FUNCTIONAL REHABILITATION associated with physical activity has been touted to be the cornerstone of athletic training’s niche among health care professions. This rehabilitation paradigm has focused on restoring sensorimotor function related to sport/activity-specific rehabilitation exercises and equipment. Advances in techniques associated with this paradigm have brought forth such things as jump training programs for the prevention of ACL injuries in female athletes and balance training for those with chronic ankle instability. As the utilization of these programs become more widespread, the need for a theoretic construct to aid in decisions associated with program design, evaluation, and progression has grown. The dynamical systems theory (DST) provides such a framework. A previous ATT report introduced DST as it relates to sports medicine research. According to DST, the behavior of the sensorimotor system is controlled by (a) the health of the person, (b) the task being performed, and (c) the environment in which a movement goal is executed (Table 1). Rather than having preprogrammed neural pathways to accomplish a movement goal (associated with traditional theories of sensorimotor system function), DST suggests that the sensorimotor system is free to develop and change strategies as it interacts with the environment. In this way, coordination within the sensorimotor system changes on the basis of demands imposed by the movement goal. Because of this spontaneous (goal-oriented) self-organization, a healthy sensorimotor system can accomplish a movement goal in a variety of ways, any one of which is based on the environmental cues received as the task is performed. If there are changes in the task or environment, the sensorimotor system can organize a new strategy to satisfy demands associated with the movement goal. More strategies translate to an enhanced ability to successfully accomplish the movement goal and cope with change. This has been referred to as invariant results through variant means, which is also referred to as functional variability. Injury can significantly hinder the sensorimotor system in its ability to

Table 1. Movement Goal: Regain and Maintain Single Limb Balance Without Error

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Definition</th>
<th>Example in Rehabilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organismic</td>
<td>Structural or functional impairment (i.e., injury) that limits functional variability in the sensorimotor system.</td>
<td>Chronic ankle instability</td>
</tr>
<tr>
<td>Task</td>
<td>Change of activity that shapes sensorimotor system strategies for movement goal execution.</td>
<td>Hop to stabilization to Hop to stabilization and reach</td>
</tr>
<tr>
<td>Environmental</td>
<td>Predictability of environmental cues shapes the strategies for movement goal execution.</td>
<td>Firm surface to Foam surface OR Predictable Hop to Unpredictable Hop</td>
</tr>
</tbody>
</table>

The most important consideration in functional rehabilitation program development is the clarity of the movement goal.
accomplish movement goals. Injuries are structural and functional alterations within a component of the sensorimotor system. Consequently, injured parts of the system cannot be used in movement strategy development, which reduces the functional variability of the sensorimotor system—in other words, it is constrained in its ability to cope with change. The purpose of this report is to introduce a constraints-led approach to rehabilitation. I will support this information with examples from a validated balance training program that has been shown to improve self-reported function, postural control, and gait among patients with chronic ankle instability. To use this model, a clinician must develop a basic understanding of sensorimotor constraints.

**Task Constraints in Rehabilitation**

Changing the demands of a movement task results in changes within the components of the sensorimotor system that contribute to accomplishment of the movement goal. The complexity of the task will govern how many strategies the sensorimotor system can use. An example of this is standing on one leg. The sensorimotor system can develop numerous strategies from its many components to maintain single-limb stance and it can make corrections for any errors in position that are introduced. In contrast, when a person performs a maximum dead lift (a very complex task with very high demands), there are very few strategies available to accomplish the movement goal of lifting maximum weight. If an error in position is introduced, it can induce an injury that structurally and functionally alters one or more components of the sensorimotor system.

**Environmental Constraints in Rehabilitation**

Environmental constraints are essential for organization of the sensorimotor system. Cues from the environment should be interpreted in terms of the predictability that they offer to the sensorimotor system. More predictable environmental cues allow for greater freedom for the development of strategies to accomplish movement goals. Less predictable environment cues constrain the sensorimotor system’s ability to develop movement goal strategies. An example is single-leg standing on a firm surface compared to a foam surface. On the firm surface, the environmental cues that are derived from interaction of the foot with a firm surface are much more predictable. On a foam surface, the environmental cues are much more unpredictable, resulting in greater difficulty in accomplishing the movement goal.

With increased exposure to task and environmental constraints, the sensorimotor system can develop new strategies to accomplish movement goals. The task and environmental constraints influence the behavior of the sensorimotor system. During administration of the balance training program, I have found it essential to adjust the environmental and task constraints to keep the subject on the cusp of failure (i.e., loss of balance). When challenged in this manner, the sensorimotor system develops greater flexibility in achieving its movement goals, which translates into better outcomes.

**Cultivating Functional Variability**

The clinician must be very specific when identifying the desired movement goal for the rehabilitation patient. Rather than focusing on the task to be performed (task-oriented rehabilitation), the functional activities should be focused on the quality of the movement goal execution (goal-oriented rehabilitation). In the balance training program, the primary movement goal I gave the subjects was to regain and maintain balance after a single-leg hop. To provide clear feedback about whether or not the movement goal was successfully accomplished, I tracked errors in a manner similar to that used by the Balance Error Scoring System (BESS) to grade the movement goal execution. If a subject touched down with the opposite limb, had a large amount of trunk lateral flexion, or missed a ground target, the movement goal (regain and maintain balance) was not successfully achieved. The subject would then remain at that level of balance training program constraints until the demands of the task and environmental constraints could successfully be met.

**Purposeful Manipulation of Task Constraints**

During progression through a functional rehabilitation program, the tasks must be meaningful to the individual. Balance training has been shown to be beneficial for patients with ankle instability. From the perspective of DST, the most important consideration in functional rehabilitation program development is clarity