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# Behavior-based Safety Program Effectiveness and Culture: A Brief Review and Update

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## Introduction

Behavior-based safety (BBS) is a subset of organizational behavior management (OBM), which itself is a sub-discipline of Applied Behavior Analysis (ABA). ABA applies scientific techniques based on principles of learning to change social behaviors [1]. OBM applies behavioral principles and methods to improve individual and group performance and safety in organizations [2]. BBS utilizes evidence-based intervention strategies ranging from basic employee behavior audits to comprehensive safety management elements with the aim of optimizing an organization's safety culture and reducing incidents [3]. Fundamentally, BBS is based on the "antecedent-behavior-consequence" [4] and reinforcement [5] models of human behavior. BBS programs are generally comprised of the following elements [6]:

- BBS program design (includes representation from management and frontline employees).
- Identification of behaviors (from mishaps, near misses, safety audits and observation) to be changed.
- Development of a safe and valid checklist or procedure for tasks in which unsafe behaviors have been expressed.
- Behavior measurement system (usually the frequency of safe and risky behaviors during observations).
- Behavioral observations (can include both single tasks and an entire workspace).
- Observer-generated feedback that includes recognition of both appropriate behaviors and those that should be changed.
- Application of behavior observation data to change management.
- Evaluation of program effectiveness.

Although BBS has been shown to reduce incident rates across industries [7], its effectiveness continues to be debated. Arguments against BBS include the high cost of program implementation, eliciting a blame culture and long-term results that are less than optimal [3]. A dominant counter-argument to these claims is that organizations' BBS program management processes warrant improvement in cases where it appears to be ineffective. In recent years, researchers have sought to explain apparent limitations in BBS and have offered ameliorative recommendations. In this vein, a brief review of selected publications is presented to provide an update.

## Recent Investigations

Variables that affect safety behaviors deserve strong consideration in any BBS program. Research in the construction industry examined how individual and cultural variables can affect safety behaviors [8]. Construction workers' self-reported safety behavior was examined in relation to the following constructs: perceived safety commitment, perceived social support, perceived production pressure (climate factors), safety knowledge and safety motivation (individual factors). Results showed that perceived management safety commitment was related to perceived social support and inversely related to perceived production pressure. Production pressure had negative effects on safety motivation, safety knowledge, safety participation and safety compliance. Lastly, safety knowledge and safety motivation were related to safety participation. These findings suggest that safety behavior is driven by several individual and cultural factors and that these factors should be given strong consideration in the practice of BBS.

Several similar BBS-related factors were examined during program implementation at an oil and gas process facility [9]. A set of "apprehensions" experienced by the Lead Trainers/Observers as well as outcomes of BBS implementation were identified. Apprehensions were construed as potential roadblocks to successful BBS program execution. Apprehensions that were identified include: some employees' reluctance to accept a BBS program, coping with employees who do not change unsafe behaviors and the possibility that reliable and valid data may not be collected. The fundamental themes of employee involvement and encouragement as well as commitment by leadership to facilitate safe work practices ran through all recommendations to alleviate observer concerns. As a result, and shortly after BBS implementation, the average base level of safe behaviors increased from 75% to 95%. Factors such as employees' general acceptance of the BBS program, increased communication and improved cooperation among facility departments were also observed. The importance of employee involvement in a successful BBS program is validated by a study conducted in the mining industry, where a stable 30% employee participation rate was observed over the course of 4 years and incident rates decreased by 50% [9]. Although 30% involvement is a seemingly low rate of participation, the authors attribute BBS effectiveness in this case to the increasing number of observations that occurred during the 4 years after the participation rate stabilized. Such findings suggest that the quality of observations can affect incident rates. "Observer quality metrics," which include dimensions such as the severity of the risky things observed, percent of at-risk observations with comments, and percent of safe observations with comments, have been proposed to promote observer engagement and to produce high quality, meaningful observations [10,11].

## Conclusion

BBS program effectiveness depends on consideration and integration of safety-relevant individual and cultural factors, given that both can have an intervening effect. The BBS process should be treated as a continuous loop, beginning with behavioral observations, analyzing data yielded from the observations, determining how to

mitigate risk, facilitating behavioral change and evaluating the mitigation's effectiveness.

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