Giornale Italiano di Medicina del Lavoro ed Ergonomia
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http://gimle.fsm.it

Supplemento A, Psicologia
2010; Vol. 32, N. 1: A15-A17
ISSN 1592-7830

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The return on investment of the B-BS process

Il ritorno sull'investimento del processo di B-BS

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ABSTRACT. Over the past 30 years or so, Behavioral Safety has become a well-established method for changing safety behavior and reducing incident rates. In 2009 Cooper meta-analytically reviewed 17 published Behavioral Safety field studies containing 24 data sets to identify the most effective design components across a wide range of settings.
The study showed designs incorporating a workgroup approach, in static settings, utilizing daily observations, multiple (3-4) feedback channels and participative goals were associated with greater incident rate reductions.
However, the review did not calculate the Return on Investment of the design components in various combinations. Addressing this gap, the results of the current paper show some designs offer high returns while others are associated with significant deficits.

Key words: *return on investment, behavioral safety.*

RIASSUNTO. Nel corso degli ultimi 30 anni, la sicurezza comportamentale è diventata un metodo consolidato per cambiare i comportamenti di sicurezza e ridurre i tassi di incidente. Nel 2009 Cooper (1) ha riesaminato 17 studi sul campo pubblicati riguardo la sicurezza comportamentale, contenenti 24 set di dati per identificare gli elementi più efficaci in un ampio spettro di scenari.
Lo studio ha dimostrato che i progetti che incorporano un approccio con gruppi di lavoro, in siti statici, utilizzando osservazioni giornaliere, con molteplici canali (3-4) per il feedback e con obiettivi condivisi, sono associati alle maggiori riduzioni del tasso di incidenti.
La rassegna non ha però calcolato il ritorno sull'investimento per progetti in cui vi sono diverse combinazioni delle componenti del processo B-BS, lacuna che questo articolo si propone di colmare mostrando come alcuni progetti siano associati ad alti ROI mentre altri a perdite significative.

Parole chiave: *ritorno sull'investimento, ROI, sicurezza comportamentale.*

Introduction

Organisations are often required to work with limited and fewer resources, while also meeting business objectives. Not exempt from this discipline, HSE professionals need to show that the cost and effort expended on a safety initiative has yielded a return.

A major question remaining about behavioral safety is whether it's cost-effective, and if so what is the expected Return on Investment (ROI). Many claims have been made about the ROI of Behavioral Safety processes (1). Some indicate the process has paid for itself (2), while others suggest a ROI of 281% (3) resulting from reductions in incidents, insurance premiums and workers compensation. Others have obtained substantial reductions in operating costs (4), further increasing the cost-benefit. Knowledge of the average ROI for various structural designs would be useful for those considering Behavioral Safety as a means to control incidents, to help in the decision-making process. Alternatively, they could provide a comparative point for those already using Behavioral Safety to determine if their average ROI is above or below expectations.

Calculating the cost of incidents

There are two types of incident costs: direct and indirect. Direct costs typically reflect those that are directly associated with an incident. Typically, these include [a] Investigation costs (i.e. how many people involved multiplied by the number of man hours multiplied by the average hourly salary); [b] Production downtime (e.g. time spent by first-aider with injured person, time spent by co-workers in attendance to injured person, and actual downtime of all the production processes); and, [c] Medical expenses, damage to equipment or product, sick pay, repairs, legal costs, court fines etc. The indirect costs typically includes costs that are indirectly linked to the accident, e.g. employers and public liability claims, business interruption, product liability, training of replacement staff, loss of goodwill, loss of corporate image, etc.

G Ital Med Lav Erg 2010; 32:1, Suppl A, Psicol
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Method

A wide-ranging literature search located 106 professional and academic behavioral safety articles. These were examined and kept for review purposes only if they (1) focused solely on occupational safety; (2) quantified behavioral change and incident reductions; (3) stated observation contact rates; and (4) were written in English. Seventeen studies met these criteria. Of these, 5 reported the results of 2 or more separate studies within the article. In total, this provided 24 useable data sets (See Appendix 1).

Common study characteristics were identified and coded. This included (i) Type of setting (static or dynamic), (ii) observation focus (individuals, workgroups or outcomes), (iii) observation frequency, and, (iv) the number of feedback channels used (posted, verbal, written, weekly briefings). Study outcomes were the degree of (a) injury reduction and (b) behavioral improvement.

Data Transformation

Many of the studies reported success in different ways. To ensure 'like for like' comparisons a number of data transformations were required:

1. *Behavioral Change*: The degree of behavioral improvement was obtained directly from the reported statistics or by subtracting the reported baseline score from the final intervention score when the specific degree of improvement was not reported.
2. *Incident reduction*: A similar procedure was adopted to ascertain the degree of injury reduction. In three instances (5), baseline injury figures encompassed a number of previous years, rather than the corresponding period in the previous 12 months. This practice could have inflated the claimed degree of injury reduction (i.e. most companies experience annual reductions in incidents due to other safety management practices). In these instances, the reported 'injury baseline' was divided by the appropriate number of months to obtain an average monthly injury rate. The product was multiplied by 12 to obtain an estimate of the prior annual injury rate. Percentage changes were computed for injury reduction and behavioral improvement from each study.
3. *Incident Rates*: The calculation of reported injury rates also differed across the studies. Some were based on 100,000 or 200,000 hours worked and some on a million hours. All injury rates were recalculated to reflect the rate of 200,000 hours worked. This did not affect the magnitude of change reported in the studies; it merely facilitated a like-for-like comparison.
4. *Incident Costs*: To ensure 100% correspondence, the direct costs of injuries were initially determined at 1978 rates of $13,520 (6), which was the year of earliest publication. These figures exclude indirect costs that are thought to range between 8-32 times the direct costs (HSE, 1991). Average start and end of study costs were calculated by multiplying each study's incident rates by $13,520, minus the man-hour training costs of those involved. The figures were then updated to reflect more recent cost estimates of $29K per disabling injury (7), by multiplying the product of all previous calculations by 2.15 (i.e. $29K/$14K=2.15),
5. *Study combinations*: To calculate the ROI of various B-BS design features in combination, the studies were divided into sub-groups. The variables of interest were [a] type of setting; [b] Observation focus; [c] Contact Rate; and [d], the number of feedback channels used.

Results

The results are illuminating (see Table I), although not definitive due to the relatively small number of studies within each sub-set.

The combination of design features providing the greatest savings ($1.7 million) per 200,00 hours worked were studies conducted in static settings, where observations of an entire workgroups safety behavior are conducted daily, and information about the workgroups safety performance is delivered using multiple feedback channels. The combination with the most significant losses ($2 million plus) are those using 1 on 1, peer-to-peer observations with a minimal contact rate of once per week, and using only 1 or two feedback channels. According to results of a survey of 1440 companies, round 50% of all B-BS processes use this loss producing combination (8).

Table I. ***ROI of B-BS design feature combinations***

No	Setting	Focus	Contact Rate	No. Of Feedback Channels	$ RoI
4	Static	Work Group	Daily	3-4	1.695,394
2	Static	Work Group	Daily	1-2	62,371
1	Static	Work Group	2-3 p.w.	3-4	33,598
1	Static	1 on 1	2-3 p.w.	3-4	232,996
4	Static	1 on 1	2-3 p.w.	1-2	142,050
2	Static	1 on 1	1 x p.w	1-2	(2,034,133)
2	Dynamic	Work Group	Daily	1-2	125,772
2	Dynamic	Work Group	1 x p.w	1-2	(2,317)
4	Dynamic	Outcomes	Daily	1-2	49,935
1	Dynamic	Outcomes	2-3 p.w.	1-2	340
1	Dynamic	1 on 1	Daily	3-4	(10,453)

Across the entire range of studies, most combinations (n=8) produced some return, although the magnitude differed. Three combinations produced losses, with no clear common distinct design feature pointing to one particular reason why. Previous research (9), however, does suggest managerial commitment to the process may account for some of the variation.

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Appendix 1. Studies Reviewed

Study	# of Data sets	Length of Study (Weeks)	Industrial Setting	Contact Rate	Observation Focus	# of Feedback Mechanisms
Cooper et al 1994	1	20	Cellophane factory	Daily	Workgroups	4
Cooper (2006a)	2	93	Metal refinery	Daily	Workgroups	4
Cooper (2006b)	1	70	Paper Mill	Daily	Workgroups	4
Zhu et al (2000)	2	52	Oil Rigs	Daily	Workgroups	1
Haynes et al 1982	1	36	Transit Operations	Daily	Outcomes	3
Larson et al (1980)	3	104	Police	Daily	Outcomes	1
Cooper & Newbold (1994)	1	11	Light bulb Manufacturer	Intermittent	Workgroups	4
Komaki et al (1978)	1	25	Food Manufacturer	Intermittent	Workgroups	2
Komaki et al (1980)	1	45	Vehicle Maintenance	Intermittent	Workgroups	2
Nasenan & Saari (1987)	1	60	Shipbuilding Yard	Intermittent	Outcomes	2
Reber & Wallin (1994)	1	88	Offshore Diving	Intermittent	One-on-One	3
Winn et al (1999)	1	60	US Postal service	Intermittent	One-on-One	3
Reber & Wallin 1984	1	56	Sugar Cane Machinery	Intermittent	One-on-One	1
Reber et al 1990	3	55	Farm Machinery	Intermittent	One-on-One	1
Mattilla & Hyodynmaa (1988)	2	20	Construction	Once P.W.	Workgroups	2
Fellner & Sulzer-Azaroff (1984)	1	60	Paper Mill	Once P.W.	One-on-One	1
Hodson & Gordon (2000)	1	104	Automotive parts	Once P.W.	One-on-One	1

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