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Introduction

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The Impetus for This Book

There is general agreement that pediatric fatness has been increasing in most high- and middle-income countries, with a marked acceleration since the 1970s. There is less consensus on trends in children's fitness. The following quotations from the research literature illustrate the spectrum of positions:

'The results of this study do not support the current well-publicized view in the United Kingdom that children's cardiopulmonary fitness is deteriorating.' [1, p. 373]

'The existing research literature does not permit any confident conclusions to be drawn regarding temporal changes in aerobic fitness.' [2, p. 8]

'So it seems that there has been a real decline in fitness, and an increase in fatness, in Australian children since 1985.' [3, p. 119]

The polarisation of opinion around this important question provided the impetus for the present volume, which has elicited contributions from researchers from four continents.

What Are We Measuring?

Before attacking the question of secular change in children's fitness, it is important to be clear on just what we mean by 'fitness', and how it is operationalized. The evidence that children's performance on tests of aerobic fitness has been declining in recent years is stronger than that for parallel changes in maximal oxygen uptake. Indeed, Armstrong et al. [1] and Eisenmann and Malina [4] have collected data which show little secular change in peak oxygen uptake since the 1930s. In their chapter, Armstrong and Welsman [this vol., pp. 5–25] delineate the mechanisms which contribute to performance on tests of aerobic fitness. The inference is that it is quite possible that maximum oxygen uptake has remained stable while performance has declined. Changes in 'anaerobic threshold', oxygen uptake kinetics, mechanical efficiency, motivation,

tactical experience and pacing skills can affect performance with no change in peak oxygen uptake.

Similar considerations are important in considering trends in performance on tests of motor skills, strength and power, which are generally less well operationalized than the gold standard $\dot{V}O_{2\max}$ test. In the next chapter, van Praagh [this vol., pp. 26–45] asks what we are actually measuring in such tests, and describes how results can be affected by small variations in testing protocol. The first two chapters both caution against jumping too easily from changes in performance to changes in underlying mechanisms.

The World Picture

The next seven chapters paint a global picture of the available performance data, from North America, Europe, the Baltic states, Asia and Australasia. Tomkinson and Olds [this vol., pp. 46–66] bring together data from around the world on over 25 million children and conclude that performance on tests of aerobic fitness has been declining globally at the rate of about 5% each decade since 1970. Prior to 1970, performance was improving. This pattern of rise and fall may help explain why some researchers, who use datapoints falling on either side of the peak in 1970, have failed to find declines in fitness performance.

Malina [this vol., pp. 67–90] looks at data from the United States. In contrast to the inclusive approach of Tomkinson and Olds, Malina cautiously focuses largely on randomized national surveys, an approach which undoubtedly yields better quality data, but also leaves many gaps. A mixed picture emerges. Shephard [this vol., pp. 91–103] moves us north to Canada, describing declines in the fitness of Inuit children from extraordinarily high levels in the 1970s until today.

Europe has benefited from the introduction of the Eurofit test battery, a standardized set of simple measurement instruments used very widely throughout the continent. This allows comparison between countries. Tomkinson, Olds and Borms [this vol., pp. 104–128] ask ‘Who are the Eurofittest?’ The answer has been unchanged since the 1950s: northern European children outperform children from Southern and Western Europe, and from children around the developed Pacific Rim. The superior fitness of northern European children has been a consistent finding in the literature since the first comparisons of European and North American children in the 1950s, which galvanized the American government into corrective action. The enduring superiority of children from Scandinavia and the Baltic warrants further exploration.

The situation in the Baltic States, Eastern Europe and Russia has been complicated by the social upheavals following the break-up of the Soviet Union in 1989–91. Jürimäe and colleagues [this vol., pp. 129–142] track changes in fitness performance in Estonia and Lithuania since independence, again detecting performance declines.

Data from Asia remain hard to access. Several Asian countries – among them the Korean Republic and Singapore – routinely collect fitness data on a census-like basis, but the data are not always made available to researchers. Macfarlane and Tomkinson [this vol., pp. 143–167] collate available data from Asia, documenting not only very large fitness differentials between children from different countries (with the Japanese performing exceptionally well), but also clear secular declines in aerobic performance. Finally, Tomkinson and Olds [this vol., pp. 168–182] move to Australasia, where a substantial historical record exists. The trends in aerobic fitness performance are quite clear: consistent declines in aerobic test performance since about 1970 in both boys and girls and across most age groups.

The Causes

The last four chapters raise some considerations regarding causes. Salmon and Timperio [this vol., pp. 183–199] review the evidence around environmental influences on children's activity levels. The evidence is equivocal, with the authors concluding that the impact of the built environment (amenity, street design and land use) on activity levels may be very context-specific.

The most obvious reason why performance on tests of aerobic fitness is declining is that aerobic fitness itself – operationalized by the criterion method of gas analysis – is declining. Rowland [this vol., pp. 200–209] analyses data on trends in maximal oxygen uptake, concluding that data are too limited to unequivocally support a clear decline.

There is consensus that increases in fatness have differentially affected the right tail of the distribution: there are more fat children, and they are much fatter than their counterparts of 30 years ago. There are very few corresponding data on shifts in the distribution of scores on fitness tests. Comparing Australian data from 1985 and 1997, Dollman and Olds [this vol., pp. 210–225] found that the overall decline in boys' performances has been the result of a shift towards poorer performance in the middle of the distribution. In contrast, girls' scores have not shown distributional changes, and the overall decline in girls' performances has been the result of across-the-board declines.

Finally, Olds, Ridley and Tomkinson [this vol., pp. 226–240] ask whether increases in fatness alone can explain performance declines. Using cross-sectional data from within and between countries, and an analysis of the fitness performance of Australian children from 1985 and 1997 matched for fatness, they conclude that increases in fatness alone explain less than half the observed decline in aerobic fitness performance.

This volume covers four continents, from the Baltic to the Mediterranean, from the Arctic Circle to the Mexican border, and across the vast sweep of Asia from the Sea of Japan to the coasts of Tasmania. It covers the 50 years from the ruins of World War Two to the superabundance of postindustrial society, years

which saw the integration of indigenous societies into the economic mainstream, the industrialization of Asia and the fall of the Soviet empire. In many ways the fitness of children may serve as a barometer of these changes.

References

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