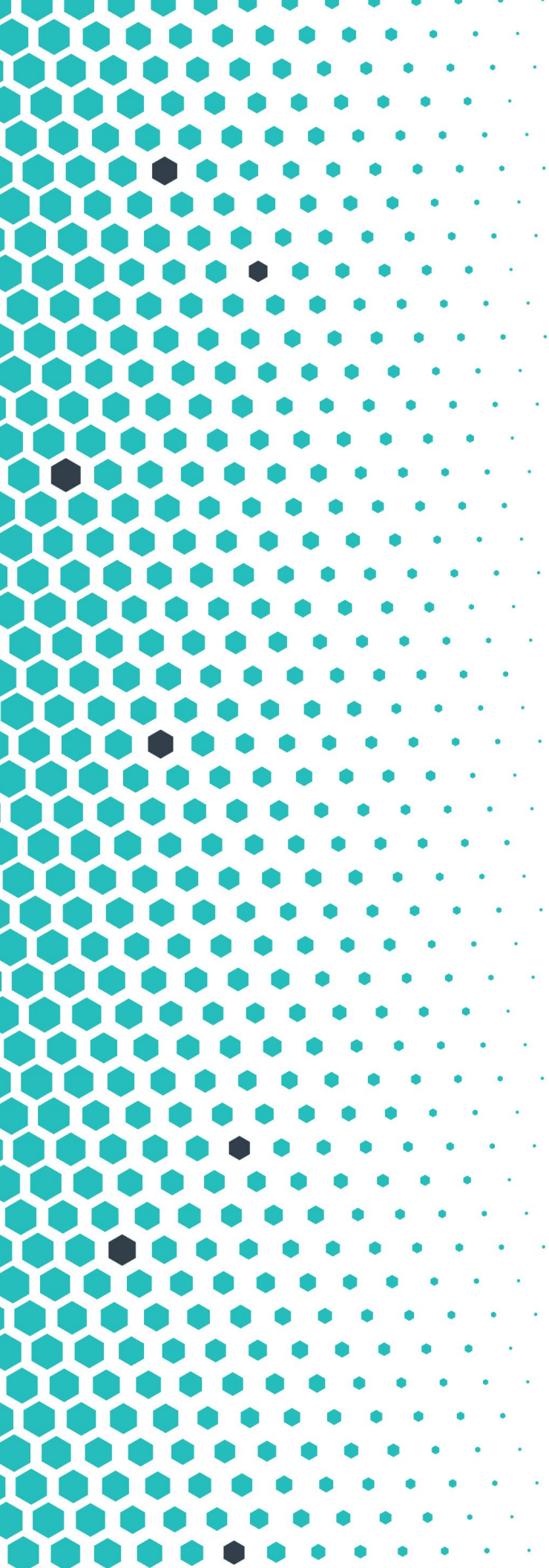

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Campbell Institute Research Outlook

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Measuring and Promoting Safety Culture

Interest in organizational safety culture as a contributing factor in workplace incidents grew exponentially after the Chernobyl nuclear disaster in 1986. Several agencies, including the International Atomic Energy Agency and Organization for Economic Cooperation and Development Nuclear Agency, cited "poor safety culture" as one of the main contributing factors for the worst nuclear power generation disaster in history (Wiegmann, Zhang, von Thaden, Sharma, & Gibbons, 2004). Since this landmark event, researchers and safety professionals have tried to identify which factors lead to positive safety culture, the tangible impact of safety culture on workplace incidents, and how to drive and promote safety culture throughout organizations. In this literature review, we will summarize the current literature on safety culture and safety climate and suggest recommendations for future areas of research based on existing gaps in the literature.

Defining Safety Culture

The concept of safety culture has gone through several definitional iterations, especially in conjunction with how it relates to safety climate. For the purposes of this literature review, we will use safety culture and safety climate somewhat interchangeably with a majority of the focus on how these concepts are similar. We will make special note, however, where safety culture and safety climate diverge and how that divergence can be important when deciding which types of safety culture programs or interventions to implement in the workplace.

In general, safety culture refers to an organization's shared values and beliefs about the importance of safety and how those values and beliefs interact within the broader organizational structure to create behavioral norms and guide decision-making (Aburumman, Newnam, & Fildes, 2019; Casey, Griffin, Harrison, & Neal, 2017; Reason, 1998). Safety culture is reflected not only in the tangible day-to-day operations of an organization, but is also embedded in the symbolic actions of its employees where there is a deeper understanding of an organization's commitment to safety as a core value (Guldenmund, 2000). In other words, organizations with positive safety culture express the value of safety from top to bottom in the organization and employees understand and respond to the culture.

Although different formal definitions of safety culture have been proposed over the past 20+ years, several commonalities tie the definitions together. One core feature is the idea that safety culture emphasizes contribution from all members of an organization, not just those in professional safety roles or employees on the front line (Eiff, 1999). Another feature of safety culture is the existence of the culture itself, regardless of being positive or negative, has an impact on employee behavior at work. Because safety culture is embedded into the fabric of the organization, employees are influenced by the culture's positive and negative qualities (Cooper, 2000). Safety culture is also highly reflected in an organization's ability and willingness to learn from workplace incidents and proactively work to avoid future incidents (Carroll, 1998). Finally, safety culture is a stable quality of a general organizational culture that is difficult to change. Because safety culture reflects the organizational commitment to safety as a whole, it often takes every level of an organizational structure to buy in to proposed changes that might improve safety culture. Therefore, employees often view safety culture as a relatively enduring quality of an organization (Wiegmann et al., 2004).

Despite some variation in the agreed upon definition of safety culture, safety climate as a concept has seen more traction in the published literature. Safety climate has many of the same qualities as safety

culture with some potentially important differences. Specifically, safety climate is defined as the perceptions of the state of safety at a particular time within an organization (Wiegmann et al., 2004). If safety culture represents the enduring values and beliefs regarding the importance of safety as a core value in an organization, then safety climate is a snapshot of how safety culture manifests itself at a specific moment within an organization (Cheyne, Cox, Oliver, & Tomas, 1998). Although safety culture is a stable, enduring trait of an organization, safety climate perceptions can change based on changes in environmental or other situational factors (Zohar, 1980). For example, an organization might display a positive safety climate when operations are running smoothly. However, if operations fall behind and employees experience higher production pressure, an organization's safety climate might weaken in an effort to catch up on operational demands. An employee might be asked to forgo scheduled maintenance on a piece of equipment to avoid production downtime or employees might be asked to work longer hours to meet production demands, potentially putting workers at greater risk of fatigue or overexertion. In these examples, a snapshot of the safety culture for the same organization might look different depending on whether operations were running on time or behind schedule.

Despite the situational differences in safety culture and safety climate, the terms are often used interchangeably in the literature (e.g., Griffin & Curcuruto, 2016). Changes in safety culture can influence safety climate and vice versa. Indeed most of the studies on assessing, measuring, and promoting safety culture within an organization have actually focused on changing safety climate, given that safety culture is more enduring and stable. Therefore, the portion of the review devoted to measurement is actually more reflective of safety climate than safety culture.

Operationalizing Safety Culture

Before one can measure safety culture or climate within an organization, it is important to consider which components within an organization foster positive safety culture. In other words, when it comes to measuring safety culture, which indicators should one examine and how is safety culture tangibly operationalized in an organization? Several key indicators of safety culture have been proposed (Flin, Mearns, O'Connor, & Bryden, 2000). At least five indicators, however, are outlined as important aspects of safety culture every organization should consider.

Perhaps the most important factor to consider for the promotion of a strong safety culture is the organizational commitment to safety from upper level management (Dedobbeleer & Beland, 1991; Zohar, 2000). Several studies have shown a connection between organizational leadership commitment to safety and positive safety outcomes in the workplace (Wiegmann et al., 2004). Specifically, organizational commitment refers to the level of demonstrated prioritization of safety as a core value of the entire organization. Importantly, the organizational commitment to safety is something that should be reflected in a positive attitude toward safety despite fluctuations in economic success or operational capacity. Upper level management exemplifies organizational commitment by promoting safety across all aspects of an organization regardless of changes in external factors or constraints. From a more tangible perspective, organizational commitment is demonstrated through constant evaluation and effort to improve safety in all aspects of operations such as equipment, training, and employee scheduling. Organizational commitment helps free up resources for the development and advancement of safety practices, which ultimately serve to protect all workers, regardless of job type or role within the organization (Eiff, 1999).

Closely related to organizational commitment is the idea of management involvement or buy-in as a means for promoting a strong safety culture. Middle management and direct frontline supervisors who

display a strong sense of concern for the safety and wellbeing of their supervisees help influence the extent to which employees adhere to operating rules and safety best practices (Wiegmann et al., 2004). Managers who are involved in the day-to-day operations, understand the safety risks of their supervisees, and are fully committed to advancing safety training enable employees to have open communication about current and future safety risks, which makes for a safer work environment (Eiff, 1999). Therefore, buy-in from the organization and day-to-day buy-in from the middle and frontline managers reinforces a solid framework for open communication and dialogue about safety issues up and down the organizational hierarchy.

Another key component of advancing safety culture within an organization is the empowerment of frontline employees. As the last line of defense against workplace incidents, frontline employees who feel empowered to make a difference in their organization through the promotion of safe operating procedures can significantly advance safety culture in an organization (Vecchio-Sadus & Griffiths, 2004). Supervisors and managers who instill in their employees a sense of ability and duty for promoting safety give frontline workers a voice in safety decisions so they do not feel like they are only receiving punishment for making mistakes (Wiegmann et al., 2004). Empowered employees have influence on achieving safety improvements and often hold themselves and their fellow workers accountable for unsafe actions. Importantly, frontline workers who feel empowered take pride in the safety record and accomplishments of their organization (Geller, 1994). Therefore, the more organizations can enable their employees to feel empowered and responsible for achieving safety goals, the stronger that organization's safety culture will be.

Another key piece of safety culture promotion is the consistency with which employees are incentivized for safe behaviors and disincentivized for unsafe behaviors. A critical component of any reward system is the fairness of the evaluation process for determining, in this context, what is a safe and unsafe behavior (Reason, 1990). Similarly, rewards and penalties also need to be applied consistently when a safe or unsafe, respectively, behavior occurs. In other words, safety culture is reflected in the way an organization maintains consistency in reinforcing and incentivizing safe behaviors and discourages unsafe behaviors (Wiegmann et al., 2004). An important aspect of this is employees must be aware of and understand the organizational process by which incentives are distributed. Strong safety culture is a reflection of consistency in the system and buy-in from the employees.

Related to reward systems, reporting systems are another critical piece of organizational practice that help advance strong safety culture. Reporting systems are essential for identifying flaws within an operational process that is critical for the promotion of a strong safety culture. Organizations can only learn and adapt from potential vulnerabilities if employees are willing, able, and encouraged to report relevant hazards, incidents, and near misses (Eiff, 1999). Importantly, employees must feel supported when it comes to reporting near misses or potential safety incidents without fear of retribution. In other words, employees are only incentivized to report relevant potential hazards when they understand that doing so helps promote a safer work environment for everyone. However, just reporting potential hazards is not enough to fully promote safety culture. Employees need to feel 1) their suggestions and reports are actually being considered by management, and 2) management is proactive in addressing the potential safety risks. Research on incident and near miss reporting suggests reporting is less likely when employees do not believe corrective action will be taken by management in response to the identified hazards (e.g., Williamsen, 2013). Therefore, reporting systems are important not only to give employees an avenue for communicating concerns to management, but for management to report back to employees how the issues are being addressed and mitigated.

Measuring and Assessing Safety Culture

There are several ways to measure safety culture within an organization. In general, an employer can use qualitative or quantitative methods or some combination of both. There are advantages and disadvantages to using both kinds of assessments. Qualitative methods provide the richest data from the point of the view of the specific employees. These data collection methods include employee observations, case studies, and focus groups (e.g., Wreathall, 1995). Importantly, with qualitative methods, the information is reported in the language of the employees, rather than in a prescribed language present in a questionnaire (Rousseau, 1990). Qualitative methods often allow for a much more nuanced and rich dataset compared to a simple survey. However, there are downsides to measuring safety culture only with qualitative methods, the biggest of which is the potential lack of portability of information from one department to another or from one worksite to another. The way in which one group of employees (either by department or by worksite) thinks and talks about safety culture might not be fully comparable to how another department or worksite thinks about safety culture. In other words, the qualitative responses are not standardized for comparison across sites or comparison and benchmarking with other organizations or across industry sectors (Wiegmann et al., 2004).

In contrast, quantitative methods allow for more structured and consistent assessment of safety culture based on the aspects of safety culture leadership is interested in measuring. Questionnaires and survey methods require more work up front in deciding which facets of safety culture to cover in the assessment. Analyzing, reporting, and comparing quantitative data, however, is simpler and more straightforward to be able to compare a specific reference or benchmark (Wiegmann et al., 2004). Quantitative methods are often cheaper and require less intensive effort than qualitative methods, so companies looking to assess safety culture on a shortened timeframe or small budget are potentially better served by using closed-ended surveys and questionnaires. Therefore, depending on the goals of the safety culture assessment, qualitative or quantitative or some combination of both types of assessment may be best.

Regardless of whether one uses qualitative or quantitative measures, there are a number of themes that should be considered when assessing safety culture. Many of these themes align with the operationalization of safety culture (e.g., management involvement) with some additional dimensions. The most commonly measured theme across various versions of safety culture and climate questionnaires is the perception of management attitudes toward safety (Flin et al., 2000). This form of management commitment can generally be thought of as how much employees perceive their managers to value safety and work toward promoting and supporting safety efforts (e.g., Christian, Bradley, Wallace, & Burke, 2009; Neal & Griffin, 2004). The actual items that measure management commitment can range from general perceptions of organizational support (e.g., Budworth, 1997) to actual management safety practices (e.g., Hayes, Perander, Smecko, & Trask, 1998) to perceptions of how managers communicate safety to their teams (e.g., Mearns, Flin, Fleming, & Gordon, 1997).

Another key theme that is often measured in safety culture surveys is employee perceptions of their organizations' safety management system (Flin et al., 2000). Safety management system attitudes are generally measured as the perceived quality of procedures, interventions, and policies aimed at improving safety outcomes for an organization (e.g., Christian et al., 2009). Employees are typically asked questions about their perceptions of how their organization conducts incident investigations, manages hazards, and implements safety procedures and policies (e.g., Borofsky & Smith, 1993). Employees who have negative opinions about their organization's safety management system will not possess a strong sense of safety culture.

An important key theme to measure when assessing safety culture is employee perceptions of actual risk in the workplace (Flin et al., 2000). There are several ways to measure the extent to which an employee believes their job to be dangerous, including measures of perceived job risk, perceived incident potential, perceived physical hazards, or general perceptions of job safety (Christian et al., 2009). As a note, measures of employee risk perception on their own are not necessarily a strong predictor of safety culture due to the reason that many workers in dangerous jobs can still feel their organization values safety. Therefore, there is not a strong link between individual risk perception and safety behavior (e.g., Cheyne et al., 1998).

The last theme typically considered in measures of safety culture is employee perception of work pressure (Flin et al., 2000). Although different definitions exist, work pressure is typically described as the extent to which an employee feels overwhelmed by their workload and forced in some capacity to work less safely than during operating procedures (Christian et al., 2009). Many organizational factors are tied to work pressure, including cost reduction, increased competition, and even organizational restructuring that can thin out the resources for a particular job (Flin et al., 2000). When time and resources are stretched thin, workers are more likely to take shortcuts and/or take on additional roles and tasks, which increases risk for injury (e.g., Mitropoulos, Abdelhamid, & Howell, 2005).

Despite there being several common themes associated with strong safety culture, how organizations measure and assess safety culture has varied over the years and across industries. Zohar (1980) developed one of the first widely used safety culture assessments that consisted of a 40-item questionnaire that measures dimensions like employee perception of their manager's safety attitudes and employee perceived importance of safety training. Similar questionnaires were developed by DeJoy and colleagues (1995) and other researchers (e.g., Gershon et al., 1995). More recently, researchers developed measures much shorter than the 30- to 40-item measures that were used for the first couple decades of safety culture research and assessment. For example, Hahn & Murphy (2008) developed a simple, 6-item global assessment of safety culture for organizations. The short questionnaire asks participants to report their agreement or disagreement on such items as, "I feel free to report safety violations where I work," and "Where I work, employees, supervisors, and managers work together to ensure the safest possible working conditions." Shorter questionnaires like this are useful for organizations who are trying to a get a quick snapshot of the global safety climate of their organizations. Employers can then do more in-depth investigation where there seem to be deficiencies in perceived safety culture.

Promoting Safety Culture

Many organizations are showing interest in implementing safety culture interventions to foster greater employee and leadership engagement in all aspects of safety. An important point to consider, however, is if there are more or less effective ways to administer safety culture interventions. Over the past several decades, researchers have examined the relationship between safety culture and actual safety behavior. Several meta-analyses of the published literature have demonstrated that stronger safety culture is correlated with safer employee behavior, greater employee safety compliance (e.g., Nahrgang, Morgeson, & Hofmann, 2011), and fewer workplace incidents (e.g., Beus, Payne, Bergman, & Arthur, 2010; Clarke, 2006). These summary studies include tens of thousands of workers from various industries and tested several different measures of safety culture and several different measures of safety behavior (see Casey et al., 2017 for a review of the meta-analytic studies).

Although the link between a strong safety culture and a safer workplace has been repeatedly demonstrated through correlational analyses, the question of whether safety culture can be actively promoted and strengthened within an organization is another important question to consider. Unfortunately, there are considerably fewer studies demonstrating effects of safety culture interventions compared to those which demonstrate the effects of a strong safety culture (Aburumman et al., 2019). Despite this limitation, there does seem to be a demonstrated ability for organizations to promote and advance safety culture within their organizations through several possible methods.

Approximately twenty studies have effectively tested safety culture interventions in the workplace and almost all of them have had success at improving and/or strengthening safety culture (Aburumman et al., 2019). The most frequently documented safety culture intervention involved creating opportunity for communication about safety through planned discussion and open dialogue meetings with employees (Lee, Huang, Cheung, & Chen, 2019). For example, one intervention study that used open dialogue and communication had workers observe their peers and provide feedback on the safety of their coworkers' behaviors and working conditions (Zuschlag, Ranney, & Coplen, 2016). In addition to the open feedback, they had workers and managers work together to identify and manage identified causes of risky behaviors and conditions and devise corrective actions to mitigate the identified risks. The company who implemented this intervention experienced an 80% drop in risky behavior over the course of two years along with demonstrable increases in safety culture scores (Zuschlag et al., 2016).

Almost half of the documented safety culture intervention techniques involved providing management with safety leadership training and development (Lee et al., 2019). For example, Mullen and Kelloway (2009) observed workers in the health care industry who received transformational leadership training, which was a half-day group-based training workshop for managers and supervisors. In the workshop, managers received lectures, engaged in group discussions, and developed goal setting skills related to transformational leadership. Managers were randomly assigned to either a general transformational leadership workshop, safety-specific transformational leadership workshop, or a control condition. Interestingly, there was no difference in safety culture outcomes between the two workshop groups, but both groups scored higher on measures of safety culture than the control condition (Mullen & Kelloway, 2009). These results and several others like them (e.g., Zohar, 2002; Zohar & Luria, 2003) suggest that addressing organizational and managerial aspects of work are crucial for advancing strong safety culture. As stated earlier, one of the key components of safety culture is leadership commitment and buy-in. Therefore, the more organizations can get their managers on board with valuing and prioritizing safety, the more likely it is for safety culture throughout the organization to increase.

Training interventions aimed at educating workers directly about safety culture and explaining the importance of modifying unsafe behaviors can also positively influence safety culture (Lee et al., 2019). In one study, workers were given an in-person training on issues related to safety culture in their organization (Pecillo, 2012). Workers were given information about the importance of observing and modifying unsafe behavior for themselves and for their co-workers to raise general awareness of unsafe behaviors in the workplace. After this formal training, employees and managers together worked to observe, identify, and register unsafe behaviors they encountered in the workplace. Debriefing meetings were held every few weeks to discuss the registered unsafe behavior and how to improve. Several measures of safety culture increased post-intervention including measures of safe behavior, safety as a core value, and perceived commitment to safety of leadership (Pecillo, 2012).

An important point to remember when evaluating safety culture interventions is that many safety culture interventions combine several different types of activities or techniques. For example, there was

only one documented safety culture intervention study that used only a single technique—training workers. The remaining studies used at least two or more interventions concurrently with many interventions focusing on five or more different types of safety culture activities (Lee et al., 2019). Other less frequently used intervention techniques included forming a health and safety committee (e.g., Nielsen, Carstensen, & Rasmussen, 2006), incentivizing good safety outcomes (e.g., Sparer, Catalano, Herrick, & Dennerlein, 2016), and creating working groups to address specific safety concerns (e.g., Rasmussen et al., 2006).

Because of the multifaceted approach of most safety culture interventions, it is difficult to isolate one single cause for improvements in safety culture. Instead, improvements in safety culture are more likely when several components are addressed with one or more interventions. Overall, the most effective safety culture interventions seem to involve the following elements: increasing the perceived importance of safety across all workers, increasing the commitment of leadership to promoting safety as a core value, and continuous behavioral monitoring (Aburumman et al., 2019). Safety culture is stronger when workers care about safety and, more importantly, care about the safety of their fellow co-workers. Additionally, safety culture is stronger when employees perceive complete buy-in from their leadership. When middle and upper management stress safety as a core value and actively work to mitigate identified safety risks in a workplace, employees feel empowered and encouraged to behave more safely.

Future Research

The bulk of the published literature on safety culture suggests that safety culture is an important dimension of overall workplace safety. Organizations with strong safety culture experienced fewer incidents, reduced unsafe behavior, and increased regulatory compliance (Nahrang et al., 2011). Promoting safety culture within an organization starts and ends with leadership. Without complete commitment from managers, workers will be less empowered and encouraged to engage in safe behaviors, especially in times of increased production pressure or economic downturns. Some questions do remain, however, that are important to consider in future research. For example:

> What are the long-term effects of safety culture interventions? What sustains improvement in safety culture?
>
> How do safety professionals and leadership convey the value of safety culture? What are some tangible ways in which organizational commitment is displayed and communicated?
>
> How can employee and leader engagement be leveraged as a safety driver?
>
> What other tools and strategies can be used to drive safety culture? How can we used safety culture as a leading indicator?

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