

Safety Climate: Measurement and Improvement

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Webinar
January 18, 2018



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1

Poll Question

Who are you?

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2

Safety Management

The 3 pillars of safety management:

- (1) Engineer/Enforce/Educate (3E model)**
- (2) Human Factors/Ergonomics**
- (3) Safety Culture/Climate (managers)**

Safety management system ought to include all of them

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Culture-based Management of Safety

New approach – Focus on Org. Culture/Climate

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Safety Culture

Definitions and problems

- Culture is defined by core values: "The core values and behaviors of all members of an organization that reflect a commitment to conduct business in a manner that protects people and the environment."
- BSEE Safety Culture policy statement includes nine elements, conceptually unrelated to org. culture, (e.g., work processes, continuous improvement, inquiring attitude)
- **Problems:** (a) An ambiguous concept that is difficult to measure (*National Academies Workshop, Strengthening the Safety Culture of the Offshore Oil and Gas Industry, 2016*); (b) Difficult to improve due to conceptual ambiguity
- **Solutions:** (a) Use **safety climate** as easy-to-measure proxy; (b) Improve safety climate instead of culture

5

What is organizational safety climate?

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What is organizational safety climate?

Employee subjective assessments of expected rewards

- **Climate** reflects socially shared assessments of the workplace, i.e. **which behaviors are likely to be better supported/reinforced** (indicative of underlying values)
- **Org. climate** scores reveal consensually expected reinf/ rewards of choosing one behavior over another
- Climate scores offer a quantitative-based description of managerial commitment to worker safety, as perceived by its employees (**through their eyes**)

Climate as a rational/adaptive mechanism: How should I behave to maximize expected rewards/reinforcements?

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What is Org. Climate?

Assessment of true priorities

- Safety climate: employee assessment of expected reinforcement/rewards for pursuing safety vs. competing goals (slower speed vs. on-time delivery; replace a leaking pipe vs. cutting production costs)
- Leaders' reward/punish practices offer simplest cues: help identify which job behaviors are better reinforced

Cue examples: (1) *Was Joe reinforced/rewarded for meeting a deadline although he violated some safety rules?* (2) *Do managers turn a blind eye to safety shortcuts that help company to cut production costs?*

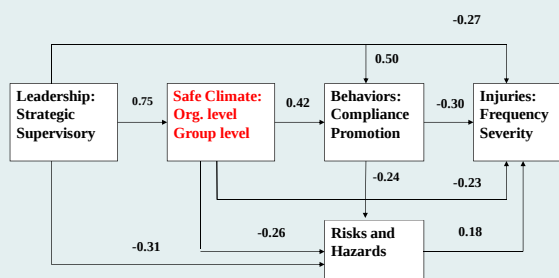
8

Safety climate works!

Meta-analysis #1: Nahrgang, et al. (2011)

N=202 studies (out of 875)

Bi-variate relationships: Mean corrected corr. estimates (r_c)



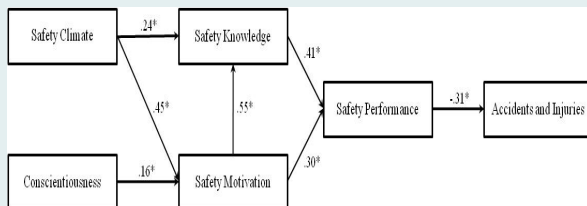
9

Meta-analysis #2: Christian, et al. (JAP, 2009)
N=90 studies (out of **509**)
 Group-level safety climate as a leading indicator

Outcome criterion	N (groups)	r_c
Self-report safety behaviors	317	0.59
Supervisor-rated safety behaviors	121	0.35
Self-report accidents/injuries	63	0.21
Archival/observer ratings	93	0.69
Medical records/OSHA data	360	0.42

10

Meta-analysis #2: Christian, et al. (JAP, 2009)
Path model: Standardized path coefficients



11

Poll Question

What is the core meaning of safety climate?

Poll Question

What does safety climate predict?

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13

Safety Climate Measurement:
Climate as a **multi-level & industry-specific** construct

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How to measure climate?
Multi-level climate measurement scale

- Employees discriminate between safety reinf./rewarding or punishing practices of senior vs. supervisory leaders
- Climate should be conceived, measured, and analyzed by reference to 2 managerial levels (dept/group & corp/site)
- The 2 measurement sub-scales should include few items (10) each, such that both can be filled in 8-9 minutes
- Industry-specific cues differ between industries, improving prediction for **industry-specific scales vs. generic scales**
- Safety climate has 4 dimensions: safety compliance, safety promotion, hazard removal, and worker safety

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A multilevel Safety Climate measurement scale

Scale items (Zohar & Luria, 2005):

My supervisor-

- *Refuses to ignore safety rules when work falls behind schedule*
- *Is strict about working safely when we are tired or stressed*

Senior management -

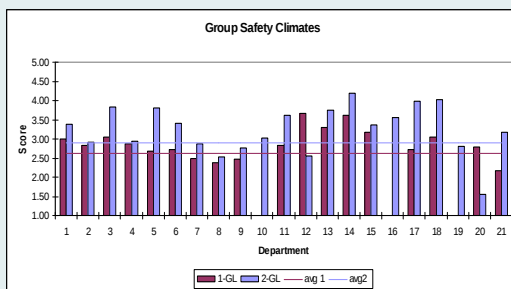
- *Quickly corrects any safety hazard, even if it's costly*
- *Considers safety when setting production speed and schedules*

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Group-level variation: Glass bottle factory (Toronto)

Group-level safety climate measured before & after intervention



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Examples of industry-specific SC scales

Use unique industry-based cues

SC for long-haul truck drivers:

- *My dispatcher overlooks log discrepancies if I deliver on time*
- *Lets me to change my routs when I see safety problems*

Specific scale **doubled** the prediction of generic scale: $R^2=0.21$ vs. 0.10 (safety behavior) & $B=-0.46$ vs. -0.21 (traffic injury)

SC for hospital nurses:

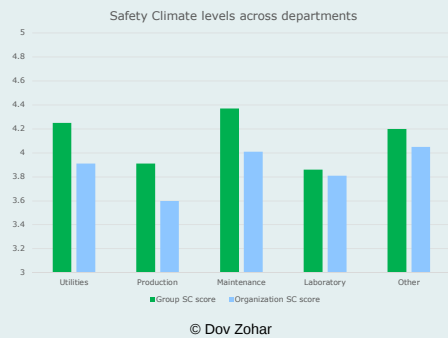
- *We have to give medications on time even during busy hours*
- *Notice any patient's irregularities (even if not under my care)*

Specific scale nearly **doubled** prediction of medication errors: $B=-0.70$ vs. -0.32

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Multi-level & Industry-specific Safety Climate Chemical production site of a global company (Texas)



19

Conclusions

- **Safety climate** complements, rather than competes with traditional safety management (3E): use both
- Safety climate diagnostics: use brief (20-item) scales + multi-level sub-scales + industry-specific versions
- Safety climate scores allow comparisons between corporate sub-units or different sites
- **Safety climate** as strongest factor affecting safety behavior can be used to improve corporate safety
- I will describe different strategies for improving safety climate in the following section

20

Poll Question

How we measure safety climate?

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Strategies for **improving climate level**
Safety leadership improvement by means of
individual feedback to managers

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Strategy 1
Action-based safety leadership training

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Strategy 1: Action-based safety leadership training

1. Half-day workshop for improving safety leadership practices (a proximal cue for climate perceptions)
2. Workshop uses a simple, action-based leadership model, which is based on the reinforcement principle
3. Focuses on safety practices: define daily safety goals + walk rounds monitoring + offer timely consequences
4. How to offer timely reward/punishment & positive or negative feedback without hurting employee feelings
5. Use 2-3 scenarios for practice; Can be used as inauguration/opening phase for the other interventions

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Strategy 2 Bi-monthly climate measurement & goals

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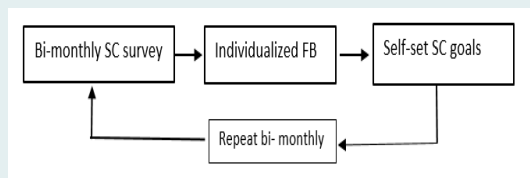
Strategy 2: Bi-monthly climate surveys & goals

1. Use industry-specific & brief (20-item) Safety Climate scale for measuring SC once at 2-month intervals
2. Safety leadership workshop focused on practices: daily safety goals + walk rounds monitoring + consequences
3. Bi-monthly data collection (paper or web-based), using random employee sampling for each unit
4. Individual feedback to unit managers (direct / remote), coupled with benchmarks & self-setting of climate goals
5. Reward goal progress/attainment (indiv. & teams) & offer re-training/guidelines for climate improvement

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26

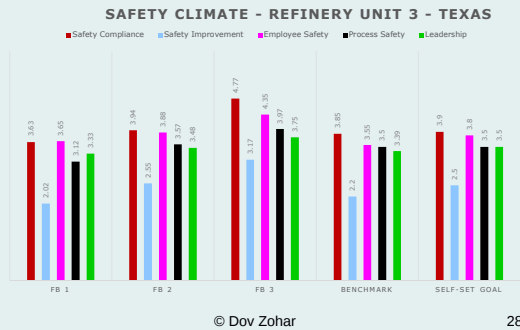
Safety climate intervention summary



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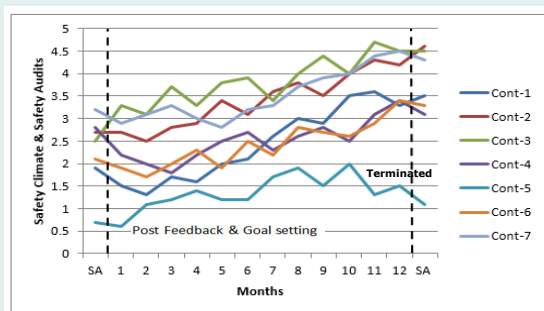
27

Example for a 3-cycle feedback display
6-months intervention



28

Monitoring sub-contractor safety climate
Goal setting: 10% quarterly increase; Annual rewarding: 10% bonus



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Strategy 3

Increase supervisory safety messages as leverage for safety climate improvement

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Strategy 3: Increase safety messages (1)
Discourse-based intervention

Given that most org. processes are **discourse (speech) driven**, org. change often depends on increasing safety messages embedded in daily work-related conversations

Use phone to ask respondents to recall & interpret the last conversation with their manager, using a checklist of sent messages consisting of safety & competing demands

Intervention can be applied across org. hierarchical levels, offering individual feedback to mid-level/senior managers or front-line supervisors

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Increase supervisory safety messages (2)
Discourse-based measurement & Feedback

1. Develop checklist items referring to key managerial messages communicated in last daily conversation
2. Use a rating scale for immediate analysis of each exchange, using followers as sub-text interpreters
3. Follower ratings measure leader messages as perceived by employees (sent vs. received messages)
4. Use last 10 conversations for bi-monthly feedback, ending with self-set safety-message goals for next FB
5. Can apply this intervention to low-, mid-, or senior level managers; adjust checklist items to managerial levels

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32

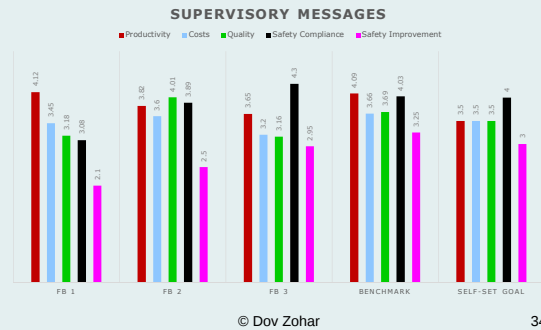
Checklist items for measuring messages
Demonstration only

How well do these sentences describe supervisory messages in this conversation

Messages	0-10	?
Made me realize that he cares more about deadlines than accident reduction		
I understood he would turn a blind eye to safety violations		
He seemed to care more about production costs than safety issues		
He let me understand that he sees worker protection as a moral issue		
Made me realize that I should come up with new energy conservation ideas		
Expected me to commit myself to finding new ways for saving energy		
Indicated that environment protection offers economic/financial benefits		
Told me we should focus on high-profile or visible environment issues		
Reminded me that our environment policies are largely meant for reputation		
Indicated it would be enough to follow minor environment issues that have minimal effect on production costs		

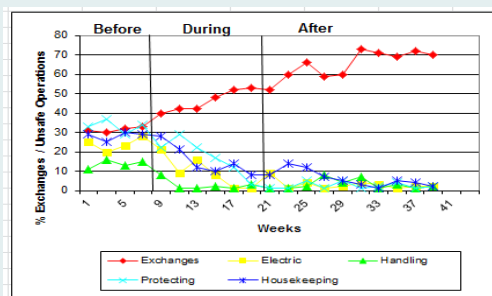
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Typical feedback display for this intervention 6-months intervention



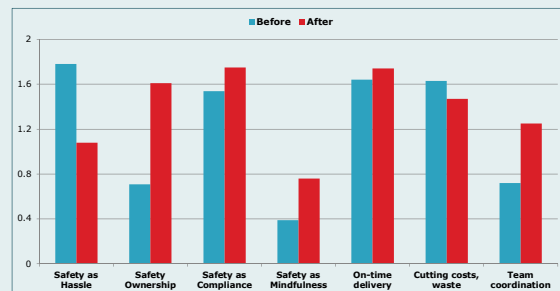
34

Oil refinery (Israel) 7-Feedback Intervention



35

Heavy manufacturing conversations (Boston) A 3-Feedback Intervention (0-1-2 Scale: None/Weak/Strong)

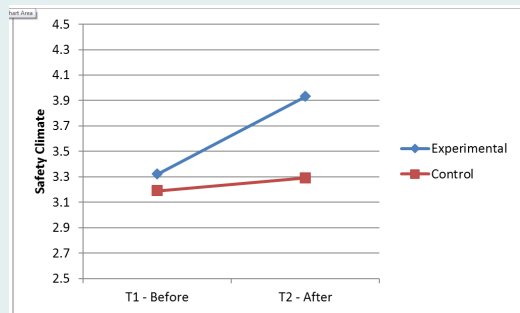


Mindfulness: Focus on process variations, failures & containment

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Shipyards conversations (Israel)

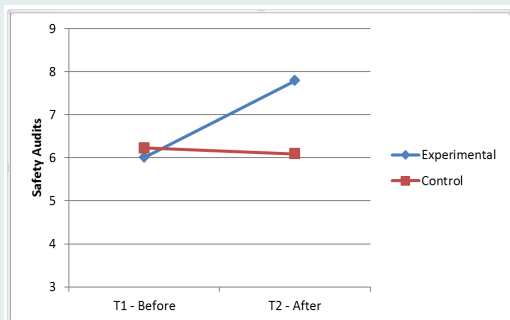


Notes: (a) 14 Experimental & 14 Control workgroups
(b) Measured 8 weeks before & after intervention

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Effect of message-change on safety audits Use 2 double-blinded safety experts



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Conclusions

- **Safety climate** as strongest factor affecting safety behavior can be used to improve corporate safety
- Safety climate measurement: use brief (20-item) scales + multi-level sub-scales + industry-specific versions
- **Intervention strategies:** SC can be improved using:
 - (a) non-verbal safety leadership practices (daily safety goals + walk rounds monitoring + consequences)
 - (b) bi-monthly surveys + goal setting + FB/rewarding
 - (c) verbal safety messages in daily work-related conversations (priority of safety vs. productivity/costs)

Cost-effectiveness: Safety interventions must be cost effective because of its competition with production costs

39

Poll Question

What needs to change for safety climate to improve?

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41
