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WHAT ARE WE TO MAKE OF SAFE BEHAVIOUR PROGRAMS?

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Abstract

WHAT ARE WE TO MAKE OF SAFE BEHAVIOUR PROGRAMS?

Safe behaviour programs are currently a popular strategy for improving safety in large organizations. This paper provides a critical look at the assumptions which underly such programs and identifies some of their limitations.

Safe behaviour programs run the risk of assuming that unsafe behaviour is the only cause of accidents worth focusing on. The reality is that unsafe behaviour is merely the last link in a causal chain and not necessarily the most effective link to focus on, for the purposes of accident prevention.

One major drawback of these programs is that they miss critically important unsafe behaviour, such as attempts by workers to re-start processes that have been temporarily interrupted. Conventional safe behaviour programs aimed at front line workers are also of no use in preventing accidents in which the behaviour of front line workers is not involved.

Given that it is the behaviour of management which is most critical in creating a culture of safety in any organization, behavioural safety observations are likely to have their greatest impact if directed upwards, at managers.

The paper concludes with an appendix about accident repeater programs which are sometimes introduced along with safe behaviour programs.

Key words: Safe behaviour; hierarchy of controls; multi-causal accident analysis

What are we to make of Safe Behaviour Programs?

Behaviour modification programs are now widely advocated as a means of reducing injuries at work. A variety of proprietary programs are on the market, for example, DuPont's STOP, and Chevron Texaco's POWER[i], all aimed at encouraging employees to behave more safely. These programs are highly controversial, with unions arguing that they amount to a return to the strategy of blaming workers for the accidents which befall them, especially when they are associated with programs which punish workers who have accidents[ii]. On the other hand, companies are hoping such programs will prove the key to driving accident rates lower, and they criticise the union viewpoint as being merely obstructionist[iii]. What often seems to be in dispute is whether it is managers or employees who are responsible for safety[iv]. Controversy is inevitable when the matter is framed in this way, and whole conferences have been devoted to behaviour-based safety, without any resolution[v].

This paper seeks to move the debate forward in certain respects. It identifies the limitations of safe behaviour programs but goes on to highlight ways in which some of these limitations can be overcome.

What are safe behaviour programs?

A major review done for the UK Health and Safety Executive concluded that the most common of these "programmes requires front line staff to carry out behavioural safety observations on their colleagues" and feed the results back on a one-to-one basis[vi]. The feedback process requires sensitivity and observers need to be trained to do this effectively. An important variant of this approach does not require the observer to give one-to-one feedback. A small number of observers count instances of agreed unsafe behaviour, for example, cases of workers not wearing hearing protection. The data are collated and statistics are reported back to the group. If observations are done at regular intervals, trend data can prepared and the mere fact of measuring and reporting on the behaviour is often enough to generate improvement[vii].

The fallacy of mono-causality

The popularity of this approach stems in part from the widely held view that "human factors" are the cause the great majority of accidents[viii]. A conclusion which is frequently drawn from this observation is that the focus of accident prevention efforts needs to be shifted from engineering solutions to ensuring compliance with safe work practices. As the general manager of DuPont Australia once said,

> Both government safety organisations and unions are quite simplistic on safety. They focus on equipment, not on the acts of people. In our experience, 95 per cent of accidents occur because of the acts of people. They do something they're not supposed to do and are trained not to do, but they do it anyway. Changing this behaviour is much harder than focussing on equipment. When you've done the technical things you've only just started. That's just the tip of the iceberg of safety management[ix].

This is the basis of the famous DuPont approach. Those responsible for developing the DuPont system assert strenuously that it is far more than a simple behaviour modification system, but its emphasis is undeniably on behaviour modification and that is how it is understood by many of its advocates as well as its critics[x].

There is a basic fallacy in concluding that because the great majority of accidents are the result of human factors, in particular unsafe behaviour, the solution is to try to modify this behaviour. The fallacy is the presumption that accidents have a single or a primary cause. Modern accident analysis proceeds on the opposite assumption, that there is a potentially infinite network of causes which contribute to an accident, all of them causes in the sense that had they been different, the accident would probably not have occurred[xi]. What this means is that while unsafe behaviour may have triggered the accident, that behaviour is better viewed as something requiring explanation rather than in itself an explanation. The moment we begin to ask why the behaviour occurred we move back along various causal chains which invariably implicate management. Just as the great majority of accidents can be attributed to unsafe behaviour by front line workers, the great majority of accidents are at the same time attributable to actions or inactions by management. An example will make the point.

> A worker descending a steep set of stairs, falls and is injured.
> Why did he fall?
> He was not using the handrail, as he was required to do by company policy
> Why not?
> He was using both hands to carry tools?
> Why?
> If he used one hand to hold the rail he would have had to make more than one trip up and down the stairs to get his tools to the lower level.
> Why didn't he do this?
> Because there was pressure from the supervisor to get the job done quickly.

Production pressures routinely lie behind unsafe actions by workers in this way. Despite all the company rhetoric about putting safety first, the experience of many workers, not all, is that production takes precedence over safety[xii]. But we can go further than this. The failure to use the handrail is not the only reason the worker fell.

> He fell because the stairs were too steep, far steeper than would be acceptable in the building code for houses, for example.
> Why were they so steep?
> Because the designers had not considered the hazards of steep stairways.
> Why had the designers not considered this hazard?
> Because they had not adopted the philosophy of designing out hazards at source.
> Why not?
> Because the regulator was not enforcing the relevant regulations.

This example could easily be developed further, but this is far enough to demonstrate the truly multi-causal nature of every accident.

Once it is recognized that a network of causes lies behind any particular event, it is immediately clear that there may be several points at which it is possible to intervene in the causal network to prevent accidents. Modifying the behaviour of the front line

worker is certainly not the only accident prevention strategy and it may not be the most effective. In the example above, the behaviour modification approach focusses on getting workers to use the handrail. Another strategy, arguably more effective, would be to use a safer stairway design.

The fallacy of mono-causality is manifested in an interesting way in an otherwise very sophisticated document on behavioural change produced for the UK oil and gas industry[xiii]. The document asserts that there are stages which an industry goes through in seeking to improve safety. First, it concentrates on engineering improvements. When this stage has almost exhausted itself and accident rates are no longer coming down, there is a shift to safety management systems as the way to drive further improvement. Finally, when these have exhausted their potential, the focus must shift to behaviour modification. (See figure 1)

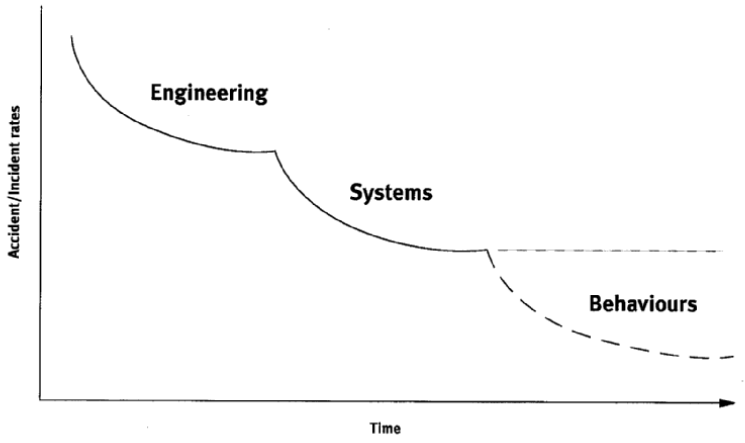

Figure 1: Stepchange's three ages of safety

It has to be said that this three stage analysis is highly contestable; indeed the analysis of Hale and others flatly contradicts it. They assert that a first age of technical, engineering improvements was succeeded by a second age, in the 1960s and 1970s in which human factors were seen as the central issues to be addressed. The late 1980s saw the dawn of a third age in which the structure and functioning of management was seen to be crucial.[xiv]

We do not need to resolve this contradiction here. The point to note is the conclusion which is drawn in the UK document, namely that further progress in improving health and safety depends on behaviour modification. The assumption is that the engineering and management level causes underlying accidents have already been addressed. The fact is, however, that even today in the oil and gas industry, as soon as we ask why a certain unsafe behaviour occurred, we inevitably find engineering and management factors which have contributed to the behaviour, in the sense that had they been different the unsafe behaviour would not have occurred. In short, we find ways of eliminating or reducing risky behaviour that are not dependent on behaviour modification techniques.

It is noteworthy that "human factors" specialists generally do *not* commit the fallacy identified above. It has long been recognised in the airline industry, for instance, that errors and violations are involved in the great majority of aircraft accidents, but the response of the industry has not been to promote safe behaviour programs; rather it has been to identity the factors which have contributed to these errors and violations such as cockpit layout, inadequate crew resource management[1] and so on, and to work at changing these. This raises an intriguing question: why is it that that response to violations by front line workers in the airline industry (pilots) has been to look for the causes of their behaviour while in so many other industries the response is to adopt behavioural safety programs? I shall not attempt to answer this question here, but it is clearly an intriguing one.

It is appropriate to let Flemming and Lardner have the last say on this point:

> Whilst a focus on changing unsafe behaviour into safe behaviour is appropriate, this should not deflect attention from analysing why people behave unsafely. To focus solely on changing individual behaviour without considering necessary changes to how people are organised, managed, motivated, rewarded and their physical work environment, tools and equipment can result in treating the symptoms only, without addressing the root causes of unsafe behaviour[xv].

The fallacy of mono-causality does not by itself account for union antagonism to behavioural safety programs. There is something else going on which needs to be highlighted. Regardless of the intention of behavioural safety advocates, their approach is inevitably associated with a tendency to blame the victims. To understand why, let us first distinguish between explanation and blame. Explanation is a rational process and explanations can be subjected to empirical evaluation - does the evidence support them? Blame, on the other hand, is a fundamentally emotional response, beyond the realm of reason. Despite this distinction, or perhaps because of it, in the case of harmful events there is an almost universal tendency to allocate blame at the point where explanation comes to an end. Given that safe behaviour programs explain accidents in terms of unsafe behaviour, it is almost impossible to avoid attributing some degree of blame to the victim (assuming, of course, it is the victim's behaviour that is unsafe). In contrast, if we ask *why* an employee violated a procedure and seek an explanation further up the causal chain, there is much less tendency to blame the worker concerned. If blame is still to be attributed it will be to the organization as a whole, or to those responsible for the way the organization is operating. It is obvious that if behavioural safety programs are to have any chance of success, they must strenuously oppose this tendency to blame employees for their unsafe behaviour.

The hierarchy of controls

The idea that there is a network of causes contributing to every accident is the starting point for understanding in more detail some of the shortcomings of behavioural safety programs.

[1] It is true that poor CRM is a behavioural issue, concerning the decision making behaviour of captains. But poor CRM is not simply a matter of non-compliance with procedures. Better CRM requires better decision making procedures and it requires that crews be trained in these procedures. This is not the kind of behaviour modification envisaged in safe behaviour programs.

There is a well-known hierarchy of controls for preventing accidents. At the top of the hierarchy, the most effective control is to eliminate entirely the hazard in question, for example replacing toxic substances with non-toxics. Further down the hierarchy are engineering controls such as exhaust fans for toxic vapours. Further down again are administrative controls, such as limiting exposure periods to toxic substances. At the bottom of the hierarchy is personal protective equipment, such as gloves and masks.

All these methods offer potential ways in which accidents may be avoided, but controls at the top of the hierarchy are more certain and more effective than those at the bottom. PPE is notoriously ineffective and should only be relied upon as a last resort. Moreover, controls which depend upon front line workers doing the right thing can never be totally reliable. Al Chapanis explains why:

> "Everyone, and that includes you and me, is at times careless, complacent, overconfident and stubborn. At times each of us becomes distracted, inattentive, bored and fatigued. We occasionally take chances, we misunderstand, we misinterpret and we misread. These are completely human characteristics. Because we are human and because all these traits are fundamental and built into each of us, the equipment, machines and systems that we construct for our use have to be made to accommodate us the way we are, and not vice versa"[xvi]

Unfortunately, in too many contexts PPE and behavioural rules are the only controls seriously considered. Moreover, they are adopted as an afterthought, after the machine or a process has been designed[xvii]. Failure to implement the hierarchy of controls can often be thought of as one of the causes of an accident. For instance, in the stairway example above, failure to design out the hazard was certainly a cause of the accident.

Behaviour-based safety is generally concerned with the lower end of the hierarchy of controls. Observations will be made, for example, on whether people are wearing hearing protection as required, or whether they are using the handrail on a stairway. Clearly, behaviour based safety directs attention to the least effective accident prevention strategies.

There is no reason in principle why an organisation which is has adopted a safe behaviour program should not at the same time be energetically implementing higher level controls. The best of them are[xviii]. In practice, however, a focus on behavioural safety can lead to the abandonment of any commitment to the hierarchy of controls.[xix] Unions argue that where safe behaviour programs are introduced, worker health and safety representatives are often co-opted and lose sight of the ways in which employers can eliminate or mitigate hazards.

Safe behaviour programs are sometimes quite explicit about this very narrow focus. Consider this passage in a behavioural safety manual:

> "When an intervention has been running successfully for some time, the number of behavioural issues left to be addressed will decrease. At this stage, there may be a temptation for observers to shift their focus onto issue such as physical workplace conditions that are normally dealt with by supervisors and/or safety representatives. It's very important, however, that the two are kept separate. The

observer's job is simply to take an accurate measurement of a behaviour (and to seek to understand why it occurred). If observers get into situations where they're chasing up actions, they will be seen (and will feel) more like 'policemen'. Their role will become less positive, less proactive and considerably more stressful. Moreover, both employees being observed and their managers may resent what they see as unwarranted interference".[xx]

While the logic of this statement is understandable, the practical consequences are disturbing. As the statement recognizes, workers who are on the lookout for unsafe acts will naturally become more aware of unsafe conditions in the workplace - hazards. These are unequivocally the responsibility of management. A manager who treats a hazard report as "unwarranted interference" shows a blatant disregard for safety. If workers are in any way discouraged from reporting unsafe conditions, they will naturally infer that management is wishing to focus exclusively on unsafe behaviour as the cause of accidents and to blame workers for accidents which befall them.

Reporting hazards is a particularly important way of preventing accidents. Research shows that major accidents are always preceded by warning signs, indicators that the hazards concerned are not properly under control[xxi]. Had these indicators been responded to, the accident would have been averted. Any employer who seeks to introduce a behavioural safety system, and wishes to convince its workforce that it is serious about safety, needs at the same time to introduce or energise a system for reporting hazards and warning signs. Of course reporting hazards is not enough - these reports must be acted on - and this is where employer sincerity about safety will really be demonstrated as far as the workforce is concerned.

It is interesting to note that there are other safety programs aimed at front line workers which are not restricted in the way that behavioural safety programs are. These alternative programs are essentially mini risk assessment procedures that workers carry out at the beginning of a job, and they invite workers to consider all potential risk factors, not just their own behaviour or that of their workmates. One such programs is Xstrata Coal's S.L.A.M, which stands for Stop, Look, Assess, Manage. The program advises workers to

STOP	Engage your mind before your hands
LOOK	At the workplace and find the hazards
ASSESS	The effects of the hazards on people, property and the environment.
MANAGE	With effective controls and advise others

The SLAM program explicitly asks workers to report hazards to supervisors. In this respect it differs strikingly from strict behaviourial safety programs. Mini risk assessments of this nature are thus immune from many of the criticisms made of behaviour modification programs.

This is not to say that the mini risk assessment strategy is necessarily successful. If it is not carefully managed it can rapidly degenerate into an ineffective ritual. This is particularly likely when workers are asked to fill out cards routinely and hand them to supervisors to be filed without further comment. It is only when supervisors and managers are keen to make such systems work that they reach their potential[xxii].

Given that behavioural safety programs are in principle not concerned with unsafe conditions, it is vital that any organization which seeks to introduce such a program should at the same time introduce or revitalize a program of hazard observation and reporting.

What Behavioural Safety Misses

To return to our topic, it is important to note that behavioural safety programs encourage a focus on behaviour with certain characteristics. First, it must be readily observable behaviour. As one proponent puts it: "The golden rule for these behaviors is that they are directly observable: i.e. anybody can see them as they occur".[xxiii] As another says, the behaviour must be "observable to the naked eye".[xxiv] Second, the behaviour must occur frequently, so that it can be counted repeatedly and any changes in frequency noted. These twin characteristics naturally highlight certain kinds of behaviour by front line employees, such as the wearing of PPE and the use of handrails when going up or down stairs.

It needs to be stressed that many types of unsafe behaviour are systematically missed by this approach, either because they are infrequent, or because they are not obvious to the casual observer. One of the common causes of accidents is the short cuts which workers take in the attempt to get a process going again which has temporarily jammed or broken down in some way[xxv]. Workers may put their hands into a dangerous machine, or crawl into a dangerous place, contrary to explicit safety rules, because they know this is the most effective, perhaps the only way to get the process started again. They do so because of production pressures they are under. Such pressures are particularly intense when pay systems are tied to production, so that lost time is lost pay, or where there are quotas, with penalties for not achieving the quota[xxvi]. Workers who in normal circumstances may be scrupulous about complying with rules such as the wearing of PPE will sometimes throw caution to the wind at times of crisis in order to get production going again. Unsafe behaviour of this nature does not fulfill a crucial characteristic mentioned above. It is relatively rare, precisely because breakdowns are abnormal, and casual observers are therefore not likely to be carrying out observations when it occurs. Even if they did become aware of it, it would be difficult if not impossible to quantify meaningfully.

A second crucial limitation is that unsafe behaviour may not be readily observable to the naked eye. Numerous accidents occur because of failures to properly implement permit to work systems, or isolate plant that is supposed to be isolated, or respond appropriately to alarms. The casual behavioural observer is not in a position to identify unsafe behaviour of this type. Indeed there may be whole sequences of behaviour which need to be observed or even studied before it can be said that the behaviour in question is unsafe.

More generally, it may require considerable expertise to recognize the behaviour as unsafe. An excellent example of this is the Longford gas plant explosion near Melbourne in 1998[xxvii]. The explosion was triggered by actions of front line workers trying to restart a pump. Neither they, nor their supervisors, nor even the plant

manager realized that this behaviour was unsafe, and no behavioural observer would ever have picked it up.

It is clear that the focus on behaviour which occurs frequently and which anyone can readily observe inevitably restricts attention to a very limited, even trivial class of behaviours. As one review puts it: "(Safe behaviour) schemes tend to focus on slips and trips types of risk that are observable and readily repeatable"[xxviii]

Finally, standard behavioural safety programs can have no impact on accidents that occur without any active behaviour, safe or unsafe, on the part of front line workers. This is such a significant class of events that it is explicitly recognized by theorists of accident causation. In Jim Reason's model, for instance, unsafe acts are seen as having a variety of organisational causes, but these organisational causes, or latent conditions as he calls them, can also cause accidents directly, without the need for unsafe behaviour at the front line (see the latent condition pathways in figure 2). Some of the best know accidents are of this nature, having nothing to do any immediate unsafe behaviour. Both the space shuttle disasters, Challenger, in 1986, and Columbia, in 2003, occurred without any input from shuttle crews, but instead resulted from shuttle design flaws and decisions made by senior NASA managers. Again, the Moura mine disaster in Queensland in which 11 men died in 1994 was not the result of the activity of the men who were underground on the night of the explosion. The levels of explosive gas in the mine were rising and the mine was a virtual time bomb set to go off at a certain time, regardless of who was underground or what they were doing. Management should never have sent men underground that night. [xxix]

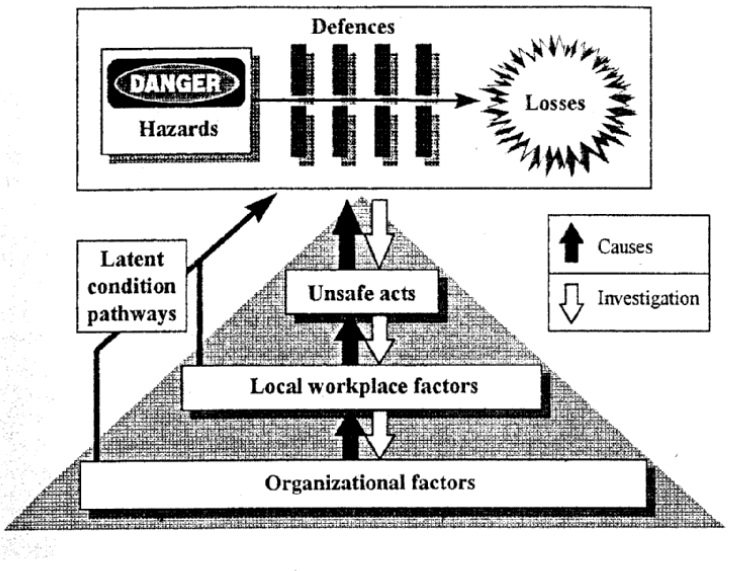

Figure 2: Reason's accident causation model (Source, Reason, 1997, p17)

Management behaviour

The preceding discussion has implicitly raised one of the most serious limitations of conventional safe behaviour programs. Management behaviour is always a factor contributing to accidents. Corporate funding decisions, what it is that managers attend to, the example they set - these are crucial determinants of organisational outcomes of all sorts, including accidents, but safe behaviour programs, with there focus on frequent and readily observable behaviour, have difficulty taking account of such behaviour.

Many commentators suggest that unless safe behaviour programs can include the behaviour of managers they will be relatively ineffective, in part because they will be missing crucial contributory factors, but also because they will be resisted by front line workers because of what they will see as an unfair focus on their own behaviour.

Fleming and Lardner have devoted considerable attention to the incorporation of management behaviour into safe behaviour programs. They identify two critical management behaviours conducive to safety.

- Meeting with employees frequently to discuss safety issues
- Responding quickly to safety suggestions and concerns raised by employees[xxx].

They go on to suggest a list of behaviour measures which safe behaviour programs can use to promote these behaviours[xxxi].

- The number of interactions per week with frontline staff where safety is the main topic of conversation and the member of staff rates the interaction as positive. (Employees to complete card evaluating quality of interaction and submit anonymously.)
- The number of safety concerns raised by employees per week that are responded to, actions agreed and a completion date mutually agreed within 12 working hours.
- The percentage of actions complete within the mutually agreed completion date per week.
- The number of safety suggestions raised by employees per week that are responded to, next steps identified and a completion date mutually agreed with 12 working hours.
- The percentage of safety suggestions progressed each week within the mutually agree timescale.

Notice that these measures involve judgments and discussions of various kinds; they are not observations that can be made “with the naked eye”. In this respect they involve a departure from the purest form of observation envisaged by the proponents of safe behaviour programs. Clearly such departures are necessary in order to produce useful measures of management behaviour.

It should be noted, too, that these measures do not get at some of the management behaviour which contributes most significantly and directly to accidents. Consider the management decision in the Challenger case to go ahead with a launch which the engineers opposed; the decision in the Colombia case to ignore the damage which Columbia sustained on take off; and the decision by Moura managers not to withdraw

men from the mine even though it was known to be approaching a dangerous state. This decision making behaviour by management contributed directly to the outcomes, yet it is not captured by the Fleming and Lardner proposals. Even their extension of behavioural safety ideas into the arena of management fails to capture some of the most crucial management behaviour.

Some big companies are taking very seriously this idea that safe behaviour programs must somehow encompass management behaviour. To this end they ask workers to make observations and appraisals of the behaviour of their managers.

> "In Shell Expro in the UK all managers were subject to an upward appraisal by their staff on their commitment to safety and their safety leadership style. This led to a personal report to each senior manager and a summary of the data presented to the whole group. Senior managers, where appropriate, agreed actions for changing their own behaviours. By repeating this process over time their behaviour was influenced in a positive direction"[xxxii].

A BP senior executive recounts the story of a behavioural safety program that encouraged a drilling crew to make observations about the unsafe behaviour of a supervisor that eventually led to the redeployment of the supervisor[xxxiii].

One can see in all these strategies an attempt to direct the focus of attention upward, at the behaviour of managers. After all, they are the employees whose behaviour is most critical to safety. As the BP manager quoted above also said: "When a leader visits the workplace, they see the behaviours of their own people but they also see, reflected in their people, their own behaviours. That sums it up for me."

These attempts to direct the focus upwards necessarily depart from the strict rules laid down by the safe behaviour theorists requiring that the behaviour to be measured be directly observable and frequently occurring. Such rules clearly limit the effectiveness of the method.

Do safe behaviour programs work?

Despite all the objections which I have raised, a crucial question has been left hanging. Do safe behaviour programs, focused on frequently occurring and readily observable behaviour, actually work to reduce accidents? Does it help to run a campaign to get people to use the handrail?

If we go back for a moment to the idea of a multi-causal network it is clear that these programs have the potential to work. Encouraging people to hold on to the hand rail has the potential to reduce the number of accidents, even if nothing is done about stair case design.

The evidence is that sometimes these programs work and sometimes they don't[xxxiv]. There are indeed cases where the introduction of safe behaviour programs have led to a reduction in accident rates. The crucial feature which distinguishes those that work from those that don't is whether or not there is trust between workers and management[xxxv]. This depends in turn on whether leaders are perceived to be

committed to safety, whether managers consult actively and respectfully with workers and whether there is a mature safety management system which is functioning well in practice. Without these features, in particular, trust, research indicates that safe behaviour systems will be ineffective.

There is a lesson here for companies which bewail union attitudes to behavioural safety programs. Union opposition stems from distrust of the employer and a belief this is just an attempt to shift responsibility for accidents from the employer to the employees. Where such distrust exists it is pointless for employers to seek to introduce such programs. The evidence is that they will fail. In such circumstances employers need first to concentrate on mending relationships with employees. As Peterson puts it, "In some organizations there is a deep mistrust between managers and workers. In these organizations much needs to happen before the behaviour-based concepts can be successful".[xxxvi]

Conclusion

Safe behaviour programs run the risk of assuming that unsafe behaviour is the only cause of accidents worth focusing on. This is the fallacy of mono-causality. The reality is that unsafe behaviour is merely the last link in a causal chain and not necessarily the most effective link to focus on, for the purposes of accident prevention. Safe behaviour programs are certainly a reasonable component of any comprehensive safety management system, but they should never be the central component and care should be taken that they do not shift the emphasis away from potentially more important safety management strategies such as designing out risks at source. Put another way, unsafe acts are only one part of the story - unsafe conditions are the other - and any good safety management system must include vigorous programs aimed at identifying and rectifying unsafe conditions.

Given that it is the behaviour of management which is most critical in creating a culture of safety in any organization, behavioural safety observations are likely to have their greatest impact if directed upwards, at managers. Considerable thought needs to be given to how this can best be achieved and the best companies are leading the way in this respect.

One major drawback of behavioural safety programs is that they miss critically important unsafe behaviour, such as attempts by workers to re-start processes that have been temporarily interrupted. Conventional safe behaviour programs aimed at front line workers are also of no use in preventing accidents in which the behaviour of front line workers is not involved.

Finally, the evidence is that safe behaviour programs do not work when the workforce mistrusts its management and believes that this is just another way to hold workers responsible. Where such beliefs prevail, employers must first win the trust of their workforce, by tackling some of the issues they see as affecting safety, such as production pressures or perhaps fatigue. Perhaps the best way to introduce safe behaviour programs is to start with upward appraisals of management behaviour. Only when progress is made in these areas are safe behaviour programs aimed at front line workers likely to achieve whatever potential they may have.

Appendix: Accident Repeater Programs

Safe behaviour programs are particularly mistrusted by unions when they are associated with another accident reduction strategy, namely, identifying and singling out accident repeaters for special treatment. What makes these programs problematic is that the special treatment may culminate in punishment. Nancy Lesson provides the following description:

> An injury discipline program popular in the United States is the "Accident Repeaters Program", which identifies workers who have had a certain number of injuries (usually one or two in a 12 or 24 month period) and places them in a program whereby they will get counseling if they report another injury; receive a written warning for their next injury; a suspension for the next injury; and termination should they report another injury after that. [xxxvii]

Let us consider this situation in more detail. Suppose we have a group of a thousand workers, of which about one in five suffer a minor injury, requiring some kind of first aid treatment, over the course a year. Suppose a closer study reveals that the pattern is actually as follows.

Number of injuries per worker:	0	1	2	3
Number of workers experiencing the given number of injuries	819	164	16	1

Accident repeater programs of the type mentioned above would have little hesitation in identifying the 16 people who had suffered two injuries as accident prone and the one who suffered three would almost certainly be the subject of disciplinary action.

This would be a serious error of logic, not to mention an injustice. Suppose accidents are simply a matter of bad luck and are randomly distributed amongst a population of workers in any particular time period, we would expect a small proportion of those who are injured will in fact have the bad luck to be injured twice. Among these people there may be a sub group which is injured three times or more, purely by chance. Putting this another way, some workers will experience more injuries than others, by chance alone. The distribution displayed above is precisely the distribution we would expect if chance alone was all that was operating. It is the well-known Poisson distribution.

If chance is all that is operating and the individual who was injured three times in one year was just plain unlucky, s/he almost certainly will not be injured three times or even two times in the next 12 months. The probability of that occurring is very slight, assuming that chance is all that is operating. If s/he were indeed to suffer two or three injuries in the second 12 month period we would be entitled to conclude that something other than chance was operating and that this individual was indeed accident prone for some reason. Under these circumstances it would be appropriate to single this person out for special consideration. (Note that a person who continually

suffers more accidents than others does not necessarily have an accident prone *personality*. It may be that their job is particularly risky, or that there is something else about the person's circumstances that is increasing the risk of accident.)

The point about all this is that before an accident repeater program is implemented, it needs to be demonstrated that the repeaters are not simply the chance repeaters predicted by the Poisson distribution. Unless we are sure that the distribution of accidents in a particular population of workers is significantly different from the Poisson distribution we are likely to end up scapegoating individuals who have experienced a disproportionate number of accidents through no fault of their own.

It is clear from the description of the accident repeater programs given earlier that those responsible for such programs have not considered the possibility that repeaters are simply the victims of chance; they jump immediately to the conclusion that such people are accident prone.

It is instructive to compare this response to the response of companies and their insurers when dealing with cancers and other illnesses which may possibly have been caused by exposure to a particular hazardous substance in a particular workplace. There will always be a certain number of cancer cases occurring in the population of workers, by chance alone, that is, for reasons which have nothing to do with exposure in the workplace. Companies and their insurers often will not accept that a particular case of cancer is work-related unless it can he shown that the number of workers from the workplace in question who have been diagnosed with cancer is higher than would occur by chance, that is, higher than in a population of comparable workers not exposed to the substances in question. In short, in this context there is a very strong tendency to assume that the phenomenon of concern is to due to chance, unless and until it is proved otherwise.

We see, then, that in the context of compensible illnesses, chance is assumed to be operating until the evidence can be assembled to rule out this hypothesis. In the context of accident repeater programs, the hypothesis that chance is all that is operating is not even considered. There is clearly a logical inconsistency here. These logically inconsistent responses are, however, consistent in one sense. In both cases workers lose out. Why this might be so will not be pursued here.

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[i] "Positive observations will eliminate risk"

[ii] See appendix to this article.

[iii] See N Wran & J McClelland, *NSW Mine Safety Review*, February, 2005, p53

[iv] D Petersen, "Behaviour-based safety: Build a culture or attack behaviour", *Occupational Hazards*, Jan 1999, 61, 1:29-32, p29

[v] ibid

[vi] M Flemming & R Lardner "Strategies to promote safe behaviour as part of health and safety management systems", contract research report 430/2002 for the UK Health and Safety Executive, p10

[vii] J Whiting, "On safe behaviour", *Australian Safety News* 64(1993), 7, pp43-5

[viii] One widely quote source for this claim is T Krause, *The Behaviour-Based Safety Process* (Van Nostrand Reinhold, 1990)

[ix] Interview with the author.

[x] A useful discussion of the DuPont system can be found in R Wokutch and C VanSandt, "OHS management in the US and Japan" pp367-390 in K Frick et al, *Systematic Occupational Health and Safety Management*, (Oxford: Pergamon, 2000)

[xi] See for example, J Reason, *Managing the Risk of Organisational Accidents* (Aldershot, Ashgate, 1997); A Hopkins, *The Lessons of Longford* (Sydney, CCH, 2000)

[xii] For evidence that not all workers experience this pressure see Pitzer, C. (1999). *Safety Culture Survey Report: Australian Minerals Industry.* Canberra: Minerals Council of Australia & SAFEmap.

[xiii] *Changing Minds: A Practical Guide for Behavioural Change in the Oil and Gas Industry*, available on the Step Change website, http://step.steel-sci.org/

[xiv] A Hale, J Hovden "Perspectives on safety management and change". Chapter 1 in A Hale and M Baram, *Safety Management* (Oxford, Pergamon, 1998)

[xv] op cit, abstract

[xvi] Quoted in N. Lesson, "Behaviour based safety schemes – A union viewpoint", Hwww.ohsrep.org.au/hazards/behaviourbased_Lessi.htmlH

[xvii] For a striking example see *The Report of the Deseal/Reseal Board of Inquiry, Royal Australian Air Force*, June 2001

[xviii] The UK step change document described earlier recognizes this, notwithstanding its three stage analysis: "Behaviour modification is unlikely to be successful unless job environment and organizational factors are also considered" (p7)

[xix] Lessin, op cit p 4

[xx] "The practicalities of a behavioural approach", www.rydermarsh.co.uk/practicalitiesof.html

[xxi] B.Turner, *Man Made Disasters* (London, Wykeham, 1978)

[xxii] A Hopkins, *Safety, Culture and Risk*, (Sydney:CCH, 2005), p19

[xxiii] "What is behavioral safety?" www.behavioral-safety.com , p2

[xxiv] "What's involved in full behavioural intervention?" Hwww.rydermarsh.co.uk/What'sHinvolvedin.html

[xxv] Nichols, T. *The Sociology of Industrial Injury*,(Mansell, London, 1997), p47

[xxvi] Lessin, op cit, p2

[xxvii] A Hopkins, *Lessons from Longford* (Sydney, CCH, 2000)

[xxviii] C Hornbury, & M Wright "A review of behavioural safety schemes in the UK" June, 2000, www.rydermarsh.co.uk/schemereview.html

[xxix] A Hopkins, *Managing Major Hazards: The Lessons of the Moura Mine Disaster* (Sydney: Allen and Unwin, 1999)

[xxx] op cit p 22

[xxxi] op cit p 27

[xxxii] S Kruse and P Wilkinson. Speech to the NSW Minerals Council Health and Safety Conference, 15-18 May, 2005, p8. See also R Flin, "Danger - Men at Work:Management Influence on Safety" *Human Factors and Ergonomics in Manufacturing*, 2003, 13,4 1-8

[xxxiii] T Haywood, "Working safely: a continuous journey" Speech to the International Regulators' Offshore Safety Forum, London, 1 April 2005, p

[xxxiv] Fleming and Lardner, op cit p 15

[xxxv] Peterson op cit p 29

[xxxvi] Petersen, op cit p 30.

[xxxvii] Op cit p 5