

Matheson L, Isernhagen S, and Hart D. Relationships Among Lifting Ability, Grip Force, and Return to Work. *Physical Therapy* 2002; 82:249-256.

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Design: Retrospective Study

Objective: To determine the validity of Functional Capacity Evaluation (FCE) testing results, specifically lifting ability and grip force, in terms of subsequent return to work and the level of work to which they returned.

Population /sample size/setting/interventions:

- 650 adults of working age (mean age = 41.5 years, 391 males, 259 females) who were not working due to reported functional limitation. Clients were selected from 25 clinics in 16 states and one province in Canada affiliated with the Isernhagen Work System (IWS-FCE).
- All participants had received an FCE following the IWS-FCE format administered by a trained physical or occupational therapist. The IWS-FCE is a standardized test battery designed to quantify safe physical abilities for the purpose of assisting in the return to work decision making process. The IWS-FCE includes 29 functional assessment subtests, 10 strength tests and 19 movement tasks.
- Five subtests of the IWS-FCE with acceptable reliability were selected for use in this study. Three measures of lifting ability including the floor-to-waist lift, waist-to-crown-level lift, and horizontal lift, and two measures of whole-hand isometric grip force measured in pounds were selected.
- A telephone follow-up interview was conducted 6 to 7 months after completion of the IWS-FCE for each participant at which time information was collected on their return to work status and their level of return to work (4 response levels). The 4 levels of return to work were; 1) Returned to prior job without modification, 2) Returned to prior job with modification, 3) Returned to a new job in the same company, and 4) Returned to a new job in a new company.
- Exclusion criteria included receiving any work hardening, work conditioning, or any other medical or rehabilitative intervention in the interval between the IWS-FCE and the telephone follow-up.

Main outcome measures:

- The study sample consisted of 349 (53.6%) participants who had returned to work and 301 (46.4%) who had not returned to work. Return to work participants were younger (40.1 years vs. 43.2 years) and had been off work for a shorter period of time (6.9 months vs. 17.0 months) ($P < .05$) than those who did not return to work.
- Multiple logistic regression analysis was performed on the predictor variables of gender, age, time off work, and the 5 performance variables against return to work (yes or no) as the outcome variable. A significance level of .05 was used for all tests.
- The analyses were performed on the 539 participants with complete data sets for all of these variables.

- Time off work and participants' gender were related to return to work with more time off work and male gender predicting a lower likelihood of returning to work.
- Age was not found to be related to return to work.
- For each of the 5 individual performance variables analyzed separately (Table 3), those who returned to work performed better on each test than those who did not return to work.
- The authors performed a multivariate logistic regression analysis with 8 variables; gender, age, time off work, and the 5 performance variables. In this model, gender, age, time off work, and floor-to-waist lift were related to and predictive of return to work. Of the 5 performance variables, only floor-to-waist lift was related to return to work with greater lift ability related to improved likelihood of return to work.
- All 3 measures of lifting ability were related to level of return to work. Both measures of grip force were found to be unrelated to level of return to work.

Authors' conclusions:

- The amount of time a worker was off from work and gender were the 2 factors that had the strongest relationships to whether or not a person returns to work, and time off work had the stronger relationship of the two.
- The amount of weight lifted from floor to waist was also related to return to work. This study showed that the greater the lifting ability, the greater the likelihood of return to work. All other performance variables did not provide any additional predictive power to the logistic regression model.
- Lift ability is a valuable performance measurement that can be used to guide return to work decisions. Measurement of grip force is not likely to be useful for return to work decisions.
- When it is not possible to administer more than one performance test in a FCE, measuring floor-to-waist lift is likely to be the most useful.

Comments:

- This study reviewed data retrospectively, and the findings should be confirmed by a prospective study using new data.
- Some pertinent information that could affect the reported results was not assessed such as physical job demands, physical/functional limitations of the participants, job availability, unemployment rates, differences between sites, and other changes in the environment or economy.
- Even though the floor-to-waist lifting ability was statistically different between the group of participants that returned to work and those that did not return to work, the predictive power of this performance variable for return to work status was quite weak. The effect size and clinical relevance was actually very small compared to the strongest predictive variables for return to work (time off work and gender).
- This study possessed two major design/analysis flaws that may have led to an underestimation of the importance and predictiveness of the floor-to-waist lifting test.
 - o In the analysis, the authors combined participants from all 4 levels of return to work as "return to work". When you classify all return to work participants together who returned to work at different levels of functional capacity, it is likely

participants will return to work with different lifting abilities, and misclassification bias will be introduced. Misclassification bias is likely to occur when you lump together those that return to work at full functional capacity with those who return to less physically demanding jobs. This underestimates the importance of those who fully return to work. If the analysis included only participants at the level of full return to work without modifications, the effect of floor-to-waist lift on return to work may have been greater.

- In the multivariate logistic regression (MLR) analysis (Table 4), the results for floor-to-waist lift indicate that it is a weak predictor of return to work due to its small regression coefficient. In this MLR model, the 5 physical performance measures are likely to be highly correlated. When several highly correlated variables are entered into a MLR model together (which should not be carried out), the contribution of each of the correlated variables is weakened. It appears that this flawed analysis has weakened the association of floor-to-waist lift with return to work and underestimated its contributions. The true contribution of floor-to-waist lift is probably greater than it appears in Table 4. The MLR analysis should not have included all 5 correlated variables. The MLR model should only have included gender, age, time off work, and one performance measure such as floor-to-waist lift. When each of the 5 performance measures are analyzed separately as shown in the results in Table 3, they are all related to return to work. On the other hand, analyze all 5 performance measures together in which adjustment for all variables takes place (Table 4), and they lose their significance because of their correlation to each other. In this defective MLR model, the results in Table 4 are poor indicators of the real contribution of the 5 performance measures. For example, the regression coefficients for right and left grip force have opposite signs, but it is not reasonable to believe that they have opposite effects where greater left grip force and weaker right grip force both predict return to work.
- The study did not give separate results for males and females, which would have helped its interpretability.

Assessment:

- This study is adequate for some evidence that gender and time off work are important predictors for return to work. Floor-to-waist lifting is also related to return to work, but the strength of the relationship and its relative importance cannot be determined from the data provided in this study.