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A comparison of static near stereo acuity in youth baseball/softball players and non–ball players

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KEYWORDS
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Stereo acuity;
Baseball;
Normal values;
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Abstract
BACKGROUND: Although many aspects of vision have been investigated in professional baseball players, few studies have been performed in developing athletes. The issue of whether youth baseball players have superior stereopsis to nonplayers has not been addressed specifically. The purpose of this study was to determine if youth baseball/softball players have better stereo acuity than non–ball players.
METHODS: Informed consent was obtained from 51 baseball/softball players and 52 non–ball players (ages 10 to 18 years). Subjects completed a questionnaire, and their static near stereo acuity was measured using the Randot™ Stereotest (Stereo Optical Company, Chicago, Illinois). Stereo acuity was measured as the seconds of arc between the last pair of images correctly distinguished by the subject.
RESULTS: The mean stereo acuity score was 25.5 ± 1.7 seconds of arc in the baseball/softball players and 56.2 ± 8.4 seconds of arc in the non–ball players. This difference was statistically significant ($P < 0.00001$). In addition, a perfect stereo acuity score of 20 seconds of arc was seen in 61% of the ball players and only 23% of the non–ball players ($P = 0.0001$).
CONCLUSIONS: Youth baseball/softball players had significantly better static stereo acuity than non–ball players, comparable to professional ball players.
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It is commonly accepted that athletes have better visual abilities than nonathletes.[1] It is less clear whether better athletes have better visual abilities than poorer athletes. Because it is not clear which sports rely most specifically on which subset of visual skills, sports vision is best examined in a sport-specific manner. The results of research comparing performance on tests of static stereopsis with a variety of testing procedures in athletic populations have had mixed results.[2]

Baseball players are among the most frequently studied athletes for visual acuity and other parameters, yet the literature is still conflicting on whether dynamic visual acuity is better in athletes than nonathletes.[3-5] Given the requirement to judge the position and trajectory of a baseball once it is hit toward a fielder or thrown toward a batter, one would expect depth perception to be a critical skill for baseball players. Many aspects of vision have been investigated in professional and collegiate-level baseball players, but the study of stereopsis in developing-age baseball players has been limited.[6,7]

Rouse et al.[5] reported a study of 17 male baseball players (19 to 24 years old) and 25 male graduate students (23 to 29 years old) and found that the mean dynamic visual acuity was better in the athletes versus the nonathletic graduate students, but the study did not measure depth

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Table 1 Stereo acuity (seconds of arc) in youth ball players and non–ball players

Group	Ball players (n = 51)	Non–ball players (n = 52)
Mean	25.5	56.2
Standard deviation	11.9	60.7
Range	20–70	20–400

perception. Melcher and Lund[8] studied 232 teenage athletes and found several visual skills to be improved in female volleyball players, but also did not test depth perception. Ridini[9] measured depth perception by means of a Howard-Dolman apparatus in eighth-grade boys and showed a difference in the subgroup that participated on an organized athletic team of any type but did not specifically study baseball players or girls. Christenson and Winkelstein[10] measured distance stereopsis in 54 college football and softball skilled position players and found no difference compared with 54 nonathletes.

The technique required (dynamic versus static and near versus distance) to measure differences in stereopsis in athletes remains controversial.[11,12] In undertaking the current investigation, we formulated the hypothesis that precollegiate-level boys and girls playing organized baseball/softball would have superior stereo acuity to non–ball players in the same age range. Because of the paucity of studies measuring stereopsis in precollegiate ball players and the lack in clarity of measurement techniques, the purpose of this investigation was to determine if youth baseball/softball players have superior static near stereo acuity compared with that in nonplayers.

Methods

One hundred three volunteers between the ages of 10 and 18 years were recruited in person from youth baseball fields and a public high school. Subjects were recruited randomly from different teams, and no rewards or inducements were offered. Subjects were told that they would undergo a simple test to measure their depth perception. The research protocol was reviewed and approved by the Lakeside High School Institutional Review Board. Informed consent was obtained from the legal guardian of each subject, and a brief questionnaire was completed to report age, gender, and regular participation in organized baseball/softball for at least 3 years of the volunteer.

Static near stereo acuity was measured using the Randot™ Stereotest Circles (with random dot background) test (Stereo Optical Company, Chicago, Illinois). Each subject wore the polarizing viewer (over prescription glasses when present) and performed the test at a distance of 16 inches in an indoor setting. This multiple-choice series tested fine depth discrimination. Within each of 10 targets were 3 circles. Only 1 of the circles had crossed disparity, which, when seen binocularly, would appear to stand forward from the other two. The subject was asked to identify which circle seemed to be at a different distance than the other two. The level of stereo acuity was recorded as the last series of targets correctly answered. If one was missed, the preceding and subsequent series of targets were retested to determine whether the subject could consistently achieve that level or was just guessing. In addition, stereo acuity was recorded as the seconds of arc between the last set of objects successfully discriminated and was tested over a range from a maximum of 400 to a minimum of 20 seconds of arc.

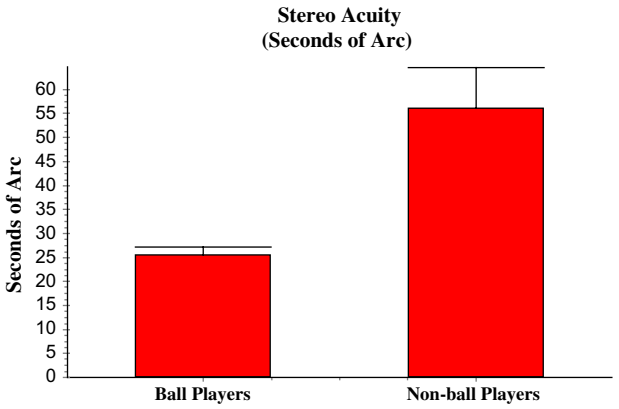

Figure 1 Mean ± SEM stereo acuity score in ball players (n = 51) and non–ball players (n = 52) aged 10 to 18 years. The difference between means was statistically significant ($P < 0.0001$).

The mean stereo acuity scores from the ball player and non–ball player groups were calculated, and the Mann-Whitney test was performed to assess the significance of any differences. The mean scores of male and female subgroups were also calculated and compared. In addition, the Fisher Exact test was used to determine if the frequency of subjects attaining a perfect stereo acuity score (20 seconds

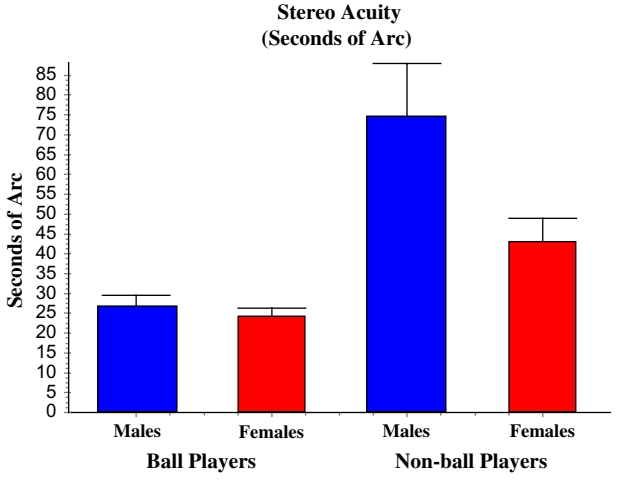

Figure 2 Mean ± SEM stereo acuity score by gender in ball players and non–ball players age 10 to 18 years. The difference between means in the male and female subgroups was not statistically significant in the baseball players but was significant in the non–ball players ($P = 0.04$).