

# **SAFE AND EFFECTIVE LIFTING**



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**Theory, Evidence, Methods, and  
Training for the Workplace and  
General Community**

**TONY SEDGWICK AND JOHN GORMLEY**



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Boca Raton

*Safe and Effective Lifting:  
Theory, Evidence, Methods, and Training for the Workplace and General Community*

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**“TRUTH WILL OUT.”**

John Milton, *Areopagitica*, 1644

**Our intent  
Is that  
Truth will out  
On  
Safe and effective lifting**

*(With apologies to Milton)*



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## FOREWORD

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Comments from members of ‘train the trainer’ courses conducted during the ‘Lifting Project’ (see Part 1).

**Ambulance officer;** ‘Most important part? Learning to lift and lower safely in varied conditions’.

**City Council OH & S Officer;** ‘I never realized that the ‘semi-squat’ approach applies to many handling tasks as well as to lifting—such as shoveling, digging, and forking—any low-down work almost’.

**Agriculture adviser;** ‘This kind of training is a must for farm workers, who tackle different challenges all day and every day, with different workloads, footholds, weather, light/dark conditions, and often with moving loads’.

**Warehouse worker;** ‘Management still believes that a picture on the wall of someone lifting a box teaches people the skill of lifting. The most important thing I learnt was that lifting takes time to master, like a sports skill—there is no short-cut. If they really want to prevent injuries, then they must arrange for real training.’

**Sports Sciences student;** ‘The most important thing for me, after three years study of biomechanics, anatomy, motor learning, etc., was to understand for the first time what adaptability is and its importance in the training process. This course on lifting made sense of just about everything I have studied, pulling it together in relation to the art of teaching physical activity’.

**Nurse OH & S Officer;** ‘I now give it to them straight. Trunk extended, ‘arse-out’, knees bent, and feet flat on the ground during low-down work. Trainees ask, “Why wasn’t I told this before?”’



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The authors express their gratitude to the generous people whose expertise inspired us to write this book. It was not easy to integrate their multi-disciplinary contributions, and to summarize them in a short text that is easy to read, thought provoking, and useful for students and teachers of Ergonomics, Biomechanics, Exercise Sciences, Physical Education, and Occupational Health. We hope the book truly reflects those contributions, and we apologize if we misunderstood or neglected important parts of their content.

Contributors (with their professional situations at the end of the Lifting Project described in Part 1) were as follows:

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*Rehabilitation;* Professor Dennis Smith (Royal Rehabilitation Centre, Sydney, NSW)

*Weight lifting;* Martin Leach (Victorian Weight-lifting Association, Melbourne, V)

*The Lifting Project management team;* Dianne Kitcher, Cathy Paver, Professor Dennis Smith, John Gormley, and Tony Sedgwick.

*Special thanks* to Dianne Kitcher for her leading role in Conference organizing; to Dennis Smith for ongoing support and the chairing of numerous conferences; and to Max Hely for his expert comments during this book's development.

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## SAFE AND EFFECTIVE LIFTING

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## **PREFACE**

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Twenty years ago, during a preliminary examination of lifting, the authors noticed that the so-called ‘leg-lift’ (see Fig. 2, page 23) was widely recommended in textbooks, journal articles, brochures, and websites as *the* ‘correct technique’ of lifting. At the same time, few people in the workplace or the general community seemed to be using it. Did that apparent paradox mean that the leg-lift is, in reality, seriously flawed? Or were there weaknesses in its promotion and training? Other questions occurred to us: What form or forms of lifting should be promoted? Is the lifting literature helpful? With such questions in mind it was agreed that an intensive study of lifting would be interesting and useful. This led to the ten-year Australasian ‘Lifting Project’ culminating in a 1997 training manual serving the interests of workplace trainers (1). Now, more than a decade later, the original paradox still exists, further complicated by recent publications which are often incomplete and inconclusive (see Appendix 1, page 87). We therefore decided that the project’s findings should be revised and re-presented in book form, making them easily accessible to a broad range of professional personnel and, via their practices, to the general community; hence this book.





# INTRODUCTION

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The book, focusing on ‘low-lying’ lifting, has three parts:

**Part 1** describes the original stimulus (the ‘trigger’) of the authors’ intensive interest in lifting, leading to the ten-year Australasian ‘Lifting Project’ and eventually to this book. The project comprised literature research, theoretical and practical analysis, training courses, and thirteen conferences—the ‘Consensus Process’. The book is outlined, with comments on the need for it, unique features, and potential readership.

**Part 2** provides answers to questions raised during the Lifting Project, addressing: the general nature of lifting; comparison of well-known lifting methods; selection of the method most clearly matching the criteria of skilful (safe and effective) lifting; examination of the training of that method; and summarizing the project’s conclusions.

**Part 3** applies the Lifting Project’s findings to training following an outline of the general principles of skill learning and the role of training. Stages for the learning of lifting skill are recommended, including guidelines for the special needs of different community groups. Suggestions are made about the promotion, organization, and research of lifting.

The contents are in ‘plain language’ intended to summarize the realities of lifting and, as a result, to facilitate discussion and practice among those operating in fields of Human Physical Performance and Health.

The ‘spirit’ of the book is to emphasize an approach to lifting which is safe and effective, and within easy reach of most people’s learning capacity. A crucial issue to be addressed;

## SAFE AND EFFECTIVE LIFTING

*which of the three well-known approaches shown in Figure 1 most closely matches those requirements?*

**Fig. 1** Three approaches to lifting



In order to provide a clear understanding of the training methods presented here, readers are recommended to view the 20-minute video referred to in Appendix 3, page 93.

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## PART I

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### BACKGROUND; THE ‘LIFTING PROJECT’, THE TRAINING MANUAL, THE NEED FOR THE BOOK

The authors’ serious interest in lifting was triggered by a brochure on ‘Safe Lifting for Back Care’, published by a leading Occupational Health organization, and promoting the ‘leg-lift’ (featuring deep knee flexion, heel raising, and vertical trunk posture) for the sake of back safety. After a preliminary literature search the following questions seemed to be significant—four being specific to the leg-lift, and one concerning the general literature on lifting:

1. Does the leg-lift seem to be effective in practice?
2. Do people in the general community use it for ‘low-lying’ lifting?
3. Is it widely promoted in the literature and the workplace?
4. Is there biomechanical evidence justifying its use?, and
5. Is the literature (textbooks, journal articles, brochures, web-sites) helpful to managers and trainers?

Regarding the *first question*, and after trying-out the leg-lift, this style seems awkward whatever the task, and impossible to use when heavy, bulky, or awkwardly shaped objects are handled, or when lifting occurs on uneven surfaces.

The answer to the *second question*, apparently, is ‘no’, judging from our experience with athletes, industrial workers, and members of the general community.

The *third question* carries a resounding ‘yes’ (see Fig. 2, page 23) as demonstrated by publications from health and workplace organizations.

The *fourth question* is not associated with information clearly demonstrating that the leg-lift is safe and effective.

The answer to the *fifth question* is that the literature is often lacking in clear and consistent advice about the training of lifting, and as a result is unhelpful for those involved in management and training.

Together, these observations suggested that use of the leg-lift should be abandoned, and that the promotion of lifting was in a somewhat confused state. At the same time it occurred to the authors that they might have ‘got it all wrong’, and that experts in Occupational Health would surely not have supported the leg-lift so enthusiastically, and for so long, without good reason.

With those contradictory thoughts in mind it was decided that it would be interesting and probably useful to examine the ‘whys and wherefores’ of lifting in detail. This led to the ‘Lifting Project’ conducted in Australia and New Zealand between 1988 and 1997, to the production of a training manual (1), and eventually to this book.

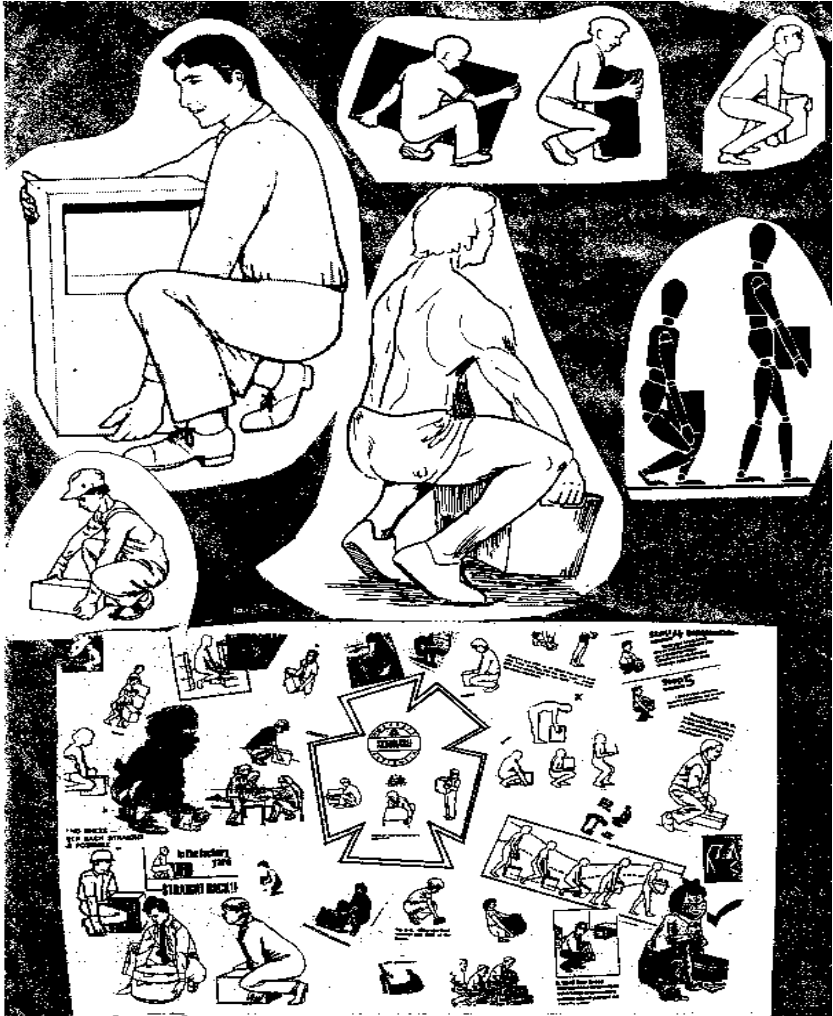
### **The Lifting Project, 1988–97**

The aim of the Lifting Project was to clarify the nature of safe and effective performance, leading to training guidelines for trainers. It was based on different sources of knowledge about human physical activity and health, explored through a ‘Consensus Process’, practical testing, and training trials. The Consensus Process involved thirteen conferences in Australia and New Zealand, with lectures, practical sessions, and workshops. Twenty lecturers were involved (see Acknowledgements, page xi) representing seventeen institutions; their contributions to the ‘Grand Finale’ conference are listed in Appendix 2 (page 91). Findings from the project were published in 1998 (2).

### **The Training Manual, 1997**

The Lifting Project culminated in a manual for trainers, *Lifting for Adaptability* (1), which outlined the history of the project and provided detailed training guidelines, a workbook, and a twenty-minute video (see Appendix 3, re DVD, page 93).

Fig. 2. Leg-lift diagrams from the literature.



### **The Need for the Book, 2009**

In 2008, after a ‘re-think’ about the Lifting Project’s findings, the authors decided that a book of this kind would be of interest for those professionally concerned with human physical performance (especially with manual handling) and health promotion. The aim—as for the Lifting Project—is to clarify the nature of skilful lifting and to provide valid training guidelines, while extending the project’s findings from the workplace to the general community.

The need for the book, in the authors’ view, reflects three closely related factors: first, the qualities and limitations of the literature on lifting; secondly, weaknesses of the current promotion of lifting and training guidelines; and thirdly the importance of the book’s subject.

### **Literature on Lifting**

A search of recent publications was enlightening in four general ways:

*First*, many publications are interesting, well presented in terms of scientific method, and informative about the anatomical, mechanical, physiological, psychological, cultural and clinical backgrounds of lifting.

*Secondly*, the literature demonstrates the difficulties of conducting research into lifting with respect to:

- The monitoring of lifting behavior (style, frequency, workload, physical and psychological impacts) in substantial populations, over different durations, and in various environments (workplace, at the home, in recreation etc.).
- Provision of high quality training in terms of course planning, duration, teacher ability, and catering for individual differences in skill and fitness.
- Measurement of short and long-term effects of training on lifting skill, habitual use of the skills learned, and injuries associated with lifting.



*Thirdly*, many publications would be even more interesting had they included some aspects of information essential to the clear understanding of lifting and its training. Examples of literature ‘problems’ follow:

1. Workplace practice dominates, and there is minimal interest in the needs of the general community as if its need for safety, effective performance, and training are irrelevant.
2. The focus on the workplace is usually restricted to ‘standard’ work environments such as a factory or hospital, while the needs of workers in farms, kindergartens, construction sites, removal vans, etc. are not adequately considered; i.e. analysis is restrictive.
3. Variability of lifting tasks, and hence the importance of *adaptability* as a major training target, is frequently overlooked; e.g. adaptation to different lifting tasks, to short-term versus long-term work, and to awkward environmental conditions such as a slope, and a moving or slippery surface.
4. Examination of the advantages and limitations of different methods of lifting is superficial; e.g. there are comparisons of physiological details such as heart-rate, energy expenditure, and psychological details such as ‘comfort’, while essential factors are frequently ignored; e.g. the numerous tasks for which the leg-lift and the stoop-lift cannot ‘work’ (see Fig 6, page 42), indicating their poor adaptability.
5. It is usually overlooked that the manual worker is involved in lifting ‘at home’ as well as at work, so that activities in those two environments interact, influencing each other with respect to injuries incurred and the value of training.
6. Opinions about the leg-lift are inconsistent, with some authorities recommending it and others decrying its use. Overall, this makes it very difficult for anyone to decide, with confidence, whether to use it or not.
7. Those disapproving the leg-lift tend not to recommend and justify a suitable replacement, and how its training should be managed.