Applying *Total Work Health®* Approaches in the dynamic construction industry

Ann Marie Dale  
Jack Dennerlein  
Justin Manjourides  
W. Kent Anger
Applying *Total Work Health®* Approaches in the dynamic construction industry

Opportunities to address the changing nature of work

- Multiple employer environments
- Transient workers who flow on and off worksites
- High risk and vulnerable populations
Commercial vs Residential

Transient Workers

Work Site Approaches

Work Team Approaches

#DynamicWorkplaces
#TWH2018
Contrasting Prevalence of Health and Safety Risks and Controls between Residential and Commercial Construction Apprentices

Ann Marie Dale, Diane Rohlman, Jaime Strickland, Kevin Kelly, Brad Evanoff
Introduction

Construction is dangerous; many fatalities and non-fatal injuries

Construction projects are typified by:
• frequently changing environment
• multiple employers
• small-sized employers
• high turnover of workers on projects

Work organization differs by types of construction- Residential versus Commercial

Residential construction has unique challenges
• fewer safety regulations
• less formal organization and project oversight
• smaller crews with less knowledgeable leaders on projects
Introduction

Workforce suffers from:

- Low wages
- Job insecurity
- Contract work/temporary employment

Growing number of industries facing similar challenges due to changes in work organization

(The Fissured Workplace by David Weil)

Purpose: to compare safety and health risks and supports between residential and commercial apprentice construction workers
### Results: traditional safety policies

<table>
<thead>
<tr>
<th>Policy</th>
<th>Residential (n=419)</th>
<th>Commercial (n=532)</th>
<th>P-value</th>
</tr>
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<tbody>
<tr>
<td>Hearing protection policy</td>
<td>% 34.9</td>
<td>66.2</td>
<td>0.00</td>
</tr>
<tr>
<td>Safety glasses policy</td>
<td>% 89.0</td>
<td>89.6</td>
<td>0.84</td>
</tr>
<tr>
<td>Ventilation controls policy</td>
<td>% 15.0</td>
<td>37.8</td>
<td>0.00</td>
</tr>
<tr>
<td>Smoking restriction policy</td>
<td>% 41.1</td>
<td>67.4</td>
<td>0.00</td>
</tr>
<tr>
<td>Cell phone use policy</td>
<td>% 65.6</td>
<td>71.6</td>
<td>0.06</td>
</tr>
<tr>
<td>Mandatory overtime</td>
<td>% 5.5</td>
<td>14.5</td>
<td>0.00</td>
</tr>
<tr>
<td>Daily work hour limit policy</td>
<td>% 46.2</td>
<td>30.1</td>
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## Results: traditional health outcomes

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</tr>
</thead>
<tbody>
<tr>
<td>missed days due to an injury</td>
<td>18.8</td>
<td>10.9</td>
<td>0.001</td>
</tr>
<tr>
<td>Low back symptoms (past week)</td>
<td>70.2</td>
<td>57.1</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
Results: non-traditional health activities

<table>
<thead>
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<th>Residential (n=419)</th>
<th>Commercial (n=532)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use sunscreen</td>
<td>% 71.9</td>
<td>% 69.9</td>
<td>0.54</td>
</tr>
<tr>
<td>Wear seatbelts</td>
<td>% 20.1</td>
<td>% 19.2</td>
<td>0.79</td>
</tr>
<tr>
<td>Access to food to purchase</td>
<td>% 42.5</td>
<td>% 60.5</td>
<td>0.00</td>
</tr>
<tr>
<td>Clean place to eat</td>
<td>% 7.9</td>
<td>% 47.4</td>
<td>0.00</td>
</tr>
</tbody>
</table>
### Results: non-traditional health outcomes

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</tr>
</thead>
<tbody>
<tr>
<td>Alcohol days/month</td>
<td>Mean (SD)</td>
<td>9.25 (9.81)</td>
<td>7.81 (8.57)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>%</td>
<td>31.3</td>
<td>24.5</td>
</tr>
<tr>
<td>Health problems affect work productivity</td>
<td>%</td>
<td>18.6</td>
<td>12.9</td>
</tr>
<tr>
<td>Prescribed meds for pain</td>
<td>%</td>
<td>15.1</td>
<td>10.6</td>
</tr>
</tbody>
</table>
Conclusions

• Residential construction have fewer safety policies and fewer supports for positive health behaviors than commercial
• Residential carpenters perceive their health is poorer
• Work organization varies within construction and impacts health
• The changing nature of work in other companies, resembling aspects of the complex construction organization, will likely create poorer worker health

Ann Marie Dale PhD  (amdale@wustl.edu)
Acknowledgements: This work was supported by the Healthier Workforce Center of the Midwest from the CDC/NIOSH Cooperative Agreement No. U19OH008858
A Cluster Randomized Controlled Trial of a *Total Worker Health*® Intervention on Commercial Construction Sites

Jack Dennerlein  
j.dennerlein@northeastern.edu  
@JackDennerlein

May 8-11, 2018

@HSPHCenterWork

Justin Manjourides  
Cassandra A. Okechukwu  
Michael Grant  
Kristin Ironsides  
Andrea Sheldon  
Dana Baarsvik  
Kincaid Lowe  
Mia Goldwasser

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#TWH2018
## StIPP
**Soft Tissue Injury Prevention Program**

### Task pre-planning:
- Checklist for the *Ergo 4*
- Ergo Simple Solutions
- Database of solutions
- Posted *Ergo 4* solutions
- Employee feedback

### Inspections:
- Including *Ergo 4*
- Weekly Reports to Foremen and workers

### Supervisor training:
- StIPP (1/2 hr)
- Adding Ergo to pre-task planning workshop (1/2 hr)
- Weekly Meetings with foreman

### Worker training:
- Toolbox talk on Ergo and Health

## Health Week
*(get workers signed up for Health Coaching)*

### Monday:
- What is health coaching

### Tuesday:
- StIPP Program – the components

### Wednesday:
- Tobacco cessation
- CO measurements

### Thursday:
- Food and Activity

### Friday:
- Questions and Health Coaching sign up

## Health Coaching:
- 4 sessions
- No cost to worker
- PA/Diet, Tobacco Cessation

### Tobacco cessation referral:
- NRT
- Online Resources
- 1-800 QUIT NOW
Cluster Randomized Controlled Trial
10 Construction Sites – 5 Pairs
• Matched and randomized within GC
• Concurrent treatment/reference

StIPP
Six Weeks

Baseline
N = 592

Follow up 1
N = 322

Health Week
Offered 4 telephone health coaching sessions

Follow up 2
Six months
N = 151

Data Collection
Treatment & Reference

Intervention
Treatment Sites
**Follow up 1 (~1 month on worksite)**

**Pain and work environment**

<table>
<thead>
<tr>
<th>Categorical outcome variables:</th>
<th>N</th>
<th>OR (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-month pain (increase compared to no change)</td>
<td>210</td>
<td>0.30 (0.10, 0.86)</td>
<td>0.0299</td>
</tr>
<tr>
<td>12-month pain (decrease compared to no change)</td>
<td>210</td>
<td>0.72 (0.30, 1.75)</td>
<td>0.4278</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome Measure (units)</th>
<th>N</th>
<th>B-Coefficient (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 item WLQ work limitations scale</td>
<td>211</td>
<td>0.06 (-0.18, 0.29)</td>
<td>0.5877</td>
</tr>
<tr>
<td>3 item ergonomics scale</td>
<td>215</td>
<td>0.09 (-0.05, 0.23)</td>
<td>0.1782</td>
</tr>
<tr>
<td>Physically demanding work</td>
<td>200</td>
<td>0.11 (-0.12, 0.33)</td>
<td>0.3080</td>
</tr>
<tr>
<td>Feel fatigued after work</td>
<td>204</td>
<td>0.03 (-0.24, 0.29)</td>
<td>0.8076</td>
</tr>
<tr>
<td>Number of body parts in pain</td>
<td>222</td>
<td>-0.05 (-0.61, 0.51)</td>
<td>0.8421</td>
</tr>
</tbody>
</table>
### Table 2: Effects of intervention on changes in worker health from baseline to follow-up 2

<table>
<thead>
<tr>
<th>Outcome Measure (units)</th>
<th>N</th>
<th>B-Coefficient (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational physical activity (minutes/day)</td>
<td>93</td>
<td>39.24 (16.46, 62.02)</td>
<td>0.0036</td>
</tr>
<tr>
<td>Healthy diet</td>
<td>114</td>
<td>0.92 (0.02, 1.80)</td>
<td>0.0459</td>
</tr>
<tr>
<td>Unhealthy diet</td>
<td>113</td>
<td>-0.25 (-0.78, 0.27)</td>
<td>0.3649</td>
</tr>
<tr>
<td>Dietary balance</td>
<td>113</td>
<td>1.20 (0.04, 2.36)</td>
<td>0.0440</td>
</tr>
</tbody>
</table>

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</thead>
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<tr>
<td>12-month pain (increase compared to no change)</td>
<td>111</td>
<td>0.33 (0.15, 0.72)</td>
<td>0.0113</td>
</tr>
<tr>
<td>12-month pain (decrease compared to no change)</td>
<td>111</td>
<td>0.78 (0.27, 2.23)</td>
<td>0.6052</td>
</tr>
</tbody>
</table>

Dennerlein et al., Work, Stress, and Health, Minneapolis, MN 2017.
• Treatment reduced new incidence of worker pain and improved self-reported health behaviors.

• Change in psychosocial support and worker knowledge about health and ergonomic approaches
  – Discussed qualitative research

• StIPP program had limitations
  – Needed more upstream changes and planning including the bidding process
  – Sub-Contractors did not have infrastructure for larger changes based on ergonomics.
Thank you!

Our Shared Goal
Protect and promote worker safety, health, and well-being
http://centerforworkhealth.sph.harvard.edu/

A Total Worker Health® Center of Excellence
Funded in part by grant U19OH008861 from the CDC/NIOSH

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PAR T N E R S H E A L T H C A R E
Boston College School of Social Work
Health Partners School of Public Health
Evaluating programs on dynamic construction sites: The effect of workforce mobility on intervention effectiveness estimates.

Justin Manjourides, PhD
j.manjourides@northeastern.edu

Jack T. Dennerlein,
Emily H. Sparer,
Cassandra A. Okechukwu

May 10, 2018

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Motivating Study: Building Safety For Everyone

• Prior hypothesis: the general contractor was the primary influencer of health and safety, and would have the most control over the ability to implement a safety communication and recognition program.

• A Cluster-RCT delivered at the worksite over 4-6.
  – Baseline when workers came on site
  – Follow up every 30 days

Challenges

• Construction workers move frequently from worksite to worksite, often due to changing phases of the project.

• 50% of workers are on a worksite for less than one month\(^1\).

Simulation Study

- Examine the effects of the worker movement on measuring the effectiveness of worksite-based interventions.

- Goal 1: Explore how movement of workers on and off construction sites could bias estimates intervention effectiveness.

- Goal 2: Use this information to design more effective health and wellbeing interventions.
Assuming no workforce mobility, the standard linear model produces unbiased treatment effect estimates.
In a highly dynamic workforce, the linear model is no longer unbiased. Treating the length of time on site (post-intervention) as an effect modifier can greatly reduce this bias.
Findings

- Worker mobility biases worksite based intervention evaluations to the null.

- Bias is related to the amount of mobility among the individual workers
  - Greater relative bias associated with shorter periods on site.

- Analysis that account for time on site mitigate bias.

- This supports the idea of directing interventions closer to the individual workers (e.g. the subcontractor).
Recommendations

• Monitor worker mobility & account for it in analyses.

• Develop comprehensive approaches across the multiple employer organizations.
  – General contractors provide expectations and resources
  – Sub-contractors are primary employers
    » Workers move with subcontractors often in teams/crews
    » Subcontractors provide technical know how to address specific conditions of work.

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Organizational and Individual Intervention Methods that Improved Total Worker Health® in Construction Workers

W. Kent Anger

Oregon Health & Science University
Oregon Institute of Occupational Health Sciences
Oregon Healthy Workforce Center

In the Symposium: Applying Total Work Health® Approaches in the dynamic construction industry

OHSU and Dr. Anger have a significant financial interest in Northwest Education Training and Assessment [or NwETA], a company that may have a commercial interest in the results of this research and technology. This potential individual and institutional conflict of interest has been reviewed and managed by OHSU.

NIOSH U19 OH010154

Research approved by OHSU IRB
Intervention – Supervisors

A route to organizational change is through the supervisors – training on an iPad

Teach supervisors to:
• interact with employees frequently and include non-work topics
• shape safe and healthy behaviors [in their employees] using social reinforcers – using an app

HabiTrak – OHSU enterprise app

cTRAIN – NwETA, Lake Oswego, OR
Intervention - All

Teach employees and supervisors healthy lifestyle behaviors

Scripted training in small groups + practice

Lifestyle Cards
Intro + Get Healthier
Calories
Basic Nutrition
Liquids
Fruits, vegetables
Snacks
Exercise
Strength Training (in home)
Motivating ongoing behavior change
Survey measures – Survey Gizmo on iPad

Based on the chronic diseases and safety issues we targeted, selected these measures:

Demographics
Injury (Kuehl/Olson)
Pain (Kuehl/Olson)
Job Satisfaction (MOAQ)
Occupational Stress: Work-Family Conflict
Occupational Stress: Family-work conflict
Wellbeing: SF-12
Wellbeing: CES-D
Wellbeing: Life Satisfaction
Nutrition: Fruit/Vegetables/Fat (Thompson)
Lifestyle: Alcohol, Smoking, Caffeine (Olson & Kuehl)
Exercise: Kuehl DOC
Sleep Deficiency Construct (Sorensen, Buysee, Buxton, Rajaratnam)
Safety Behaviors: Safety Compliance and participation
Safety behaviors: Safety and motivation (Neal)
Group-level Safety Climate (Zohar & Luria)
FSSB-SF Supervisor (Hammer)
FSSB-SF Employee (Hammer)
Team Cohesion (Shin)
Social Support for Diet (Sallis)
Social Support for exercise behaviors (Sallis)
Basic Reaction (Anger)
Basic Reaction adapted for wellness
BMI, height, weight (Tanita)
Flexibility (grip strength left and right)

22 surveys (245 ?s) / 7 markers / ~ 45 min
Supervisor Training

Tracking Behavior

2 wks

contact frequency
5 min/day

Effective Supervision, reinforce behaviors

90 min

12 wks

reinforce safety practices

reinforce healthy behaviors

Work Crew ‘Get Healthier’ Education

1. Get healthier (goals, pedometer)
2. Sleep
3. Calories
4. Liquids & calories
5. Basic nutrition/labels)
6. Snacks
7. Sugar
8. Exercise
9. Strength
10. Flexibility
11. Stress
12. Moving forward (health goals)

Surveys & Topic 1

90 min

Topics 2-11

40 min/week

Topic 12 & Surveys

90 min
Participant Sample

• 4 construction companies
• conducted in Portland, Eugene, Prineville
• n = 35 (mostly supervisors)
Results – Training/education

- 22 supervisors trained – knowledge p< 0.05 (d=2.92)
- Tracking (self-monitoring)
Results – Training/education

- Scripted lifestyle education employed with 22 supervisors and 13 employees.
  - Knowledge increases for 12 topics ($d = 0.18 – 1.59$)

- Reaction measures
  - Intervention components were rated excellent and useful
Results (@ end of intervention) significant (p<.05) improvements in: N=35

- family-supportive supervisory behaviors (d=0.72)
- team cohesion (d=0.38)
- frequency of exercising 30 minutes/day (d=0.50)
- frequency of muscle toning exercise (d=0.59)
- sugary snacks and drinks (d=0.46 & 0.46)
- sleep duration (d=0.38)
- co-worker healthy diet support (d=0.59)
- family healthy diet support (d=0.53)
- systolic blood pressure (d=0.27)
Kirkpatrick’s 4 levels

• Reaction ratings of “good,” “excellent”

• Knowledge improved: Substantial knowledge gains in supervisor training and Get Healthier cards

• Behavior: Increased targeted comments to wkrs, sleep duration, exercising, Reduced sugary snacks, drinks

• Results: Systolic blood pressure improved (reduced) Increased team cohesion

Luis Arechiga, InLine commercial construction
“...My communication with my subcontractors and co-workers has significantly increased not only on the professional aspect but personal as well ....”
Dissemination

Available in Spanish & English with User Guides

www.ohsu.edu/ohwc

toolkits
tools
Partners and Authors

IUPAT – IBEW
InLine - General Sheet Metal
Fortis – Mortenson

Katie Vaughn, Jason Yano-Kyler,
Brad Wipfli, Ryan Olson,
Magali Blanco

Commercial vs Residential

Work Site Approaches

Transient Workers

Work Team Approaches

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Discussion

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