



## Evaluating the Effectiveness of behavioural-Based Safety Measures Amongst Workers Working in Industrial Workplaces.

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### ABSTRACT:

Behavioural-Based Safety (BBS) is a proactive approach to reducing workplace accidents by promoting safe behaviours among workers. This study evaluates the effectiveness of BBS measures in industrial workplaces, focusing on worker awareness, implementation challenges, and overall impact on safety culture. Data was collected from permanent and contract workers to assess their perception of safety training, reporting systems, and behavioural compliance. Findings indicate that while BBS programs improve workplace safety, challenges such as lack of training, resistance to feedback, and inadequate management support affect effectiveness. Strengthening safety training, encouraging peer observations, and enhancing management commitment can improve BBS outcomes.

**Keywords:** Behavioural-Based Safety (BBS), Workplace Safety, Industrial Workers, Safety Culture, Risk Reduction, Safety Training, Accident Prevention.

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### INTRODUCTION:

Workplace safety is a critical concern in industrial environments where employees are exposed to various occupational hazards. Ensuring a safe working environment is essential not only for preventing accidents and injuries but also for enhancing productivity and workforce morale. Traditional safety measures have predominantly focused on enforcing compliance with safety regulations and providing personal protective equipment (PPE). However, recent approaches emphasize Behavioural-Based Safety (BBS) as an effective strategy to reduce workplace incidents by addressing human factors and behavioral patterns.

Behavioural-Based Safety (BBS) is a proactive safety management approach that focuses on identifying and modifying unsafe behaviors to create a safer work culture. It operates on the principle that the majority of workplace accidents result from human behavior rather than equipment failure or environmental hazards. By encouraging employees to observe, report, and correct unsafe behaviors through peer feedback and positive reinforcement, BBS aims to instill a culture of safety ownership among workers. This approach also involves continuous monitoring, training, and engagement from both employees and management to ensure a sustainable safety culture.

This study will provide insights into workers' perceptions of BBS measures, the challenges faced in implementation, and the effectiveness of peer observation and feedback mechanisms. By analyzing responses from a diverse workforce, including both skilled and unskilled workers, this research will help identify key success factors and areas for improvement in BBS programs within industrial settings. The findings will contribute to developing better strategies for integrating behavioral safety practices into workplace safety policies, ultimately ensuring a safer and more productive work environment.

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### SIGNIFICANCE OF THE STUDY:

Ensuring workplace safety is a critical priority in industrial environments, where hazards and risks are prevalent. This study on "Evaluating the Effectiveness of Behavioural-Based Safety (BBS) Measures Amongst Workers in Industrial Workplaces" is significant as it provides valuable insights into how behavioral safety strategies impact worker safety, accident prevention, and overall workplace culture. By assessing the effectiveness of BBS measures, this research helps identify gaps in safety practices, training programs, and compliance levels among both permanent workers and contract laborers.

Additionally, it highlights the role of management, peer observations, and employee engagement in fostering a safer work environment. The findings will aid industries in refining safety policies, enhancing training programs, and encouraging proactive safety behaviors to reduce workplace injuries and fatalities. Ultimately, this study contributes to building a safety-conscious workforce, improving productivity, and ensuring regulatory compliance in industrial settings.

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## REVIEW OF LITERATURE:

**Silvia Carra 31 (August 2024)**, Behavior-Based Safety (BBS) is increasingly adopted in various industries to promote worker safety through structured behavioral interventions. This study analyzed 230 scientific papers on BBS from 1970 to 2023, highlighting its evolution, strengths, and limitations. Results show BBS integrating traditional principles with new elements like technology and worker-centric approaches. Future prospects of BBS will involve tailored variants for different contexts.

**J. Zakaria (September 2023)**, In 2022, there were 4514 workplace accidents in Malaysia's industrial sector, underscoring the necessity of efficient safety measures. To encourage safe conduct among employees, BSOP, a Behavioral-Based Safety (BBS) program, was put into place. Over the course of two observation cycles, the percentage of safe acts increased from 61% to 82%, indicating a significant decrease in at-risk behavior. The training showed how to create safety interventions in a thorough and organized manner.

**Mairi Bowdle (8 July 2023)**, This systematic review examines the effectiveness of behavioral interventions in reducing injuries and illnesses in high-risk industries. 19 articles were analyzed, with 11 showing evidence of effective interventions. Multi-faceted interventions tailored to the target group were found to be most effective. However, methodological quality issues were identified in 10 studies, highlighting the need for more rigorous research.

**Jim Spigener 16 (Mar 2022)**, A study by Cambridge University analyzed 1.3 million observational data points from 88 international clients, challenging traditional assumptions about Behavior-Based Safety (BBS) initiatives. The findings suggest that using dedicated observers, monthly observations, and task-familiar observers are more effective strategies. These insights provide implications for BBS practitioners to optimize their safety programs. The study contributes to the maturing empirical basis for BBS.

**Bello Mahmud Zailani (August 2021)**, This study examines the relationship between workers' safety attitude, safety behavior, and hazard recognition capability (HRC) in the construction industry. The results show that safety attitude influences safety behavior, but no direct relationship was found between safety behavior and HRC. This finding highlights the complexity of human factors in safety management. Further research is recommended to explore other human-related factors and improve the industry's safety performance.

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## RESEARCH METHODOLOGY:

### Research Design:

The research is descriptive in nature

### Objectives:

- To evaluate the impact of Behavioral-Based Safety measures on workplace safety outcomes.
- To analyze the influence of BBS measures on employee safety awareness and attitudes.
- To identify common challenges and barriers faced by industrial organizations in implementing BBS measures.
- To develop practical recommendations for enhancing the design and sustainability of BBS programs in industrial settings.

### Universe:

The study focuses on workers and employees from various industrial units in Vadodra district, Gujarat. It includes workers from GIDC sectors and other local industries. The research covers permanent staff, contract workers, and skilled, semi-skilled, and unskilled laborers. By analyzing this specific industrial region, the study evaluates the practical viability of Behavioural-Based Safety (BBS) practices in real workplace settings.

### Sample:

The employees and workers working in Makarpura G.I.D.C (Industrial area) were taken as sample in this study.

### Sample Size and Sampling Method:

The study will use a sample size of 60 workers from various industrial workplaces, ensuring representation across different job roles and industries. A stratified random sampling method will be employed to ensure diverse representation, with workers categorized based on their job functions, experience, and exposure to safety measures. This approach will help provide a comprehensive evaluation of the effectiveness of behavioral-based safety measures across different workplace settings.

### Tools and methods of Data collection:

The tool for data collection used by the researcher was closed ended questionnaire in this research.

### Limitations of the Study:

- Self-reported information can be subject to bias, with employees overestimating safety compliance or influenced by social desirability, compromising the validity of findings.

- Participants might report behaviors inaccurately, which can lead to possible inaccuracies in measuring safety measure effectiveness.
- The small sample range of the study might not generalize to the overall workforce, and thus results might not be generalized to all industrial sectors or geographical areas.

#### Statistical Tool:

Microsoft Word: Primarily used for creating, editing documents.

Microsoft Excel: Primarily used for organizing and analyzing data using spreadsheets to create charts, graphs and diagram.

#### Reference Period:

The research data collection and analysis lasted from August 2024 to December 2024.

## RESULTS AND DISCUSSION:

### *Age wise distribution of the respondents:*

Table 1: Table showing the division of respondents in terms of Age:

Age	Frequency	Percentage
Below 25	14	23.35%
25-35	26	43.3%
36-45	15	25%
46-55	2	3.3%
Above 55	3	5%
Total	60	100%

Table 1 shows the distribution of respondents by age group, with frequencies and percentages listed. The majority (43.3%) are aged 25-35, followed by 25% in the 36-45 range. Respondents under 25 make up 23.35%, while those aged 46-55 and 55+ represent 3.3% and 5%, respectively. The sample of 60 responders includes a broad range of age groups.

### 1.1 Employment Type of All Respondents

Table 2: Table showing Employment Type of All Respondents:

Employment	Frequency	Percentage
Permanent worker	35	58.3%
Contract labourer	25	41.7%
Total	60	100%

The distribution of respondents by type of employment is seen in this table. Of the 60 responders, 25 (41.7%) are contract laborers and 35 (58.3%) are permanent employees. The information sheds light on the makeup of the workforce in the population under study.

### 1.2 Distribution according to Primary Job Role of All Respondents

Table 5: Table showing the distribution according to Primary Job Role of All Respondents

Job Role	Frequency	Percentage
Machine operator	19	31.7%
Supervisor	18	30%
Maintenance staff	12	20%
Material handling	8	13.3%

Forklift Operator	3	5%
Total	60	100%

The distribution of all respondents by principal employment role is shown in Table 5. Machine operators make up the largest category of the 60 responders (31.7%), closely followed by supervisors (30%). Twenty percent of the responses are maintenance staff, and thirteen percent are in material handling positions. Forklift operators make up 5% of the sample as a whole, making them the smallest category. This distribution sheds light on how different occupational roles are represented in the research population.

### 1.3 Respondents' Perception of the Effectiveness of BBS Measures in Reducing Workplace Accidents

Table 9: Table showing distribution according to Respondents' Perception of the Effectiveness of BBS Measures in Reducing Workplace Accidents

	Frequency	Percentage
Strongly agree	25	41.7%
Agree	30	50%
Neutral	5	8.3%
Disagree	-	-
Total	60	100%

Table 9 shows the distribution of respondents' opinions on the effectiveness of behavioral-based safety (BBS) in reducing workplace accidents. Of the 60 respondents, 41.7% strongly agreed, and 50% agreed that BBS methods are effective. 8.3% were neutral, indicating uncertainty. Notably, no respondents doubted the efficacy of BBS, reflecting overall positive views on its impact on workplace safety.

### 1.4 Frequency of Observing Unsafe Behaviours Among Workers

Table 10: Table showing distribution according to Frequency of Observing Unsafe Behaviours Among Workers

	Frequency	Percentage
Daily	23	38.3%
Weekly	16	26.7%
Occasionally	7	11.7%
Rarely	6	10%
Never	8	13.3%
Total	60	100%

Table 10 shows the distribution of respondents based on how often they observe risky behaviors among employees. The majority (38.3%) report seeing risky behaviors daily, while 26.7% observe them weekly. Additionally, 10% see them infrequently, 11.7% occasionally, and 13.3% never notice any risky behaviors. This highlights the need for effective safety measures and interventions.

### 1.5 Respondents' Suggestions for Additional BBS Strategies

Table 19: Table showing Respondents' Suggestions for Additional BBS Strategies

	Frequency	Percentage
More safety training	35	58.3%
Better rewards for safe behaviour	23	38.3%
Stricter enforcement of safety rules	31	51.7%
More involvement from supervisors	17	28.3%
Others	2	3.3
Total	60	100%

The respondents' recommendations for enhancing Behavior-Based Safety (BBS) techniques in the workplace are summarized in the table. The most common suggestion, made by 58.3% of respondents, was "more safety training." The second most frequent recommendation, from 51.7% of respondents, was "stricter enforcement of safety rules." Other suggestions included "better rewards for safe behavior" (38.3%) and "more involvement from supervisors" (28.3%). Additionally, 3.3% proposed alternative tactics.

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## FINDINGS:

- The majority of respondents (43.3%) are aged 25–35, followed by 36–45 (25%), with a diverse age representation.
- Most respondents (58.3%) are permanent employees, while 41.7% are contract workers.
- The majority of respondents are Skilled workers dominate (70%), with no respondents identifying as unskilled.
- The majority of respondents are Machine operators (31.7%) and supervisors (30%) form the largest employment rolls.
- Most respondents (56.7%) attend monthly safety training, while 3.3% never receive training.
- The majority of respondents have Awareness of Behavioural Based Safety (BBS) principles is high (73.3%), with only 1.7% unfamiliar.
- The majority (91.7%) of respondents believe BBS practices reduce workplace accidents in an organization.
- The majority of respondents have observed Risky workplace behaviors that are frequently observed daily (38.3%) or weekly (26.7%) in a particular organization.
- The majority of respondent believed that Organizational support for reporting unsafe behavior is mixed, with 56.7% agreeing and 35% disagreeing.
- The majority of the respondents have believed and observed Fear of reporting incidents (60%) and inadequate training (56.7%) are major BBS challenges in an Industry.
- According to majority of respondents, Workplace safety has improved for 92% of respondents due to Behavioural Based Safety (BBS) programs.
- The majority of respondents have observed a high workplace accident rate (61.7%) was reported in the past year.
- The majority of respondents finds risky behavior (51.7%) is the leading cause of workplace accidents.
- More safety training (58.3%) and stricter enforcement (51.7%) are key recommended improvements.
- According to majority of respondents, Contract workers are perceived to be at higher risk than permanent employees.
- BBS practices are widely considered effective (83.3%), with no respondents rating them ineffective.

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## SUGGESTIONS:

- Future studies should use both qualitative and quantitative methods to assess behavioral-based safety (BBS) indicators, and conduct longitudinal research on the long-term effects of BBS interventions on workplace safety culture.
- Research should compare BBS implementation across different industries (manufacturing, construction, chemical processing) to identify sector-specific challenges and best practices.
- Studies should explore the role of organizational commitment, leadership, and psychological factors in the effectiveness of BBS programs, as well as the influence of safety training and incentive schemes.
- Future research should investigate the role of technology-driven safety measures (wearable gear, real-time monitoring, AI) and examine barriers to BBS implementation, including employee perceptions and cultural factors.

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## CONCLUSIONS:

Behavior-based safety (BBS) practices are crucial in industrial settings for promoting a culture of safety, reducing accidents, and enhancing worker well-being. When implemented effectively, BBS programs increase safety awareness, encourage adherence to safety protocols, and proactively reduce risks. Workers involved in regular safety training and participation in safety programs demonstrate higher levels of hazard recognition and adherence to safe practices. However, success depends on factors like management support, organized reporting channels, and leadership engagement.

Despite the positive outcomes, challenges such as inconsistent training, fear of retaliation, and lack of awareness can hinder the full effectiveness of BBS procedures. The study stresses the importance of continuous improvement in safety training, better communication, and fostering a no-blame culture to motivate workers. Ultimately, the success of BBS programs relies on consistent monitoring, training, and creating a shared responsibility for safety in the workplace.

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