A Manual of
LOWER EXTREMITIES ORTHOTICS

UNIVERSITY OF CALIFORNIA
Division of Vocational Education

UCLA ALLIED HEALTH PROFESSIONS PROJECT
Santa Monica, California

Research and Demonstration Grant 8-0627
U.S. Office of Education, Bureau of Research
Department of Health, Education, and Welfare

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LOWER EXTREMITIES ORTHOTICS

(Second Printing)

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CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by
CHARLES C THOMAS • PUBLISHER
Bannerstone House
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.

ISBN 0-398-02217-8
First Printing, 1972
Second Printing, 1977

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The project presented or reported herein was performed pursuant to a grant from the U.S. Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein, however, do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

Occupational Code
Orthopedic Appliance and Limb Technician (brace maker)
USOE 07.0404; DOT 712.281-018

Printed in the United States of America
OO-2

FOREWORD

The Division of Vocational Education, University of California, is an administrative unit of the University which is concerned with responsibilities for research, teacher education, and public service in the broad area of vocational and technical education. During 1968 the Division entered into an agreement with the U. S. Office of Education to prepare curricula and instructional materials for a variety of allied health occupations. For the most part, such materials are related to preservice and inservice instruction for programs ranging from on-the-job training through the associate degree level.

A National Advisory Committee, drawn from government, educational and professional associations in the health care field and the lay public, provides guidance and help to the overall activities of the Allied Health Professions Projects. The following individuals and institutions participate in the concerns of this nationwide interdisciplinary body:

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Washington, D. C.

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Dr. William Shannon, Acting Associate Executive Director
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Washington, D. C.

Elizabeth Simpson, Ph.D.
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John D. Twiname, Commissioner
Social and Rehabilitation Services
Department of Health, Education, and Welfare
Washington, D. C.

C. Gordon Watson, D.D.S., Executive Director
American Dental Association
Chicago, Illinois

In addition, each of the specialized programs comprising the Projects has the benefit of consultation with a National Technical Advisory Committee of persons especially knowledgeable in the area concerned. In the case of the present Manual of Lower Extremities Orthotics, preparation was facil-

itated through the efforts of a Subcommittee on Education named by the Joint Educational Committee of The American Orthotic and Prosthetic Association, Inc., and The American Board for Certification in Orthotics and Prosthetics, Inc.

The support and interest of the National Advisory Committee contributed importantly to the success of two years of arduous and often frustrating effort which culminated in the completion of the Manual and official acceptance of the document by the national professional organizations that had approved and authorized its preparation.

MELVIN L. BARLOW, Director
Division of Vocational Education
University of California

Professor of Education, UCLA

Principal Investigator
Allied Health Professions Projects

PREFACE

The Allied Health Professions Projects were initiated in August, 1968, by the Division of Vocational Education of the University of California, Los Angeles, for the purpose of developing curricula and instructional materials for use in health care-related educational programs. This work is supported by Research and Demonstration Grant 8-0627 from the U. S. Office of Education, Department of Health, Education, and Welfare.

In the past twenty years the United States has experienced a very large increase in demand for health services of all kinds. As a result, there is a shortage of skilled personnel in the field, which can best be resolved through increased educational efforts. A good educational program requires a good curriculum and instructional materials, hence the effort to direct funds and energy to the development of such materials as rapidly as possible.

Prosthetics-orthotics was selected as one of the allied health professions to be studied because of the chronic shortage of prosthetists and orthotists, and the critical nature of the services performed by them for amputees, paralytics, and other orthopedically handicapped persons.

It is customary in developing curricula and instructional materials for use in an occupational education program to depend upon experts from the occupation for recommendations as to technical content and qualified consultants and for help in validating the materials produced. To accomplish this end, the professional organizations of the prosthetic-orthotic occupation, the American Orthotic and Prosthetic Association and the American Board for Certification in Orthotics and Prosthetics, Inc., were asked to name a national educational advisory committee to cooperate with the Allied Health Professions Projects in developing the program.

Since separate educational committees were already in existence for each of the professional organizations, several members of each were appointed to a new joint committee. Other members were appointed to represent organizations and institutions that were users of prosthetic-orthotic services.

This joint educational advisory committee was authorized to represent both professional organizations in working with the UCLA Allied Health Professions Projects. The following are members of the committee:

Mr. Herbert B. Warburton, Temporary Chairman
Executive Director, American Orthotic and Prosthetic Association
American Board for Certification in Orthotics and Prosthetics, Inc.

Mr. William L. Bartels
President, American Orthotic and Prosthetic Association

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Chairman, Education Committee, American Orthotic and Prosthetic Association

Miss Audrey J. Calomino
Assistant Executive Director, American Orthotic and Prosthetic Association
American Board for Certification in Orthotics and Prosthetics, Inc.

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Chairman, Education Committee, American Board for Certification in Orthotics and Prosthetics, Inc.

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Past President, American Orthotic and Prosthetic Association

Mrs. Florence L. Knowles
U. S. Department of Health, Education, and Welfare
Social and Rehabilitation Service
Secretary, Committee on Orthotic and Prosthetic Education

Mr. William M. Bernstock
Assistant Chief, Research and Development Division
Prosthetic and Sensory Aids Service
U. S. Veterans Administration

Mr. Albert Post
Division of Policy and Standards
Bureau of Health Care
Social Security Administration
U. S. Department of Health, Education, and Welfare

Miles H. Anderson, Ed.D., Consultant to the Joint Committee
University of California, Los Angeles
Division of Vocational Education

The Joint Educational Advisory Committee met in Washington, D. C., January 30-31, 1969. Reports of manpower needs in the fields of prosthetics and orthotics which were reviewed indicated a serious shortage of trained personnel. This shortage resulted in demands for more edu-

cational programs to train additional workers, which, in turn, led to demands for instructional materials to make such educational programs effective.

It was agreed that the UCLA Allied Health Professions Projects offered a means for developing the needed materials, and it also was agreed that the committee would work with UCLA to that end. It was further agreed that the field of orthotics needed attention first, and a recommendation was made that work be started as soon as possible to develop a manual of lower extremities orthotics. It was further recommended that when this manual was completed, work should start on one for spinal orthotics.

To do the actual work of preparing the Manual of Lower Extremities Orthotics, a Subcommittee on Lower Extremities Orthotics was appointed by the Joint Educational Advisory Committee. Following is a list of the members of this subcommittee, all practicing experts in orthotics from various regions of the United States:

Clauson F. England, CPO
Director, Prosthetics and Orthotics Department
Bowman Gray School of Medicine
Wake Forest University
Winston-Salem, North Carolina

Robert E. Fannin, CO
Columbus Orthopaedic Appliance Company
Columbus, Ohio

Jerome E. Skahan, CO
Central Orthopedic
Cincinnati, Ohio

Harold W. Smith, CO
Children's Hospital Medical Center
Boston, Mass.

The Subcommittee met at UCLA April 14-18, 1969, at which time the members were oriented in vocational teaching techniques and in writing instructional materials. An occupational analysis was completed in which all the tasks in lower extremities orthotics were listed and then grouped into units of related tasks. The units were allocated to members of the Subcommittee, who agreed to write the step-by-step instructions for each task on their return home and to send the completed materials to UCLA for editing. When text had been edited, the rough sketches and photographs provided by the Committee members to illustrate their work were converted by an illustrator into clean line drawings. The instructions, with accompanying illustrations, were duplicated and sent to all Subcommittee members for correction and revision. When the copies were returned, all changes were incorporated in the manuscript and the corrected version was sent to the members for checking.

After the Subcommittee had completed its work, a draft version of the manual was prepared and the group met at UCLA to give it a final review.

Changes suggested by the Subcommittee were made, and publishers were invited to submit bids setting forth the terms under which they would publish and distribute the manual. The manuscript was turned over to the publisher submitting the most favorable bid, who is issuing it in final form and will make it available to anyone wanting to purchase and use it.

It is important that users of this manual understand that no claim is made that the instructions presented are to be construed as being the only methods useful in making and fitting the various orthoses and shoe modifications described. No doubt many equally good methods exist. Also, no claim is made that this manual is a scientific research document in any sense of the word. All it attempts to do is accurately describe the procedures used by a group of practical orthotists in fabricating and fitting lower extremities orthoses. It is not anticipated that every practicing orthotist will agree with all the procedures described. In fact, the men who worked together to write the manual did not always agree with one another, but they usually managed to work out a compromise.

It is not possible within the space limitations of a practical laboratory manual to describe the construction of every type of lower extremity orthosis. Since the manual is primarily for use in preemployment and inservice training programs, orthoses were selected for inclusion on the basis of frequency of use.

This manual is intended for use as a teaching aid for the orthotics instructor who uses the standard four steps in instruction, which require that he demonstrate and explain a procedure, then assist his students in applying in the laboratory the procedures they saw demonstrated. It is in this latter step, the application, that the manual is invaluable, as the students can refer to it for help, thus freeing the instructor for the more difficult instructional problems that arise.

MILES H. ANDERSON
Editor-in-Chief

MARY ELLISON
Editor, UCLA Allied Health
Professions Projects

CONTENTS

A Manual of
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CHAPTER 1

EXTERNAL SHOE MODIFICATIONS

EXTERNAL SHOE MODIFICATIONS

Before he undertakes to perform shoe modifications, the orthotist needs some basic information, which is summarized below.

Almost all shoe corrections should be made on what are commonly known as orthopedic or corrective shoes, or other footwear of good quality. Such shoes are constructed of leather uppers, leather counters, leather insoles and outsoles, and have a Goodyear welt construction. A diagram of this type of shoe appears on the following page. In addition to their sturdy construction, such shoes are characterized by a broad heel for better balance, and a spring steel shank.

Outsoles for children's shoes are sometimes of chrome leather or of man-made materials that have better wearing qualities than leather. Such materials are of the same weight (thickness) as leather; they are equally light, and can be stitched or cemented in the same way as leather.

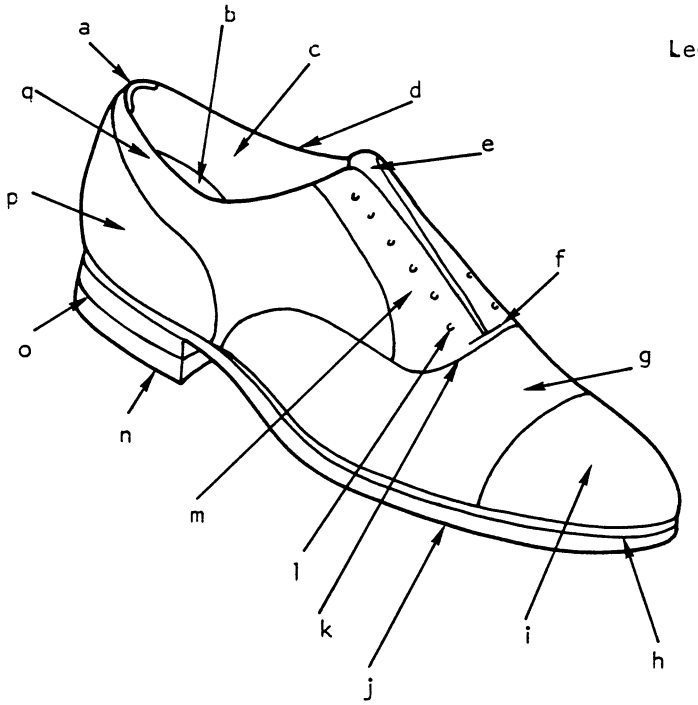
Goodyear welt construction signifies that a leather welt is used to attach the outsole to the upper portion of the shoe. This enables the orthotist to separate the sole in any desired area by cutting the stitching in order to insert the desired correction between outsole and insole, and then to restitch the sole into place. The stitch-down upper and the sole that is merely cemented to the upper, or the McKay stitched shoe, are not well suited for shoe modification.

Children's shoes in the smaller sizes sometimes have spring heels. This means that the heel is placed between the outsole and the upper, with the sole stitched to the upper all the way around. When corrections are required in the heels of such shoes, it usually is best to cut the stitching between heel and sole and heel and welt, and remove the heel. Restitch sole to welt and put on an external heel and corrections as prescribed.

Corrective shoes have the same construction as standard Goodyear welt shoes, but are made over special lasts, e.g., outflare, inflare, straight last.

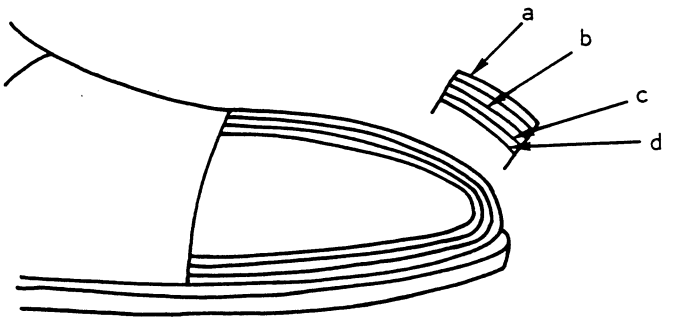
All modifications discussed in this chapter will relate to orthopedic or corrective shoes or regular footwear of Goodyear welt construction.

ANATOMY OF A SHOE WITH STANDARD CONSTRUCTION
(Goodyear Welt)

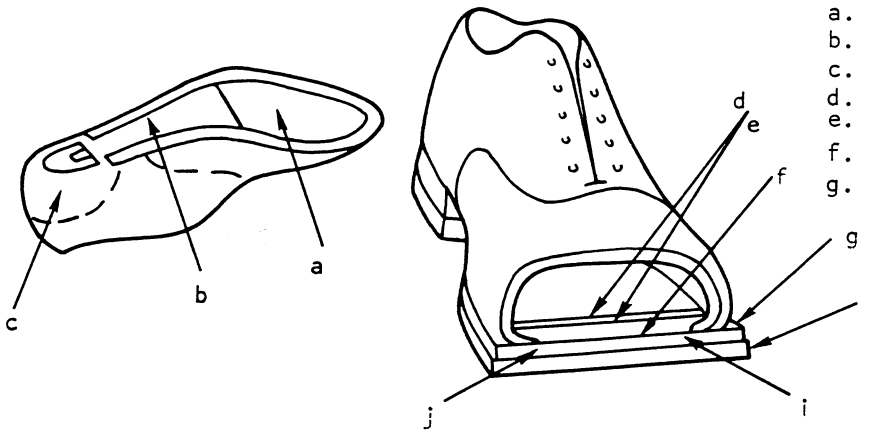


Legend:

a. Backstay
b. Heel pad
c. Quarter lining
d. Top line
e. Tongue
f. Tongue bar
g. Vamp
h. Welt
i. Toe cap
j. Outsole
k. Throat line
l. Eyelet row
m. Eyelet facing
n. Heel
o. Heel base
p. Heel foxing
q. Quarter



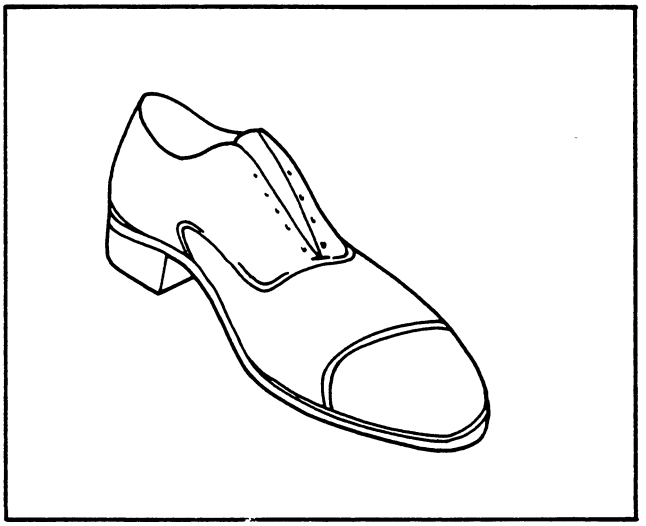
a. Upper
b. Doubler
c. Boxtoe
d. Lining



a. Bottom filler
b. Shank
c. Counter under quarter
d. Sock lining
e. Insole
f. Filler
g. Welt
h. Outsole
i. Insole rib
j. Stitch uniting insole, upper, and welt

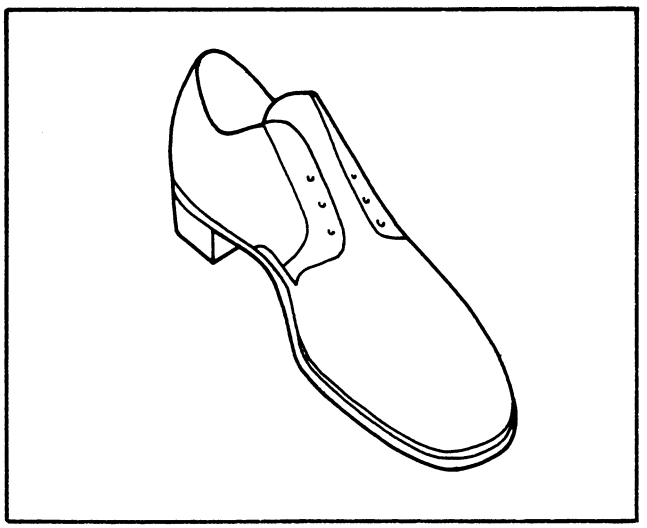
SHOE STYLES

Except for personal choices dictated by fads, the shoes the orthotist deals with most frequently are likely to be oxfords or low-cut styles. Typical of these are the bal (or balmoral) and the blucher.



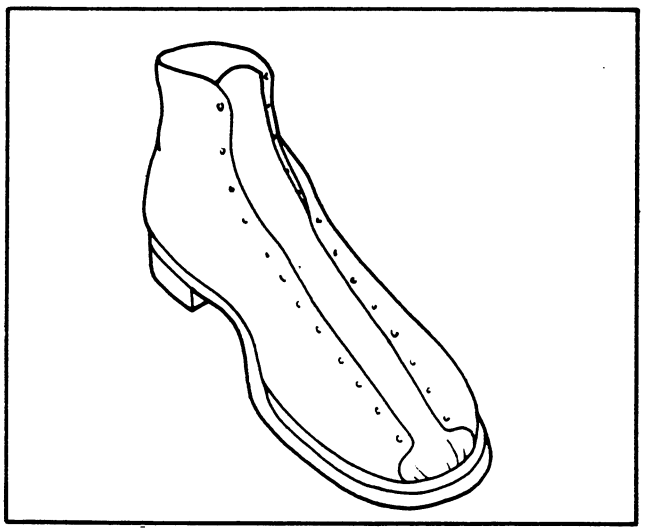
The bal model (upper right) presents difficulties for the orthotist faced with the problem of making internal corrections, because the tongue bar and stitched throat line allow little room for reaching into the shoe interior.

The blucher model (right), however, permits easy access to the interior because the eyelet facing is not stitched down to the vamp. For this reason, it is much preferable when internal modifications are called for.



The surgical or convalescent shoe would present an ideal situation if it were not for the element of esthetics, since it laces all the way to the toe. An alternative style laces at the back seam.

High-cut shoes may be prescribed for various conditions involving stability of the ankle.

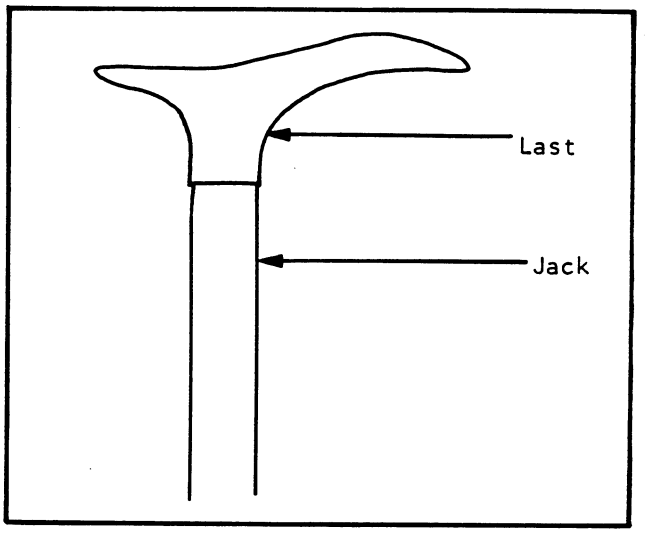


HEEL WEDGES

Medial heel wedges commonly are used for valgus conditions and lateral wedges, for varus. Wedges also are used in conjunction with other modifications, such as sole wedges, to achieve control over walking pigeon-toed and similar conditions. They also are used along with internal shoe corrections.

Basically, heel wedges are intended to give better balance to the calcaneus by supporting it in a more vertical position, thus relieving pressure on the subtalar joint.

1. Prepare the shoe by removing heel, heel pad, and sock lining (if any). To remove the heel, place the shoe on a last of proper size and mount it on a jack. Work from the shank of the shoe so as not to mar the heel.



2. Insert special heel removing tool or broad blade screwdriver between the outsole and the heel breast to pry the heel loose. Start near a nail and twist the handle, pulling one nail loose at a time, until the heel comes off.