Work Hardening: Occupational Therapy in Industrial Rehabilitation

(rehabilitation, vocational; work capacity)

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Work hardening, presented in this paper as a "new" service for the industrially injured, is actually well grounded in the traditional models and practices of occupational therapy. From the profession's early roots in industrial therapy to the development of a variety of programs for the industrially injured through the 1950s and 1960s, the historical and philosophical bases of occupational therapy support the use of work as an evaluative and therapeutic medium. What is actually new is the adoption of terminology, technology, and a program format that fits in with the needs of consumers in the 1980s.

Recent developments that created the need for the specialized services that occupational therapists are uniquely qualified to provide include growth of private sector vocational rehabilitation, changes in workers' compensation laws, and increasing costs of vocational rehabilitation. This paper describes work hardening in its present form. A case example is given that demonstrates how work hardening can be a cost-effective and time-saving bridge which spans the gap between curative medicine and the return to work.

Work hardening is a work-oriented treatment program that has an outcome which is measured in terms of improvement in the client's productivity. This is achieved through increased work tolerances, improved work rate, mastery of pain (through the effective use of symptom control techniques), improved work habits, increased confidence, and proficiency with work adaptations or assistive devices. Work hardening involves the client in highly structured, simulated work tasks in an environment where expectations for basic worker behaviors (e.g., timeliness, attendance, and dress) are in keeping with workplace standards. The ultimate goal of work hardening is to help the client achieve a level of productivity that is acceptable in the competitive labor market. This productivity improvement is achieved at various levels through the following techniques.

- Decrease in secondary impairment effects. Impairment is often magnified through disuse. Work hardening improves strength, flexibility, and endurance.
- Decrease in functional limitations. The client's style of work and the quality of his or her work behavior often increases the functional decrement due to the impairment. Work hardening helps the client learn effective adaptive behaviors.
- Decrease in disability. Disability is the impact of functional impairment on the client's societal roles, among which work roles are prominent. Work hardening helps the client reestablish many of these roles. Improvement in these other areas generalizes to work roles and results in a concomitant decrease in work-related disability.

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- Improvement of vocational feasibility. Feasibility, which is the client's acceptability as an employee, is a key issue in work hardening. Most clients with chronic industrial injuries have not worked for several months. Thus, work hardening identifies and remediates potential problems with productivity, increases safety in the workplace, and strengthens interpersonal relations.

- Improvement of employability. Employability, which is the probability that the client will achieve employment, is a consequence of the levels of the client's work tolerances (e.g., ability to lift, carry, and stand) compared with the tolerances of other workers in the general labor market. Work hardening identifies and develops these work tolerances.

- Decrease in vocational handicap. The match between the client and job can be improved by increasing the client's level of function and by modifying the job's critical work demands. Work hardening involves both the client and the employer to address these issues.

**Historical Roots**

Although work hardening is presented here as a new service, in the sense of its recently recognized importance within industrial rehabilitation, the origins of many of its current concepts and techniques are found in occupational therapy (1).

In the early 1900s, several societal trends culminated in a nationwide awakening to the rehabilitation needs of the physically disabled. Before, care for the disabled usually took the form of custodial public support.

Meanwhile, occupational therapists were actively involved with the development of industrial therapy programs in mental hospitals. Industrial therapy was well developed by the late 1930s and was defined as "the prescribed use of activities inherent to the hospital operation, planned for the mutual benefit of patient and institution" (2, pp 1-7). Various jobs within the institution were analyzed according to skill level, physical and mental demands, and potential therapeutic benefits. Working as part of a professional team, the occupational therapist coordinated work assignments in keeping with the patient's aptitudes, interests, experiences, and therapeutic goals (3, 4).

The aftermath of World War I focused society's attention on the increasing numbers of disabled unemployed veterans who wanted to lead economically productive lives. Public awareness soon expanded to include even greater numbers of disabled civilians, who faced a similar dilemma as the mechanization of American industry caused more industrial accidents. To return to the workplace, injured workers often needed retraining, sometimes for an entirely new occupation (1, 3, 5).

In response to these needs, private agencies began to develop programs to provide rehabilitation services. In 1920, the passage of the federal Vocational Rehabilitation Act added important governmental support to these private efforts. The purpose of this law was to provide funds to reclaim persons who would not otherwise be employable by retraining them "around the disability" and placing them in suitable jobs. Amendments in 1943 and 1954 to the 1920 Act increased funding for vocational rehabilitation services and allowed these services to be expanded to include programs for psychogenic illness and for physical restoration (1, 5).

The expanded opportunity to develop vocational rehabilitation services resulted in temporary lags between theory and practice. Occupational therapy responded to the challenge, and several programs emerged. Among the earliest efforts was the establishment of "curative workshops." The practice of occupational therapy within the curative workshops supported the concept that the profession provided an important service to bridge the gap between a physical restoration and the return to work.

In the hospital, an injury or disease is treated sufficiently to enable the patient to return home, but it remains for the curative workshop to continue the treatment until the patient is capable of returning to his occupation (8, p 223).

Treatment in the curative workshop was geared toward restoring the impaired body part to as normal function as possible, with the return to work as the eventual goal. Graded activities were used to improve function, and these were often planned along the lines of the physical demands of the patient's original job (7). Therapeutic activities were adapted so that "the muscles he has always used and must use again in his job are brought into play and restored to the patient's functional and economic needs" (8, p 164).

The "work evaluation" program in the 1940s at the Rochester Rehabilitation Center in New York represents another step in the conceptual development of work hardening (9). This program was recognized not only as a treatment
center to recondition a person for
the return to work, but also as an
evaluation center that supplied ini-
tial information for the identifica-
tion of appropriate vocational
goals. Individuals who had gained
maximum physical restoration
were admitted to the work evalua-
tion program. In this program,
they were presented with a variety
of industrial jobs in work condi-
tions that simulated the industrial
environment. Over the course of
several weeks, clients would learn
to work at maximum efficiency to
meet industrial standards. Per-
formance was carefully observed
and analyzed in terms of general
worker traits (e.g., strength, tool
handling, work habits, dexterity) to
determine areas of employability.
In the approach used at the Roch-
ester Rehabilitation Center, as in
work hardening today, vocational
interests were formally evaluated
only after work tolerances were rel-
atively stable and well defined. Ste-
vens (9), an occupational therapist
who helped develop the program,
said, "To direct the client's interest
and then to determine the capabil-
ity produces a 50-50 chance that
the interest will have to be un-di-
rected afterwards" (p 158).

In the late 1950s, many rehabili-
tation programs were divided into
"prevocational" and "vocational" services. In addition, there was
movement toward using more
standardized vocational testing
procedures. This led to the de-
velopment of the profession of voca-
tional evaluation. Vocational eval-
uation was seen as a comprehen-
sive assessment process that used stan-
ardized work samples and psycho-
metric tests to determine assets and
limitations in the areas of work apti-
tudes, interests, temperaments, and
skills. Separate prevocational
programs, such as that developed
at the Institute for the Crippled
and Disabled in New York (10),
helped prepare clients for the pres-
sures and demands of vocational
evaluation. The prevocational pro-
gram was concerned with develop-
ing a client's work habits, work tol-
erances, coordination, and produc-
tive speed to levels acceptable for
entry into vocational evaluation and
 eventual employment. The de-
cision as to whether a client should
undergo prevocational evaluation
and training, begin vocational eval-
uation, or go directly into a job
training program was made by the
rehabilitation team. This team
often used information gained
from structured "work tests" (11)
or from "physical capacity evalua-
tions" (12) developed and admin-
istered by occupational therapists.

Perhaps the best example of an
ever work hardening program can
be found in Wegg's (13) descrip-
tion of the "work therapy" pro-
gram at the May T. Morrison Cen-
ter for Rehabilitation in San Fran-
cisco.

This program consists of those ac-
tivities which are simulations of actual
on-the-job conditions of the individu-
al patient and can be used both as an
estimate of ability and as an exercise
medium to develop work habits, con-
idence, increase physical and emo-
tional tolerance, improve strength,
range of motion, coordination, and
dexterity. The familiar working situ-
ations promote good physiological ef-
fects. The clear treatment objectives
provide motivation. The availability of
the tools used in his trade allows the
injured worker to begin developing the
speed and skill he had attained during
his employment. The occupational
therapist is provided with an op-
portunity to grade activities as to length of
time, resistances used, distances that
weights are lifted and carried, positions
of work, and so on (p 252).

While some occupational ther-
apists were developing sophisticated
methods for vocational evaluation
and treatment for the industrially
injured, the profession as a whole
was responding to societal pres-
sures to develop a more scientific
rationale for its practice. In the late
1950s and 1960s, occupational
therapy began embracing the med-
ical model and moved toward de-
veloping its professional role
within rapidly growing physical re-
habilitation centers. As a result, oc-
cupational therapists began to
leave vocational rehabilitation pro-
grams for the industrially injured.

By the mid-1960s, occupational
therapists in work-related pro-
grams were found mainly in prevoc-
tional or work adjustment pro-
grams that served the severely dis-
abled or the mentally or emotion-
ally handicapped.

The 1980s have shown a reawak-
en of occupational therapy to
the values and beliefs of its foun-
ders and to the realization that the
marketplace supports reestab-
ishment of the profession's role in vo-
cational rehabilitation of the indus-
trially injured.

Work Hardening Program
Characteristics

The present form of work harden-
ing was developed at Rancho
Los Amigos Hospital in Downey,
CA, in the late 1970s. A survey of
programs in existence in March
1984, indicated that work harden-
sing services were being offered in
26 locations in the United States
and that approximately an equal
number of programs was in orga-
nization. Almost half of these pro-
grams were located in California.
All of the programs served injured
workers as their primary popula-
tion. Only two of these pro-
grams were based in government-operat-
ated institutions. A large majority of
these programs (17 of the 26)
were established and/or operated
by occupational therapists, who occasionally worked with a physical therapist or vocational evaluator. Work hardening typically takes place in a nonhospital environment, although several good work hardening programs are in hospitals or clinical environments. Work hardening requires from 600 to 1,500 square feet; the better programs typically occupy 1,200 square feet or more.

Work hardening programs use work capacity evaluation devices as the primary treatment tools. This is a new class of evaluation equipment that allows the work hardening professional to present the patient with tasks that simulate job tasks and that can be graded in terms of the level of difficulty or the length of time involved. Matheson and Ogden (15) and Matheson (14) describe several work capacity evaluation devices. Most of the devices in use are "homemade," although a few have recently become commercially available.

The work hardening client typically is supervised by a technician-level individual in a 4:1 or 6:1 ratio. The technician is closely supervised by the person responsible for the program and conducts the program based on the individualized work hardening plan written by the supervisor. This plan is developed by the professional in consultation with the client after an intake process. Typical charges for work hardening are $85 to $95 on a half-day basis and $125 on a full-day basis.

Experience shows that the clients who experience the greatest benefit from work hardening programs are those who are seriously deconditioned after an impairment caused by an injury or disease. In addition, people who have major discrepancies between their symptoms and objective findings and individuals whose impairment is limited to the dominant upper extremity substantially benefit from work hardening.

**Evaluation Process**

To consider a client for work hardening, a clear diagnosis and specific work restrictions or impairment description must be available from his or her primary care physician. Work hardening is conducted within this context. The work hardening tasks assigned to the client must not exceed his or her work restrictions. As the client progresses in the work hardening program, these restrictions may require modification. If recent medical information is not available, an updated medical evaluation should be conducted. Under no circumstances should a work hardening program be conducted without recent and reliable medical information.

**Application of Work Hardening—A Case Example**

Work hardening practitioners today take a highly systematic approach to treatment, with the type of intervention predicated on the stage in the rehabilitation process at which the patient is functioning. Figure 1 presents the stage model of industrial rehabilitation. Work hardening programs routinely address stages 2 through 7, and the type of intervention depends on the stage.

Mr. Jones is referred to the XYZ work hardening program after having sustained a lumbar strain/sprain. He is a paint container packager and loader; this is a job to which he believes he cannot return. His physician restricts him to lifting no more than 50 pounds and allows only infrequent bending and stooping. Mr. Jones reports a
current tolerance for lifting ten pounds “occasionally” and believes that he could not perform this task on an all-day basis. An outline of his work hardening program with treatment modules and program schedule follows. It is delineated in terms of the pertinent stages from the model depicted in Figure 1.

Stage Two (Impairment)

Decreased strength is identified in the erector spinae and quadriceps muscle groups. Mr. Jones is assigned to a lifting/lowering task (Treatment Module 1) on a 10-pound, twice-per-minute basis, from knee to shoulder height, for 15 minutes. This module is repeated once per hour for two hours for two days. Module 1 is increased to once every hour for four hours for days 3 through 5 and maintained at four times a day with an increase in frequency to twice per hour in days 6 through 8. Increases in load at five-pound increments begin at day 7 as tolerated.

Stage Three (Functional Limitation)

As Mr. Jones begins Module 1, he is observed to be using poor body mechanics and work posture. A 15-minute videotape feedback session (Module 2) once every day for five days brings Mr. Jones to the realization that his work behavior is tied to increases in pain, which limit his productivity. He receives instruction on appropriate work behavior, including body mechanics, and continues his program with the requirement that these be in constant use to develop the work habits which optimize his function.

Stage Four (Disability)

Mr. Jones reports that he cannot return to his previous job as a paint container packager and loader. In addition, he cannot repair his pickup truck, clean his yard and garage, prune his fruit trees, work at his garage workbench, or continue with his volunteer job as a maintenance man at his church. His “critical work function themes” are analyzed. He is found to avoid activities that require him to lift or carry more than 10 pounds, to perform whole-body push or pull tasks, or to reach to retrieve anything over two pounds at shoulder level or above. As he progresses with Modules 1 and 2, Mr. Jones is assigned to a “disability tasks” module (Module 3), which replicates these task demands while performing simulated work. The tasks are arranged so that he is allowed to successively approximate (under his control) the level of task demand that he avoids. This expansion of the concept of disability beyond the client’s work roles is crucial. Most clients are ambivalent about returning to the job on which they were injured. Conversely, very few clients are ambivalent about returning to the other social roles for which they have become disabled. The generalization to the work role of the client’s motivation to perform these roles is one that the practitioner undertakes with a great deal of care.

Stage Five (Feasibility)

Mr. Jones works beyond his tolerance on the third day of the program. He has such bad back pain afterwards that he is unable to sleep and misses the next day of work. When he returns to the program on the fifth day, he receives instruction in the use of the “Feasibility Evaluation Checklist” (14) and the “feasibility hierarchy.” He begins to learn to balance work pace (quantity of productivity), workplace tolerance, and attendance—the three feasibility areas that cause him the most trouble.

Stage Six (Employability)

As Mr. Jones progresses in the program to the point at which a return to his usual and customary occupation may be considered, Module 1 is modified to simulate his job’s critical work demands, based on a job analysis conducted in consultation with the work hardening program staff. The frequency and range of motion targets for the work hardening program are obtained from the job analysis. A work hardening program is designed to increase his work tolerance for range of motion under load (lifting and lowering).
services were provided by a vocational evaluator as part of a work hardening on 25 clients quickly. Table 1 depicts the effect of work hardening on 25 clients for two or three years, and only a few clients were expected, at the time of referral, to be able to return to work. Work hardening services were provided by a vocational evaluator as part of a work capacity evaluation program, which was graded to provide the patient with increases in work demand as his or her work tolerances improved.

**Improvement in Work Capacity—Career Development Center**

In Table 1, the general level of physical demand characteristics (PDC) of this group at intake is compared with the level seven to 10 days later when the patients left the program. Typically, patients improved from the sedentary range of PDCs to the light-medium range of PDCs. PDC refers to the general strength demands of work as defined by the US Department of Labor. Strength is probably the most important factor. In industrial rehabilitation, the types of injuries that most chronically disabled people have sustained directly affect their ability to bring strength to bear on the job tasks. Figure 2 depicts the Employment and Rehabilitation Institute of California’s version of the Department of Labor’s system.

**Physical Demand Characteristics of Work**

Typically, clients depicted in Table 1 improved from the sedentary to the light-medium PDC level. This is a significant improvement from the point of view of employability. It greatly improves the likelihood that these people are going to be able to find jobs that match their aptitudes, interests, and temperament.

While work hardening results in several important consequences, clients most frequently indicate increased employability as its most important effect. Work hardening improves employability in four specific ways.

1. Improvement of specific work tolerances through conditioning of the work hardening patient. As in the example presented above, work hardening develops strength, flexibility, and endurance through the use of work simulation as conditioning tasks. As work tolerances increase, employability improves because a greater number of jobs become possible.

2. Clarification of work tolerances in general. While work hardening is primarily a treatment program focusing on a few specific tolerances, a considerable amount of knowledge is gained about the patient’s work tolerances in general. Clarification of these work tolerances improves employability by providing a better definition of jobs the client is able to perform.

3. Symptom control through the use of work pacing, proper body mechanics, and the substitution of productivity for symptomatology as the method of self-assessment. Symptoms are controlled (not nec-

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td><strong>Improvement in Work Capacity—Career Development Center</strong></td>
</tr>
<tr>
<td><strong>Physical Demand Characteristics Level</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Intake</strong></td>
</tr>
<tr>
<td><strong>Exit</strong></td>
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<tr>
<td><strong>Values are for n = 25. S, sedentary; S-L, sedentary light; L, light; L-M, light medium; M, medium; M-H, medium heavy; H, heavy; V-H, very heavy; No change, 8%; 1 level, 16%; 2 levels, 32%, 3 levels, 32%. Avg length of program = 7 days. Range = 5-12 days.</strong></td>
</tr>
</tbody>
</table>
Figure 2
Physical demand characteristics of work

<table>
<thead>
<tr>
<th>Level</th>
<th>Weight Lifted</th>
<th>Frequency of Lift</th>
<th>Walking/Carrying</th>
<th>Typical Energy Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>10 lb or less</td>
<td>Infrequently</td>
<td>None</td>
<td>1.5 METS</td>
</tr>
<tr>
<td>Sedentary light</td>
<td>15 lb</td>
<td>Infrequently</td>
<td>Intermittent self-paced</td>
<td>2.0 METS</td>
</tr>
<tr>
<td>Light*</td>
<td>20 lb</td>
<td>Infrequently</td>
<td>2.5 mph no grade Slower speed with 10 lb or less</td>
<td>2.5 METS</td>
</tr>
<tr>
<td>Light medium</td>
<td>20 lb</td>
<td>Infrequently</td>
<td>3.0 mph no grade Slower speed with 20 lb or less</td>
<td>3.0 METS</td>
</tr>
<tr>
<td>Medium</td>
<td>50 lb</td>
<td>Infrequently</td>
<td>3.5 mph no grade Slower speed with 25 lb or less</td>
<td>3.5 METS</td>
</tr>
<tr>
<td>Medium heavy</td>
<td>75 lb</td>
<td>Infrequently</td>
<td>3.5 mph no grade with 35 lb load</td>
<td>4.5 METS</td>
</tr>
<tr>
<td>Heavy</td>
<td>100 lb</td>
<td>Infrequently</td>
<td>3.5 mph with 50 lb or less load</td>
<td>6.0 METS</td>
</tr>
<tr>
<td>Very heavy</td>
<td>In excess of 100 lb</td>
<td>Infrequently</td>
<td>3.5 mph with 50 lb or more load</td>
<td>7.5-12.0 METS</td>
</tr>
</tbody>
</table>

* Even though the weight lifted may be negligible a job is considered light if it requires a significant amount of walking or standing or frequent use of arm and/or leg controls.

MET, measure of energy expenditure.

cess in the labor market. The second goal often is not readily accepted by rehabilitation professionals. However, such a resolution of the client’s case not only facilitates adjustment to disability, but also provides the client with better access to the governmental support services that may otherwise be unavailable. For example, persons with true pain disorders that are based on a moderate level of pathology or a collection of minor pathologies often are not granted a Social Security Disability Insurance (SSDI) award, even though they are unable to perform substantial gainful employment. This is because the SSDI system measures employability in terms of impairment and does not directly evaluate employability. In cases in which work hardening has been unsuccessfully attempted, the fact that the work hardening program resolved the client’s work status in an unequivocal manner led to successful pursuit of SSDI awards. Conversely, success in work hardening facilitates a client’s return to the labor market.

Typical referrals for work hardening come from two sources: a) the rehabilitation counselors and rehabilitation nurses who supervise the vocational rehabilitation programs for people who have suffered industrial injuries whose vocational rehabilitation programs are being underwritten by either workers’ compensation carriers or their self-insured employers and b) the primary care physician and the insurance claims person. Primary care physicians who are working with people who are significantly deconditioned or for whom there is a major discrepancy between subjective symptomatology and objective findings greatly prefer to have a short trial of work harden-
ing available before work restrictions are set or before the client is cleared to return to work.

Insurance claims persons will readily support work hardening if it is used as a means to conclude a medical rehabilitation program that can be shown to be effective in promoting subsequent placement or a resolution of the case. Experience has shown that individuals who can benefit from work hardening can be identified early in the program. Hence programs can be time limited and their outcome is often predictable. This is quite attractive to claims persons.

In California, a substantial number of injured workers who might benefit from vocational rehabilitation services choose not to take part in the vocational rehabilitation process or are excluded from the program because they are found to be not suitable for competitive employment. Some of these people could have benefited from the rehabilitation process if work hardening had been available.

Summary

Work hardening is a new specialty within rehabilitation. It is addressed by several different disciplines among which occupational therapy has taken a leadership position. Work hardening is an important new approach to the rehabilitation of injured workers and others whose entry into the work force is under consideration.

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