

# Injury Reduction in Airline Workers Through a New Hire Physical Capability Screening Program

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Presented To:

Annual Meeting of the American College of Sports Medicine

May 31, 2002

St. Louis, MO

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## **Introduction**

Industries normally involved in material handling usually have high incidence and severity rates for overexertion injuries to the low back, shoulders and knees. This kind of work is typically found in the transportation, heavy manufacturing, construction, and nursing home industries.

The overexertion injury is one that can be prevented by one or a combination of the following:

1. Using correct body mechanics
2. Use of ergonomic aids or
3. Correctly matching the physical capability of the worker to the physical demands of the job

In the airline industry, it is difficult to always use correct body mechanics or ergonomic aids when loading or unloading an airplane. The cargo holds are small and the work is normally done on hands and knees, which makes the job physically difficult. This in turn leads to a high incidence of overexertion injuries in the airline industry. With this in mind, United Airlines set out to reduce or prevent their overexertion injuries for ramp workers, ticket agents, freight handlers and cabin cleaners. These job categories were selected based on the frequency and severity rates of injury related to overexertion injuries to the shoulders, knees and low back.

## **Purpose**

Thus the purpose of this study was to determine the effectiveness of an isokinetic physical capability new hire evaluation on the incidence rate of injury; specifically the reduction of overexertion injuries to the knees, shoulders and back and associated

costs by correctly matching the physical capability of the worker to the physical demands of the job.

## **Methods**

All new hire applicants hired between January 1, 2000 and December 31, 2000 for the job categories previously identified at the Chicago O'Hare United Airline hub were included in this study. The Not Tested Group consisted of 424 new hires who were hired between January 1 and June 30 and did not receive any form of a physical capability evaluation. The Tested Group consisted of 494 new hires hired from July 1 through December 31. The only difference between the two groups as related to the hiring procedure was the Tested Group went through an isokinetic physical capability evaluation. As a result, the physical capabilities of the individual's hired for the Tested Group either met or exceeded the physical demands of the job. Those who did not were not hired.

## **Physical Capability Assessment and Data Analyzed**

The assessment was an isokinetic evaluation performed on a Biodex Systems 3 machine. The test consisted of a shoulder and knee flexion and extension evaluation at 60 degrees per second. Two sets of 5 repetitions were performed.

The isokinetic data was analyzed for peak torque, peak torque to body weight ratio, right/left ratio scores, agonist/antagonist ratio scores and a force curve rating for each joint. The data was then combined using a mathematical model to generate a single digit physical capability score. If this score equaled or exceeded the Target score for the job, then the applicant was recommended for hire.

Injury data was collected on all injuries from United's workers compensation and medical departments for those job categories previously mentioned. Data collected consisted of cause of injury, result of injury, body part, cost of injury, date of injury and hire date. Only those injuries occurring within the first 6-months of employment were used. This allowed both groups to be matched on length of employment relative to injury rates and costs.

## Results

When assessing the differences in the frequency of injuries between the two groups, a Chi Square analysis was performed. The analysis yielded a significant Chi Square value of 44.81 at the  $p < .0000$  level as shown on Chart A. For the Tested group, the analysis showed that 81 injuries were Expected but only 21 were observed – a difference of 60 injuries or a 75% reduction. In contrast for the Not Tested group, the analysis showed that 69 injuries were Expected and 64 were Observed – a difference of 5 injuries or a 7% reduction.

Chart A

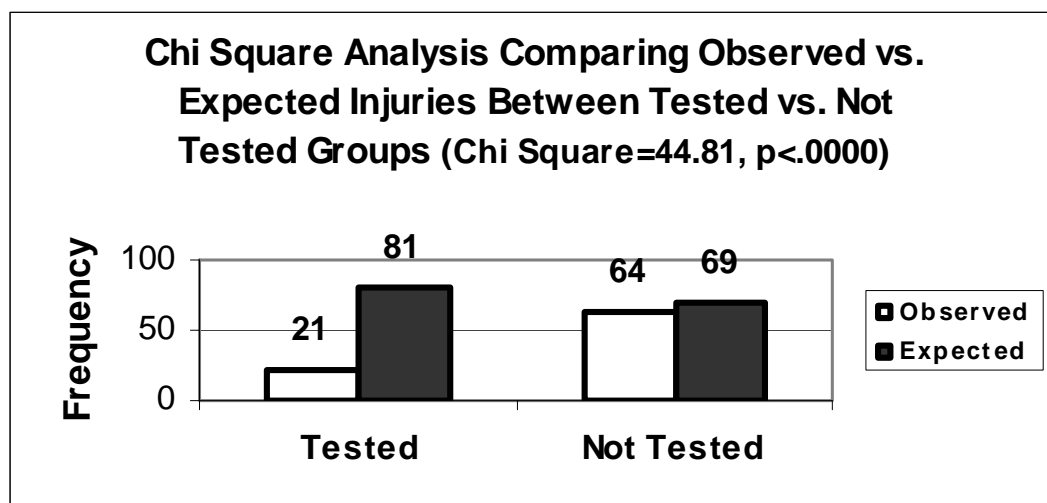


Chart B shows the frequency of injuries presented as incident rates per 100 workers. The incidence rate of injury for the Tested group was about 4 times less than the rate for the Not Tested group.

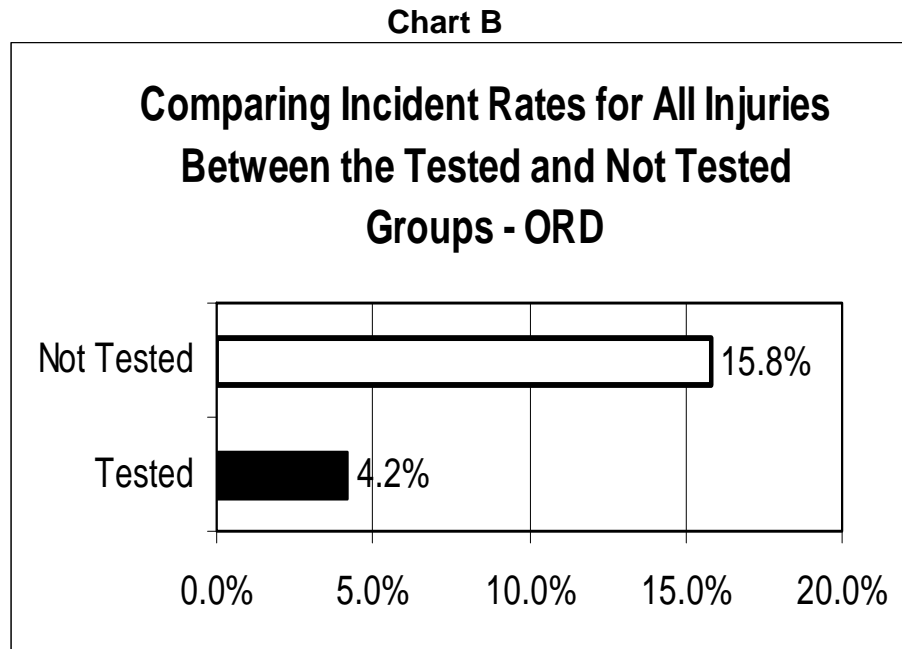
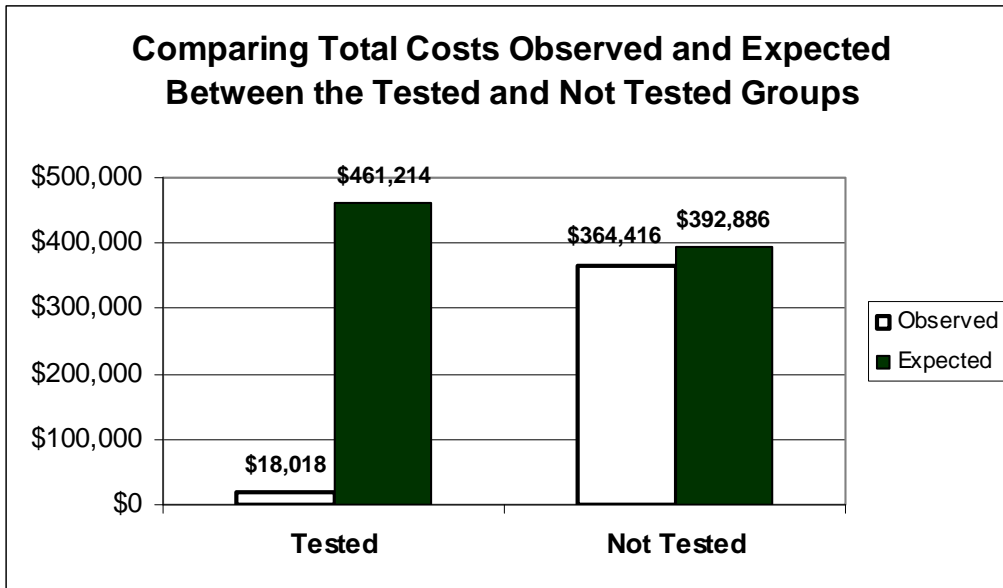


Chart C shows the differences in the Expected vs. Observed costs associated with the injuries for the Tested and Not Tested groups. The Expected injury costs for the Tested group was \$461,214 and the Observed was \$18,018 or a difference of \$443,196, which yields a 2,460 percent reduction. The Expected injury cost for the Not Tested group was \$392,886 and the Observed was \$364,416 or a difference of \$28,470, which is an 8 percent reduction. The difference between the two groups was statistically significant at the .05 level as derived by the Chi Square analysis. In otherwords, the Tested group experienced a reduction in costs 25 times greater than the Not Tested group. An unexpected finding of these data is the dramatic reduction in both the frequency and cost for all injuries not just the overexertion injuries to the knees, shoulders and trunk as stated in the purpose of the study.

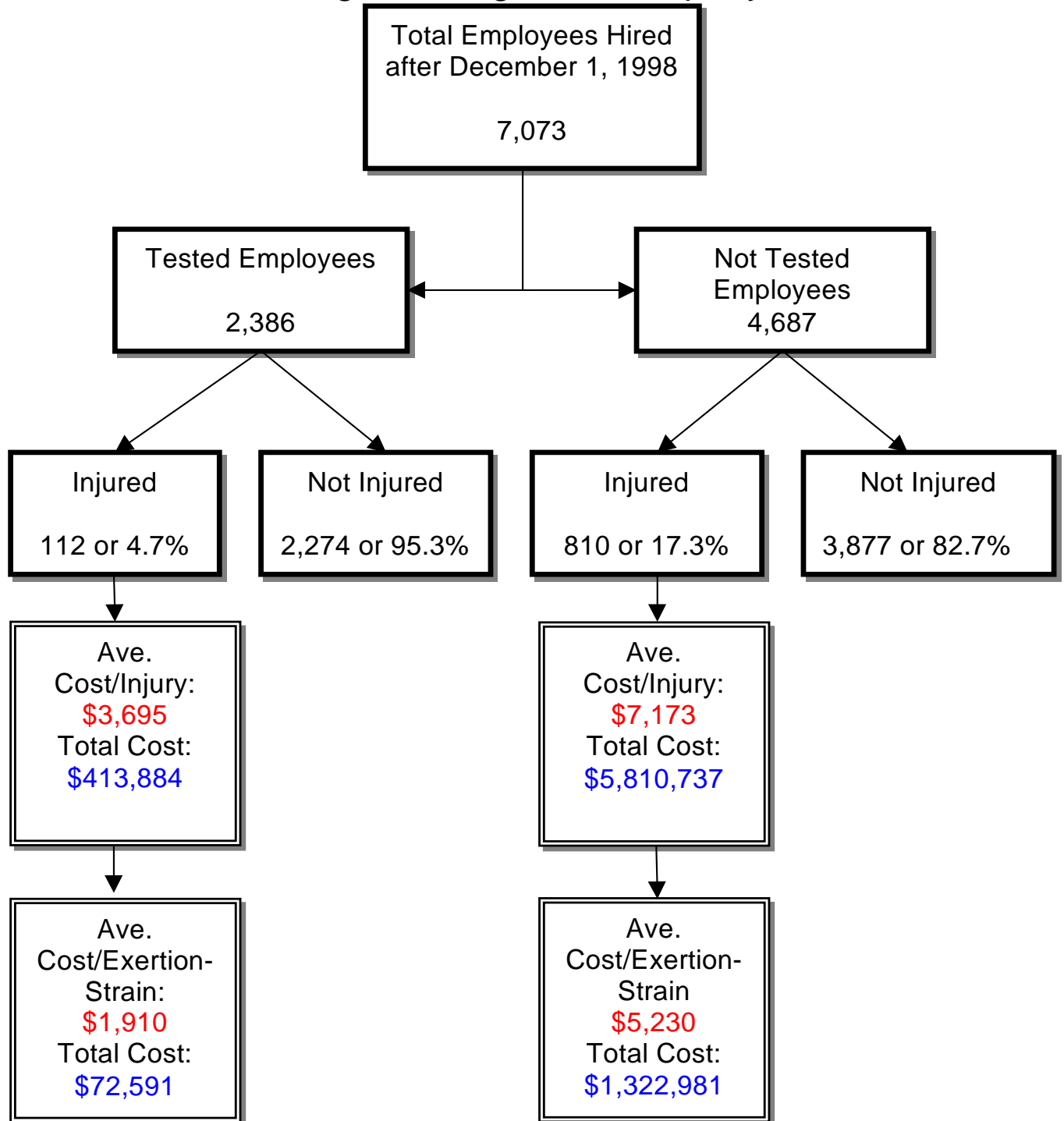
**Chart C**



In an effort to corroborate these findings, unpublished data collected from December 1998 through December 2001 was analyzed in early 2002 for a large trucking-logistics company in the United States. The data, as shown on the flow chart on the next page, clearly supports and confirm the findings presented for United Airlines.

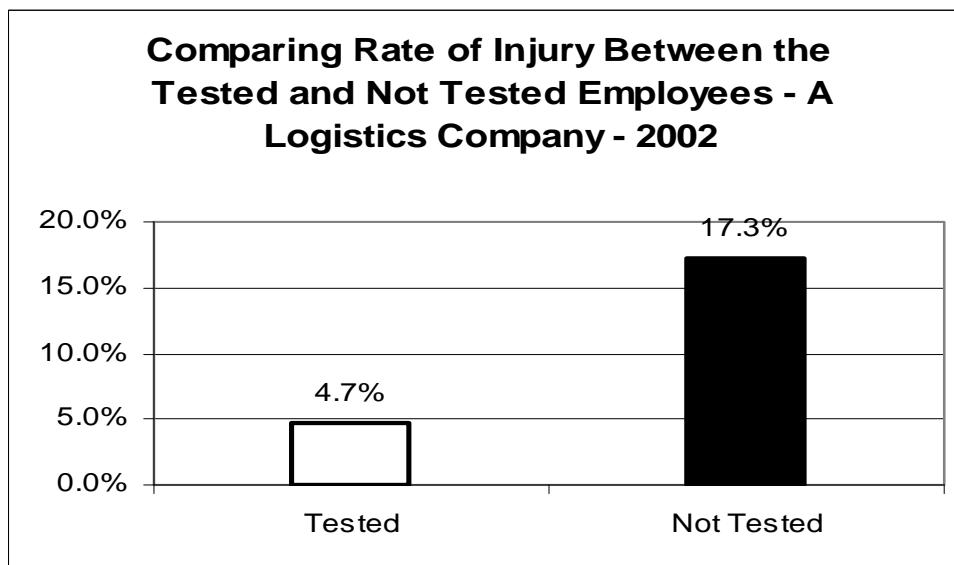
Of the 7,073 new hires who participated in this study for the trucking company, two thousand, three hundred eighty-six completed the isokinetic physical capability evaluation identical to the protocol used for United Airlines and 4,687 did not. All were applying for the same kinds of jobs (driver, dockworker, material handler) and all were matched on length of employment relative to the injury data.

# A Large US Logistics Company



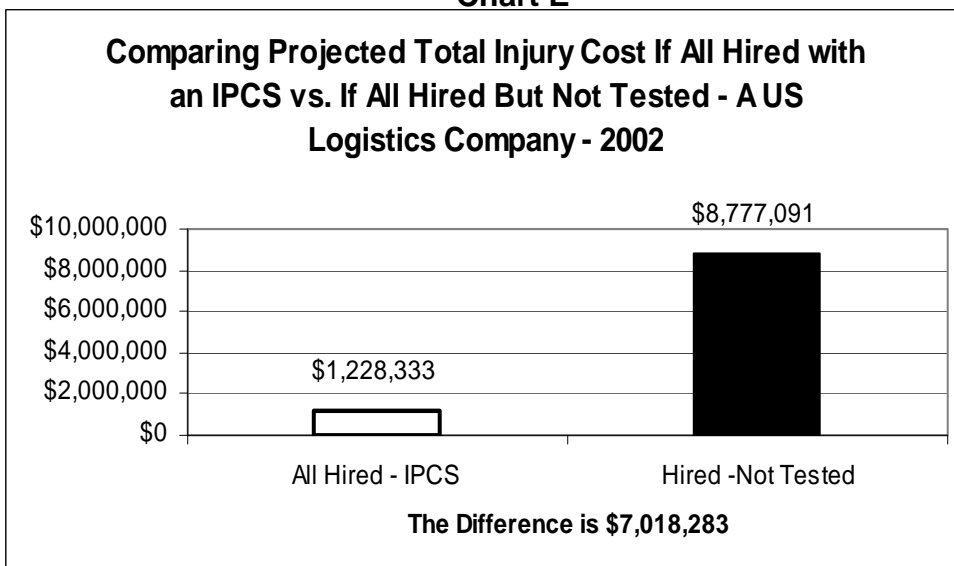
The incidence rate of injury for all injuries for this trucking company was 4.7% for the Tested group and 17.3% for the Not Tested group as shown on Chart D. These rates are similar to those found for United Airlines.

**Chart D**



The extrapolated costs savings for this trucking company over the 3-year period were in excess of \$7 million dollars had everyone been tested. (See Chart E)

**Chart E**



## **Discussion**

Corporate America continues to show an interest in new hire screening programs in their attempt to combat both rising injury rates and, more importantly, rising medical costs. Although many studies have demonstrated that physical capability new hire assessment programs have failed particularly using isokinetics, it is my belief that they failed because they focused only on a single joint such as the low back.

Of all possible isokinetic tests, the back test is probably the least reliable and least valid according to two studies by Newton et. al. in the early 90's. Previous analysis of our data collected on new hires using an isokinetic back test has shown this to be true which supports Newton et. al. research, as well as research by Dueker. Physically demanding jobs, such as an airline ramp worker, requires the coordination and integration of the major muscle groups to safely and effectively perform the essential functions of the job. We believe that we continue to demonstrate significant and effective results from an isokinetic new hire testing protocol because we include the major muscle groups such as the shoulder and knee flexors and extensors. The isokinetic test for these groups have been proven to be reliable and valid. Furthermore, Porterfield and other clinicians have presented the importance of the anatomical linkage between the low back and the shoulders, hips and lower extremities via the thoracolumbar fascia in preventing low back injuries. This linkage provides a possible explanation as to why an isokinetic knee-shoulder evaluation is successful in reducing low back injuries.

## **Conclusion**

In conclusion, these results show that an isokinetic knee-shoulder new hire physical capability evaluation significantly reduced the frequency and costs of work related injuries for United Airlines.

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