between level of competition ($F_{2,195} = 0.19$, $P = 0.81$) and injury status ($F_{2,195} = 0.23$, $P = 0.63$), but there was a significant difference between playing position ($F_{2,195} = 9.64$, $P = 0.00$). Scheffe's S post hoc comparisons showed that there were significant differences between mid-field and goal attacks ($P < 0.01$) and between mid-field and goal defence ($P < 0.01$) players. There were no differences between goal attack and defence players. Figure 2 shows these differences.

For the third dependent variable, ectomorphy, there was no significant difference between level of competition ($F_{2,195} = 0.44$, $P = 0.64$) and injury status ($F_{2,195} = 1.89$, $P = 0.16$), but there was a significant difference between playing position ($F_{2,195} = 5.84$, $P = 0.00$). Scheffe's S post hoc comparisons showed that there were significant differences between goal defence and mid-field ($P < 0.01$) and between goal defence and goal attack ($P < 0.01$) players. There were no differences between goal attack and mid-field players. Figure 3 shows these differences.

Discussion

Physical anthropometric data have often been used to assess the relation between successful performance in sport and body build.³ For this reason somatotype for the different playing positions was assessed over all the three levels of competition. Significant differences were found for mesomorphy and ectomorphy somatotype components and different playing positions. In the mesomorphic component, the mid-field players had a different somatotype from the goal attack and goal defence positions. These mid-field netball players were more muscular and robust to meet the demands of short accelerated movements linking defensive play and attacking manoeuvres. Goal defence players were significantly different from the goal attack and mid-field players for the ectomorphic component. These players had

increased linearity measures which gives an advantage when rebounding an attempted goal, leaping to catch a pass, or making a defensive interception of the ball.

Somatotype profiling is considered important in determining an athlete's potential and suitability for a specific sport. The present study found that there were no relations between any of the somatotype components and the incidence of injury during the championships. In contrast, when Hopper *et al*⁶ compared somatotype ratings with injury incidence during an entire winter season, they found that there was no difference between the injured and non-injured for the mesomorphic and ectomorphic components but the injured players had a significantly lower endomorphic component when compared with the non-injured players.

Conclusions

This study confirms that high performance female netball players do have different somatypes for the selected playing positions, and that there is no relation between endomorphic, mesomorphic, and ectomorphic somatotype variables and the incidence of injury.

Sincere thanks are expressed to all the netballers and the All Australian Netball Association without whom this study would not have been possible.

- 1 Sheldon WH. *The varieties of human physique*. New York: Harper, 1940.
- 2 Tanner JM. *The physique of the Olympic athlete*. London: George Allen & Unwin, 1964.
- 3 Wilsmore RG. The body type of female hockey players involved in different playing positions and levels of competition. *Aust J Sci Med Sport* 1987;19:26–8.
- 4 Elliott B, Smith J. The relationship of selected biomechanical and anthropometric measures to accuracy in netball shooting. *Journal of Human Movement Studies* 1983;9:171–87.
- 5 Hopper DM, Hopper JL, Elliott BC. Do selected kinanthropometric and performance variables predict injuries in female netball players? *J Sports Sci* 1995;13:213–22.
- 6 Hopper D, Elliott B. Lower limb and back injury patterns of elite netball players. *Sports Med* 1993;16:148–63.
- 7 Carter JEL. *The Heath-Carter somatotype method*. San Diego: San Diego State University Press, 1980.

Commentary

Hopper should be applauded as she continues to build on her earlier work and the work of others in Australia and New Zealand. Australia are the reigning world champions of 1991 and 1995, and as such have received much more media attention than England, for example, who finished fourth in the last two World Championships. Many workers have highlighted the seriousness of the injury problem including Egger,¹ who estimated that knee injuries accounted for 20% of all injuries among netball players and that the estimated cost of all injuries in this group was about \$12–14.5 million. It is vital, therefore, that further research should examine, in depth, factors that may affect injury. Other identified factors include landing patterns,² footfall patterns and passing height,³ playing surfaces, footwear, and footfall patterns.⁴

PATSY ROCHESTER

- 1 Egger G. *Sports injuries in Australia. Causes, costs and prevention—a report to the national better health program*. Sydney, Australia: Centre for Health Promotion and Research, October 1990.
- 2 Hopper D, Lo SL, Kirkham C, Elliot B. Landing patterns in netball; analysis of an international game. *Br J Sports Med* 1992;26:101–6.
- 3 Neal RJ, Sydney-Smith M. The effects of footfall patterns and passing height on ground reaction forces in netball. *Aust J Sci Med Sport* 1992;24:73–8.
- 4 Steele JR. Biomechanical factors affecting performance in netball: implications for improving performance and injury reduction. *Sports Med* 1990;10:88–102.