Visual acuity standards for Beach Lifeguards

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ABSTRACT

This project was designed to determine, in an operational scenario, the visual acuity required by beach lifeguards (BLG) in order to identify a human head at 300m. It was hypothesized that this would be greater than that calculated (6/17), due to factors associated with location/detection, colour, contrast, lighting and movement in the operational scenario. Following eye tests to ensure normal vision, twenty-one BLG undertook a series of tests on two beaches. During these tests the vision of the BLG was blurred (using spherical lenses placed within a trial frame) to a visual acuity at which they could not identify any of the targets presented to them (approximately 6/70). The targets were human heads or equivalent sized and shaped buoys. The subjects were required to look out to sea or across a wet beach and report if they could see the target in the water or on the sand at various distances. Visual acuity was improved by gradually reducing the refractive blur in 0.25 dioptre increments until the subject could identify the head to the point at which they would investigate the object further using binoculars. It was determined that, on average, to identify a human head in the sea at 300m a BLG required visual acuity of 6/7. This represents a high standard of visual acuity that is likely to exclude some existing and potential BLG. It is therefore recommended that consideration should be given to allowing BLG to wear spectacles. On the basis of the other tests undertaken it was concluded that the uncorrected vision of a BLG should be 6/14.
INTRODUCTION

Over the last decade a small number of authorities have introduced specific eyesight standards for lifeguards. For example, the California Department of Parks and Recreation recommend that entry level lifeguards exhibit a corrected visual acuity of 6/6 or better and an uncorrected visual acuity of 6/12 or better in each eye. However, such standards are the exception rather than the rule, and most organisations employ more general requirements such as the need for "good" eyesight. Even the specific standards do not appear to have been based on any operationally-relevant research.

We have undertaken the first study to determine, in an operational scenario, the visual acuity required by beach lifeguards (BLG) in order to identify a human head at the outer edge of a patrolled area of 300m out to sea. The required visual acuity as determined by the angle subtended by a human head at this distance would be 6/17, but due to location and detection factors we hypothesised that it would have to be better than this.

METHODS

The experiment received ethical approval and twenty-one BLG (16 male, 5 female, all less than 35 years) gave their consent to participate. Following eye tests to ensure normal vision (mean (range) visual acuity 6/4.8 [6/3.8-6/5]), they undertook a series of tests on beaches at Bournemouth (N=9) and Westward Ho! (N=12), during which their vision was blurred (using spherical lenses placed within a trial frame) to a visual acuity at which they could not identify the targets presented to them (approximately 6/70); these were human heads or equivalent sized buoys. The subjects looked out to sea or across a wet beach and their visual acuity was improved every minute by reducing the refractive blur in 0.25 dioptre increments until they could identify the target to the point at which they would investigate it further using
binoculars. The tests were performed on the same day, in good weather, uniform lighting conditions and a sea state of 0-1 (calm).

**Figure 1.** A subject looking for a head-out immersed human at 300m wearing ophthalmic trial frames for altering visual acuity

**RESULTS**

Results are presented in Table 1, data were normally distributed (Anderson-Darling normality test).
Table 1. Results from Bournemouth (B) and Westward Ho! (W)

<table>
<thead>
<tr>
<th>Condition</th>
<th>LogMAR Mean (SD)</th>
<th>Snellen</th>
</tr>
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<tbody>
<tr>
<td>(i) B: locate and identify a human head within a 300m radius out to sea</td>
<td>0.11 (0.06)</td>
<td>6/8</td>
</tr>
<tr>
<td>(ii) B: identify an arm waving at 300m in the sea</td>
<td>0.33 (0.16)</td>
<td>6/13</td>
</tr>
<tr>
<td>(iii) B: identify a human immersed to the waist at 300m in the sea</td>
<td>0.74 (0.15)</td>
<td>6/33</td>
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<tr>
<td>(iv) B: locate and identify a human head within a 100m radius out to sea</td>
<td>0.86 (0.23)</td>
<td>6/43</td>
</tr>
<tr>
<td>(ii) W: locate and identify a human head within a 300m radius out to sea</td>
<td>0.06 (0.17)</td>
<td>6/7</td>
</tr>
<tr>
<td>(iii) W: identify a buoy at 100m out to sea</td>
<td>0.78 (0.25)</td>
<td>6/36</td>
</tr>
<tr>
<td>(iv) W: identify a buoy on the wet beach at 300m</td>
<td>0.23 (0.19)</td>
<td>6/10</td>
</tr>
<tr>
<td>(v) W: identify a buoy on the wet beach at 200m</td>
<td>0.48 (0.13)</td>
<td>6/18</td>
</tr>
<tr>
<td>(vi) W: identify a buoy on the wet beach at 100m</td>
<td>0.87 (0.15)</td>
<td>6/44</td>
</tr>
</tbody>
</table>

The variability observed between subjects is likely to have been due to the differing ability of individuals to adjust to the lenses, and the central processing required to search, see and identify a head in the sea. This also explains why the visual acuity required to see a human
head at 300m in the sea was 6/7, rather than the theoretical figure of 6/17. We therefore accept the hypothesis.

On the basis of the present results it is recommended that a BLG should have visual acuity of 6/7 or better. As this will exclude some individuals, consideration could be given to allowing BLG to wear corrective eye glasses (not currently the case). It seems logical to base the requirement for uncorrected eyesight on what the BLG must see when they have removed their glasses and are moving towards a casualty. By then the BLG will have detected the casualty. As the visual acuity required to maintain sight of a casualty is less than that required to locate/detect them in the first place, it is reasonable to require a BLG to have uncorrected vision, in their worst eye, that is at least equivalent to that required to see a head from 200m-300m distance, or an arm waving from 300m. The average for these activities is 6/14 (Table 1).

**TAKE HOME MESSAGE**

In terms of the Snellen chart, we recommend that the corrected vision for BLG be 6/9 best eye, 6/18 worst eye, and the unaided acuity be no worse than 6/18 in either eye.

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**REFERENCES**