A FEW REMEDIAL EXERCISES.

By MAJOR T. F. KENNEDY,
Royal Army Medical Corps.

I AM very diffident at introducing the subject of remedial exercises, but I shall feel more than justified in the attempt if I succeed in setting the controversial ball rolling in what, for the Army, is a very important subject. I lay no claim to being an authority on the subject, and shall welcome any criticisms or suggestions which this article may promote.

I approached the matter originally at the Army School of Physical Training, Aldershot, from the point of view of instructing the Physical Training Staff in a few practical points in the treatment, by exercises, of the deformities more commonly met with in the Army, so the exercises suggested are based to a large extent on those already incorporated in the Physical Training Tables for Recruits of all Arms. Such exercises as were not in the tables have since been recommended for inclusion.

It is suggested that physical training should provide the general basis for remedial work in the Army, and as it would usually be carried out by physical training instructors working under the direction and supervision of medical officers, it is thought that these officers might find the suggestions in this article of use.

Remedial work is of great importance in preventing wastage in time of peace, but becomes infinitely more so in war when convalescent depots would be full of men needing special exercises to render them fit.

CAUSES OF DEFORMITY.

I will not attempt to tabulate the various causes of deformity, but it is obvious that exercises could hold out little hope of improving any of a bony nature, consequently their utility would be confined to those of a ligamentous or muscular origin, or a combination of both.

DEFORMITIES MET WITH.

The more common deformities met with are:—
(1) Flat-foot.
(2) Exaggerated lumbar curve with lax abdominal muscles and consequent tilting forward of the pelvis.
(3) Lateral curvature of the spine.
(4) Unilateral development.
(5) Exaggerated forward curve in the dorsal region.
(6) Pigeon chest.
(7) Any injured and impaired muscle group.
A Few Remedial Exercises

(1) Flat-Foot.

Predisposing Causes: (a) Constitutional.—I do not propose to enlarge on this.

(b) Occupational.—Continual standing must have an effect by putting increased strain on the structures forming the arches.

I should like under this heading to draw attention to the influence which high heels, or in fact any heels at all, have in throwing increased weight on the arch of the foot. When a person is standing erect the weight on the body is directed through the ankle-joint mainly on to the heel, with a slight proportion of the strain diverted on to the outer side of the longitudinal arch, and thus on to the base of the fifth metatarsal (see diagram).

![Diagram of normal feet and compensated splaying]

Note that no weight is borne on the inner side of the arch—the ball of the great toe rests on the ground, but there is no pressure on it.

When the heels are raised, even to a slight extent, the weight is thrown forward and the main part of the strain is thrown on to the arch and transmitted through it to the ball of the great toe. So it is evident that, when standing with a raised heel, the arch of the foot which normally should be resting is subjected to strain.

The throwing of the weight from the back and outer on to the back and inner parts of the foot decreases the area of the pedestal on which the body is balanced; the toes are pointed out to compensate this, and this splaying of the feet aggravates the strain on the inner side of the arch when walking.

![Diagram showing position of feet with and without splaying]

Dotted line shows position of normal feet.
Continuous line shows the compensatory splaying necessary to preserve balance.

Causes.—The more common are:

(a) Stretching or contraction of the intertarsal and metatarsal ligaments.

(b) Weakness of, or stretching of, the following muscles:

(i) Anterior tibial group, consisting of tibialis anticus, extensor longus digitorum and extensor proprius hallucis. (Action of this group is to flex the ankle-joint and raise the longitudinal arch of the foot.)
(ii) Tibialis posticus. (Action—helps to support the inner side of the longitudinal arch and prevents the astragalus from being crowded down between the calcaneum and the scaphoid.)

(iii) The small muscles of the sole of the foot which stretch between the two pillars of the main arch. (Action—approximation of the two bases of the arch with an upward bending of it.)

(iv) Peroneus longus. (Action—it prevents the transverse or minor arch from spreading by extending down behind the external malleolus, turning forward at its lower end at an angle of 60°, passing forward along the outer margin of the foot to the groove in the cuboid bone where it takes another turn of about 100° to extend diagonally forward and across the sole of the foot to its insertion at the base of the first metatarsal and outer side of the external cuneiform bone.)

(c) Traumatic. Where injury to the plantar or other ligaments occurs from trauma, e.g. landing with a jar on a hard surface.

Correction.—(1) Removal of cause.

(2) Exercises to increase the tone and strength of those muscles at fault. If we take the muscle groups whose defections are mainly responsible we shall be working on a logical basis.

<table>
<thead>
<tr>
<th>Starting Position</th>
<th>Anterior Tibial Group</th>
<th>Exercise</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick March</td>
<td></td>
<td>1. Rapid Marching</td>
<td>To be carried out as fast as possible, with short steps and toes pointing slightly inward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Walking on heels</td>
<td></td>
</tr>
<tr>
<td>Hips firm, one knee raise</td>
<td>1. Foot flexing</td>
<td></td>
<td>Could be added to any balance exercise. Gives exercise to all the muscles that have an action in the arches of the foot</td>
</tr>
<tr>
<td></td>
<td>2. Foot inward rolling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At wall bars, standing position, hips firm, feet support</td>
<td>1. Trunk inclining backward</td>
<td>Trunk to be lowered backward as far as possible</td>
<td></td>
</tr>
<tr>
<td>At wall bars, sitting position, hips firm, feet support</td>
<td>1. Trunk inclining backward</td>
<td>Trunk to be lowered to the ground</td>
<td></td>
</tr>
</tbody>
</table>

NOTE.—(a) When landing from jumping exercises feet should be apart and toes should be turned slightly inward.

(b) When landing from a height or with forward impetus feet should be in same position as in (a) and forward movement should be continued.

<table>
<thead>
<tr>
<th>Starting Position</th>
<th>Exercise</th>
<th>Tibialis Posticus and Peroneus Longus</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting position, feet astride</td>
<td>Feet turned inward</td>
<td>Chiefly develops the tibialis posterior without any weight being thrown on the arch as in later exercises</td>
<td></td>
</tr>
<tr>
<td>All exercises of “Heels raising” type from the tables</td>
<td>In marked cases of flat-foot these should not be given until the muscles have been strengthened by non-weight bearing exercises</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A Few Remedial Exercises

SOLE-OF-FOOT MUSCLE GROUP.

<table>
<thead>
<tr>
<th>Starting Position</th>
<th>Exercise</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet astride, hips firm</td>
<td>1. Alternate foot arching</td>
<td>Should be done with shoes and socks removed, which gives more freedom of movement</td>
</tr>
<tr>
<td>Feet closed, hips firm</td>
<td>2. Feet arching</td>
<td></td>
</tr>
<tr>
<td>Feet astride, hips firm</td>
<td>1. Alternate sole of the foot turning inward and foot arching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Alternate heel placing forward on the ground and foot arching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Alternate toes placing forward on the ground and foot arching</td>
<td>This exercise also develops the tibialis posticus and peroneus longus</td>
</tr>
</tbody>
</table>

Remarks

Should be done with shoes and socks removed, which gives more freedom of movement.

Note.—All these anti-flatfoot exercises are merely suggested as a guide, and can easily be added to, or modified, to suit circumstances.

(2) Exaggerated Lumbar Curve with Consequent Forward Tilting of the Pelvis and Lax Abdominal Muscles.

Predisposing Cause: Postural.—In this connection, again, high heels play their part. The raising of the heels throws the weight of the body forward, and a compensating backward bend takes place in the lumbar region of the spine to counteract the forward inclination of the lower extremities.

Causes: (a) Ligamentous.—Contracture of the posterior and stretching of the anterior intervertebral ligaments in the lumbar region.

(b) Muscular.—(1) Contracture of the dorsal muscles of the lumbar region. (2) Laxity of abdominal and hamstring groups of muscles.

The following diagrams illustrate how the forward tilting of the pelvis is associated with the condition, and how abdominal and hamstring groups of muscles both need to be considered in its correction.

Fig. 1.—Shows normal erect posture with body balanced evenly on the hips.

Fig. 2.—Shows the tilting of the pelvis when the body bends forward. Note the hamstring muscles are on the stretch.

Fig. 3.—Shows erect posture but a forward tilting of the pelvis. Note the stretching of the hamstring and abdominal muscles.

Correction.—Should be directed towards stretching the muscles and ligaments which are contracted, and shortening those which are overstretched.

(a) Exercises for stretching the posterior ligaments and the erector spinae group of muscles. (1) All exercises from the tables of the "lying on back" to "forward reach" and "floor beat" variety (knees in this case should
not be kept straight.) (2) Trunk bending down quickly and up to "arms bend" position. (3) Sitting position, legs straight, feet or ankles grasp, trunk bending forward.

(b) Exercises for shortening abdominal group of muscles. All exercises in Group VI (abdominal exercises) of the Recruits Tables. (Attention must be paid in these exercises that the muscles are given work when fully contracted more than at normal or extended length.)

(c) Exercises for shortening hamstrings.

Exercise | Remarks
--- | ---
1. Correct position of attention | Practised by standing with back against wall and pressing lumbar region into wall. (Position should be held for a little while)
2. Hips firm—leg backward raise and strongly stretch. Later—knee bend | Body must be kept as erect as possible and leg raised as high as possible
3. Lying (on the face)—legs raising. Later—knees bending | The body must not be raised in doing this exercise
4. At wall bars, hang on top bar, face to bars—knees bending | 

(3) Lateral Curvature of Spine.

Causes.—I will not touch on these.

Correction.—Search for a "key-note position" in which the lateral curvature is corrected, and then slowly get the subject to relax the other muscle groups which helped him to assume the position, but try hard to maintain correct position of the spine by use of the spinal muscle alone—constant practice of this should be carried out.

[Note.—Manipulation of both arms should be done until the "key-note position" is discovered.]

Exercises for Correction of Curvature.

1. Feet astride, hips firm | Trunk bending sideways
2. Feet closed, one arm bend, and one hand hips firm | Trunk bending with arm stretching
3. "S" position, feet astride | Trunk bending sideways. (Later quickly)
4. On knee, hands on head | Trunk bending sideways
5. Hips firm, foot support | Trunk bending sideways. (Later—with arms upward stretch)
6. Hips firm, hip support | Trunk bending sideways. (Later—with arms upward stretch)
A Few Remedial Exercises

(4) Unilateral Development.

Causes.—Occupational, recreational, etc.
Correction.—Obtained by exercising specially those muscles which are weak until they are equally developed to their fellows of the opposite side —then continue with harmonious bilateral development.

(5) Exaggerated Forward Curve in Dorsal Region.

Predisposing Causes.—Occupational position, etc., e.g. bending over a desk. Slovenliness in carriage, constitutional, etc.
Correction.—Exercises directed to reduce the curve and to strengthen the muscles for holding the body erect.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feet astride, hips firm — trunk bending backwards</td>
<td>The bracing backward should be confined to the dorsal region and should not take place in the lumbar region</td>
</tr>
<tr>
<td>2. Kneeling position, sitting on heels — back stretching</td>
<td>The hands should be clasped behind the back and should not be raised when stretching</td>
</tr>
<tr>
<td>3. Feet astride, trunk forward bend — arms swinging backward, forward and upward</td>
<td>These exercises should be carried out very carefully under personal supervision of the medical officer</td>
</tr>
<tr>
<td>4. Forward lying (on bench) — trunk bending backward</td>
<td></td>
</tr>
<tr>
<td>5. Lying on face — trunk raising</td>
<td></td>
</tr>
<tr>
<td>6. (Double beams). Back support — hanging. Later — swinging</td>
<td></td>
</tr>
<tr>
<td>7. (Wall bars,) Dorsal span bending with helper</td>
<td></td>
</tr>
</tbody>
</table>

(6) Pigeon Chest.

Cause.—Constitutional.
Correction.—Those exercises which develop the pectoral group of muscles and tend to widen the chest wall.

1. Arms flinging from low cross to sideways stretch.
2. Arms flinging to flight.
3. Arms forward bend — arms flinging.
4. Arch hang! — arms bend. (Note.—The head should be allowed to go forward and elbows lowered in these two exercises so as to throw the maximum of the work on to the pectorals.)

(7) Any Injured or Impaired Muscle Group.

Correction.—In this case I should be guided by the muscle group or groups which need special attention.