports performance it is important to understand the interaction between environmental demands on the system, optical properties of the eye and the functional properties of the visual perceptual system. Our research does suggest that the visual information processing system, and more specific visuomotor control, is far more important than the visual information gathering system when considering sports performance. Thus superior athletes differ from the normal population in their ability to use visual information to control motor action rather than simply relying on visual perceptual skills. An ineffective gathering system may however limit proper visual processing and should therefore not be ignored. According to Milner and Goodale the traditional distinction between the 'what' and 'where' in the visual system should make way for a 'what' and 'how' approach. Thus the emphasis should be to develop the 'how' abilities of athletes by developing visual training programmes that relates to the specific visuomotor demands of a specific sport.

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