Changing Safety Attitudes Throughout a Career

Adam T. Biggs,[1] Todd R. Seech,[1] & Dale W. Russell[1,2]

[1] Commander, Naval Surface Force, US Pacific Fleet, Coronado, California, USA

[2] Department of Psychiatry, Uniformed Services University of the Health Sciences, Bethesda, Maryland, USA

Running Head: SAFETY ATTITUDES THROUGHOUT A CAREER

Please address all correspondence to:

Dale W. Russell
Commander, Naval Surface Force, U.S. Pacific Fleet
2841 Rendova Road, Coronado, CA 92155
240-330-0038
dale.w.russell1.civ@us.navy.mil

Author Note

 This work was funded by Commander, Naval Surface Forces. Neither the authors nor their family members have a financial interest in any commercial product, service, or organization providing financial support for this research. The views expressed herein are those of the authors and do not necessarily reflect the official policy or position of the Department of Defense, Department of the Navy, Uniformed Services University, nor the U.S. Government. The survey was approved by the Naval Medical Center Portsmouth Institutional Review Board (NMCP.2020.0051).

Abstract

Workplace safety attitudes are influenced by many factors. For example, one positive contributor involves affective commitment, or how much the individual feels attached to the organization. However, affective commitment and some related attitudes develop and change throughout a career. In turn, there is an opportunity to identify what safety-related attitudes are likely to change, thereby providing optimal target attitudes for safety interventions. The current study utilized a large sample (N>11,000) to conduct exploratory analyses that would identify the relationship of safety attitudes to safety climate while accounting for relative position in the organizational hierarchy. Additional analyses differentiated between the relative contributions of affective commitment and years of service to these changing attitudes. Specifically, both affective commitment and years of service significantly influenced the development of personal responsibility for safety. Higher feelings of commitment and more years of service independently related to higher adoption of personal responsibility for safety. Non-compliance similarly exhibited a relationship with both variables, but while the connection was much less robust, these attitudes varied greatly in their relationship to overall safety climate. Taken together, personal responsibility for safety and non-compliance attitudes represent two of the most prominent individual perceptions about safety that change across a career.

Keywords: Safety; Attitudes; Affective commitment; Naval; Military; Non-compliance

Workplace safety programs aim to prevent accidents in highly dynamic environments, and as such, there are many possible factors that could contribute to safety issues. For example, individual perceptions can contribute to the safety climate (Griffin & Curcuruto, 2016; Griffin & Neal, 2000; Hofmann, Burke, & Zohar, 2017), occupational demands can directly influence the safety climate (Rowen, Grabowski, & Russell, 2022), and some employee behaviors can undermine workplace safety—such as safety underreporting (Gilbey, Tani, & Tsui, 2016; Petitta, Probst, & Barbaranelli, 2017; Probst, 2015; Probst, Brubaker, & Barsotti, 2008; Probst & Estrada, 2010). These possible factors represent only a few of the relevant influences without even accounting for industry-specific issues. The common element, among this myriad of safety-related factors, is simply the diverse and multi-faceted array of potential contributing factors to the workplace safety climate.

Although many studies explore the impact of particular safety factors on a given scenario, the root cause of accidents and mishaps can begin long before an actual incident. Safety factors are not just dynamic in this sense, but cumulative and pervasive. Ideas such as normal accident theory (Hopkins, 1999; Perrow, 1984; Weick, 2004) explain how small issues cascade into larger problems given the context of complex, interconnected systems and involvement of humans-in-the-loop. One implication is to examine safety factors with long-term potential to influence outcomes. In particular, just as safety accidents can have long developing causes, worker attitudes can grow and change throughout their employment. After all, career stages have long-been known to influence attitudes and perceptions in the workplace (Hall; 1971; Cron & Slocum, 1986). However, attitudes over a career can invite many confounding variables that must be disentangled to identify root influences. Age is perhaps the most obvious confounding variable given that older workers tend to have different attitudes toward safety regulations (Gyekye &

Salminen, 2009; Siu, Phillips, & Leung, 2003), yet the key implication should be that many factors besides age can evolve throughout a career.

One important consideration is how individual attitudes toward safety change over time. Individual experiences can contribute to individual behaviors, but these experiences are also coupled with individual connection to the organization. Employees will likely develop some form of attachment to their organization if working in the same place long enough, and affective commitment has been linked positively to safety attitudes (Curcuruto & Griffin, 2018; Wang et al., 2022). Thus, individuals should be more likely to develop positive attitudes toward safety climate over time as they also develop a feeling of commitment to the organization. Even though this idea could apply to many different workplace environments, some particular industries can be especially disposed to strong affective commitment. Military service is a notable example where affective commitment and term of service can become inextricably linked (cf. Booth-Kewley, Dell'Acqua, & Thomsen, 2017; Fragoso, Chambel, & Castanheira, 2019; 2022a; 2022b). More specifically, servicemembers often integrate their military service deep into their personal identities, and in turn, military personnel provide an interesting population wherein to explore affective commitment and safety given the decades of service spent in a high-risk industry where safety is paramount.

The current study utilized a large ($N > 11,000$) cross-sectional dataset to explore differences in safety attitudes throughout a career. Although the cross-sectional nature of the data limits causal interpretations, there are several advantages to this approach. Longitudinal studies can be time consuming and expensive; given that naval military careers can exceed 20 years, these resource limitations become even more problematic. The cross-sectional nature of the study allows for an exploratory analysis to determine whether future longitudinal studies would

be feasible or meaningful without the same resource investment. Similarly, the large sample allows for an exceptional distribution across all sampled years of service from 1 to 25> years of military service.

Two core investigations questions are posed here. First, does the relationship with overall safety climate change for some variables as the individual progresses within the organizational hierarchy? Military populations are ideal for this question because the hierarchical structure remains nearly identical even while an employee shifts between units within the parent organization. Similar organizational structure then permits an exploration of the changing relationship of safety attitudes to the overall safety climate based on individual progression up the organizational hierarchy. Second, career progression typically presumes a simultaneous increase in affective commitment and years of service. The large sample allows these attitudes to be disentangled for their relative impact given the variety available in the diverse sample. Two key safety-related attitudes were given central focus in this study as they represent individual perceptions rather than organizational-dependent influences: *personal responsibility for safety,* which represented how much the individual believed that their actions directly contributed to the safety climate; and *non-compliance attitudes,* which represented how much an individual would be willing to ignore safety requirements in the pursuit of their duties. Taken together, the study goal involved assessing changes over time for safety-related attitudes as contributors to safety climate while also exploring the influence of affective commitment and years of service on individual attitudes.

Method

Sample and procedure. Data were drawn from the U.S. Navy Afloat Safety Climate Assessment Survey (ASCAS; Russell, Russell, & Lei, 2022). This survey tool was developed following several high-profile mishaps with the intent of exploring and ultimately enhancing the safety culture of naval operations. Surface warships are required to administer the ASCAS at set intervals, although participants retain the right of voluntary participation and anonymity. During distribution, the survey link is sent to work e-mails with the survey landing page representing the opportunity to receive informed consent and remind participants about their rights as human subjects in research. In particular, respondents are information that leadership would only receive aggregated data and that no punitive action would be incurred based on their survey responses. Although survey enrollment remains an ongoing process, these analyses examined data collected between November 2020 and October 2022.

A total of 26,704 individuals were invited to complete the survey; of those, 11,917 opted in. The majority of respondents were male (79.47%) and white (52.91%). and a sample that skewed young in age, as might be expected of a military population (median age range of 26-30: ages 17-21 had N=1,789; ages 22-25 had N=3,259; ages 26-30 had N=2,454; ages 31-35 had N=2,118; ages 36-40 had N=1,413; ages 41-45 had N=662; ages 46-50 had N=168; ages 51-55 had N=44; and, only 6 participants were aged years 56 or older).

Years of service was a key variable in this dataset. Although there are more participants with fewer years of service, the dataset did include a high volume of participants across all possible years of active-duty service: 1 year, N=1,745; 2 years, N=1,579; 3 years, N=1,506; 4 years, N=1,375; 5 years, N=840; 6 years, N=381; 7 years, N=206; 8 years, N=243; 9 years, N=385; 10 years, N=433; 11 years, N=363; 12 years, N=445; 13 years, N=327; 14 years, N=264; 15 years, N=248; 16 years, N=246; 17 years, N=215; 18 years, N=233; 19 years, N=215; 20

years, N=174; 21 years, N=116; 22 years, N=102; 23 years, N=77; 24 years, N=76; 25 years, N=67; and, greater than 25 years of service, N=119.

Measures. Safety climate measures included 9 distinct components: error management, which assessed the management and attitudes regarding errors in the organization (2 items, α = 0.77, van Dyck et al., 2005); no-blame error reporting, which measured organizational attitudes regarding anonymity and potential reprisal in error reporting (4 items, α = 0.72, Choo & Grabowski, 2018); psychological safety, which measured how comfortable the individual felt in speaking their thoughts and opinions (4 items, α = 0.83, Edmondson, 1999); supervisor safety climate, which rated the safety climate as created under their immediate supervisor (4 items, α = 0.92, Zohar & Luria, 2004); command safety practices, which rated general practices of the organization as pertaining to safety (4 items, α = 0.92, Lu & Tsai, 2008); group non-compliance, which measured crew attitudes toward established safety procedures (3 items, α = 0.92, Fogarty et al., 2018); individual non-compliance, which measured individual attitudes toward established safety procedures (3 items, α = 0.86, Fogarty et al., 2018); personal responsibility for safety, which measured the extent to which an individual believed that organizational safety depended upon their personal actions (4 items, α = 0.88, internally-developed measure); and, safety communication, which measures the opportunity to discuss safety issues within the organization (3 items, α = 0.91, Griffin & Neal, 2000). All safety climate items were measured on a 1-to-5 Likert-type scale.

Three additional measures were included to complete these analyses. First, paygrade measured relative position in the organizational hierarchy. These paygrades divided personnel into tier 1 (officers and chief warrant officers), tier 2 (E7-E9), tier 3 (E4-E6), and tier 4 (E1-E3), where tier 1 represented the highest levels of leadership in the organization and tier 4 represented

the lowest levels of leadership in the organization. Second, years of service asked participants to enter the number of years they have served as an active-duty member of the military. Third, affective commitment asked participants three questions about their current command, including whether they felt like "part of the family," "emotionally attached to the command," or if they felt a "strong sense of belonging" to the command. Affective commitment items were adapted from prior work (Allen & Meyer, 1990) with answers given on a 1-to-5 Likert scale ranging from strongly disagree to strongly agree. Higher scores indicated greater affective commitment to the command.

Statistical Analyses. Structural equation modeling (cf. Hoyle, 1995; Kline, 2011; MacCallum & Austin, 2000; McDonald & Ho, 2002) as conducted here used the *lavaan* software package. This statistical technique utilized several goodness-of-fit measures to determine model fit, including Chi-squared tests, Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI). For CFI and TLI, values greater than 0.90 would indicate adequate model fit. Model misfit was determined using root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR; Bentler, 1990; Hu & Bentler, 1999), and for these model misfit measures, inadequate model fit would be determined by values greater than 0.08. These structural equation modeling analyses utilized available recommendations and guidelines (Schreiber et al., 2006).

Linear regression analyses were conducted with IBM SPSS® Statistics 28 software. The analyses included correlations and linear regressions. Because some correlation was expected among affective commitment and years of service, collinearity was assessed through the variance inflation factor (VIF). Existing guidelines recommend values below 10.0 VIF as acceptable,

although it might be reasonable to accept VIF value even in excess of this point under the right circumstances (O'Brien, 2007).

Results

Safety Climate Differences by Paygrade

Analyses quantified the relative contribution to safety climate of 9 distinct variables (error management, no-blame error reporting, psychological safety, supervisor safety climate, command safety practices, group non-compliance, individual non-compliance, personal responsibility for safety, and safety communication) while accounting for paygrade (tier 1: officers, tier 2: E7-E9, tier 3: E4-E6, tier 4: E1-E3). See Figure 1. Overall, the model produced a χ^2 statistic of 6,109.67 ($df = 425$, $p < 0.001$). Additional information also supported observed model quality through good fit (CFI = 0.965, TLI = 0.962) and no issues related to model misfit (RMSEA = 0.041, SRMR = 0.046). Most factors contributed similarly to the safety climate across paygrades. However, there were notable differences when examining the relative relationship of non-compliance attitudes (see Figure 2). Both group non-compliance and individual non-compliance exhibited marginal or even non-significant relationships to safety climate at the lowest tiers of the organization. As individuals rose through the organizational hierarchy, compliance attitudes related much more strongly to the safety climate. A more positive safety climate was related to lower non-compliance attitudes at the higher levels of leadership. These findings indicate that non-compliance attitudes change the most in their relationship to the safety climate when considering position in the organizational hierarchy.

Safety Climate Contributors When Accounting for Affective Commitment and Years of Service

Linear regression analyses examined the relationship between safety attitudes and factors related to career progression (affective commitment to the organization, years of service, and the interaction between affective commitment and years of service). Two regression analyses were conducted on different dependent variables with the same independent variables, including the dependent variables of personal responsibility for safety and individual non-compliance. See Table 1 and Figure 3 for more information.

Regarding personal responsibility for safety, the regression model significantly predicted individual attitudes, Adj. $R^2 = .22$, $p < .001$, $F(3, 11{,}361) = 1{,}050.05$, $p < .001$. Both main factors contributed to the model as significant predictors (affective commitment: $\beta = .399$, $t = 31.27$, $p < .001$; years of service: $\beta = .274$, $t = 12.00$, $p < .001$). Increasing affective commitment and more years of service contributed to increased feelings of personal responsibility for the safety climate. Moreover, the interaction term was also significant, albeit as a negative predictor (interaction: $\beta = -.076$, $t = 2.89$, $p < .01$). Despite the relationship among the variables, VIF values remained reasonable at 7.55 for years of service and 2.36 for affective commitment. The interaction term was elevated (VIF = 10.05), although reasonable for being an interaction between the other variables.

Regarding individual non-compliance attitudes, the regression model again significantly predicted individual attitudes, albeit while accounting for much less of the overall variance, Adj. $R^2 = .04$, $p < .001$, $F(3, 11{,}283) = 151.48$, $p < .001$, although the effect size for non-compliance attitudes was reduced compared to the personal responsibility for safety. Both main factors contributed to the model as significant predictors (affective commitment: $\beta = -.087$, $t = 6.14$, $p < .001$; years of service: $\beta = -.084$, $t = 3.31$, $p < .001$). Increasing affective commitment reduced non-compliant attitudes toward safety, and years of service likewise reduced non-compliant

safety attitudes. The interaction term was also significant (interaction: $\beta = -.068$, $t = 2.34$, $p = .02$), albeit, unlike the prior regression, in the same direction as the other predictors. Collinearity factors (VIF) were nearly identical to the previous regression.

Discussion

Successful workplace operations depend upon occupational safety in any environment, but especially for high-risk industries (Bartone, & Barry, 2011; Stergiou-Kita et al., 2015). Naval operations in particular demand close attention to safety given the social and technological networks that encompass interdependent processes during ongoing operations (Hänninen, 2014; Zhang & Thai, 2016). Unfortunately, safety violations represent a persistent hazard in maritime operations despite substantial attention to the problem (Allianz, 2019; Antão & Soares, 2019; US Navy, 2017). There are many different factors which contribute to the safety climate, although for a military population, commitment to service has especially important implications. The current study demonstrated that experience and commitment have differential influences upon safety attitudes. Structural equation modeling indicated that most factors contribute similarly to the safety climate over a career, although non-compliance attitudes are most prone to change in their relative contribution. Specifically, non-compliance attitudes related more strongly to safety climate for higher tier leadership positions, where a more positive safety climate related to lower non-compliance attitudes. This example demonstrates how safety climate can also be subtly different for different levels of the organizational hierarchy. Additionally, personal responsibility and non-compliance attitudes depended upon both years of service and affective commitment. This outcome suggests that more positive safety attitudes depended both upon the experience of the individual and their personal connection to the organization.

The implications of these findings suggest that both personal responsibility for safety and non-compliance are malleable constructs over the course of a career. Because they can be changed, they represent ideal targets for interventions aimed at improving safety perceptions. Moreover, affective commitment represents an important tool not just for individual morale, but also for safety attitudes. Higher affective commitment produced deeper personal responsibility for safety and a greater willingness to comply with established safety standards. This outcome further suggests that nurturing a connection with the organization is not just a morale or team building issue, but one with tangible benefits to the safety climate. A challenge will be developing actions and activities intended to support developing a commitment to the organization.

Ultimately, affective commitment tends to grow throughout a career. This organizational connection makes sense given that those who enjoy employment at an organization are more likely to remain employed there rather than seek out opportunities elsewhere. Still, although commitment and experience grow concomitantly, they appear to have distinct influences on the development of safety attitudes throughout a career. Affective commitment and experience can foster personal responsibilities for safe conduct of operations, but the disparate influence on safety attitudes compared to non-compliance indicates that these influences are significant, but not universal. In turn, future longitudinal studies may hold the key to exploring the development of safety attitudes, which will prove critical in fostering an effective safety climate that minimizes risk in hazardous operating environments.

References

Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. Journal of occupational psychology, 63(1), 1-18.

Antão, P., & Soares, C. G. (2019). Analysis of the influence of human errors on the occurrence of coastal ship accidents in different wave conditions using Bayesian Belief Networks. Accident Analysis & Prevention, 133, 105262.

Bartone, P. T., & Barry, C. L. (2011). Leading for resilience in high risk occupations. Working in high risk environments: Developing sustained resilience, 125-141.

Bentler, P. M. (1990). Comparative fit indexes in structural models. Psychological bulletin, 107(2), 238-246.

Booth-Kewley, S., Dell'Acqua, R. G., & Thomsen, C. J. (2017). Factors affecting organizational commitment in Navy Corpsmen. Military Medicine, 182(7), e1794-e1800.

Cron, W. L., & Slocum Jr, J. W. (1986). The influence of career stages on salespeople's job attitudes, work perceptions, and performance. Journal of Marketing Research, 23(2), 119-129.

Curcuruto, M., & Griffin, M. A. (2018). Prosocial and proactive "safety citizenship behaviour"(SCB): The mediating role of affective commitment and psychological ownership. Safety science, 104, 29-38.

Fogarty, G. J., Cooper, R., & McMahon, S. (2018). A demands–resources view of safety climate in military aviation. Aviation Psychology and Applied Human Factors, 8(2), 76-85.

Fragoso, P., Chambel, M. J., & Castanheira, F. (2019). The high-performance work system and commitment of the Portuguese Navy personnel. Military Psychology, 31(3), 251-266.

Fragoso, P., Chambel, M. J., & Castanheira, F. (2022a). High-performance work systems (HPWS) and individual performance: The mediating role of commitment. Military Psychology, 34(4), 469-483.

Fragoso, P. J., Chambel, M. J., & Castanheira, F. (2022b). Commitment profiles: An analysis of the Portuguese navy officers. Military Behavioral Health, 10(3), 191-201.

Gilbey, A., Tani, K., & Tsui, W. H. K. (2016). Outcome knowledge and under-reporting of safety concerns in aviation. Applied Cognitive Psychology, 30(2), 141-151.

Griffin, M. A., & Curcuruto, M. (2016). Safety climate in organizations. Annual Review of Organizational Psychology and Organizational Behavior, 3, 191–212.

Griffin, M. A., & Neal, A. (2000). Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. Journal of Occupational Health Psychology, 5(3), 347–358

Gyekye, S. A., & Salminen, S. (2009). Age and workers' perceptions of workplace safety: A comparative study. The International Journal of Aging and Human Development, 68(2), 171-184.

Hall, D. T. (1971). A theoretical model of career subidentity development in organizational settings. Organizational Behavior and Human Performance, 6(1), 50-76.

Hänninen, M. (2014). Bayesian networks for maritime traffic accident prevention: Benefits and challenges. Accident Analysis & Prevention, 73, 305-312.

Hofmann, D. A., Burke, M. J., & Zohar, D. (2017). 100 years of occupational safety research: From basic protections and work analysis to a multilevel view of workplace safety and risk. Journal of Applied Psychology, 102(3), 375–388.

Hopkins, A. (1999). The limits of normal accident theory. Safety Science, 32(2), 93-102.

Hoyle, R. H. (1995). Structural equation modeling: Concepts, issues, and application. Thousand Oaks, CA: Sage Publications.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal, 6(1), 1-55.

Kline, R. (2011). Principles and practice of structural equation modeling. New York: Guilford Press.

MacCallum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. Annual Review of Psychology, 51, 201-226.

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation analyses. Psychological methods, 7(1), 64-82.

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. Quality & quantity, 41(5), 673-690.

Perrow, C. (1984). Normal accidents. New York: Basic Books.

Petitta, L., Probst, T. M., & Barbaranelli, C. (2017). Safety culture, moral disengagement, and accident underreporting. Journal of Business Ethics, 141(3), 489-504.

Probst, T. M. (2015). Organizational safety climate and supervisor safety enforcement: Multilevel explorations of the causes of accident underreporting. Journal of applied psychology, 100(6), 1899-1907.

Probst, T. M., Brubaker, T. L., & Barsotti, A. (2008). Organizational injury rate underreporting: the moderating effect of organizational safety climate. Journal of Applied Psychology, 93(5), 1147-1154.

Probst, T. M., & Estrada, A. X. (2010). Accident under-reporting among employees: Testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices. Accident analysis & prevention, 42(5), 1438-1444.

Rowen, A., Grabowski, M., & Russell, D. W. (2022). The impact of work demands and operational tempo on safety culture, motivation and perceived performance in safety critical systems. Safety science, 155, 105861.

Russell, D. W., Russell, C. A., & Lei, Z. (2022). Development and testing of a tool to measure the organizational safety climate aboard US Navy ships. Journal of safety research, 80, 293-301.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. The Journal of educational research, 99(6), 323-338.

Siu, O. L., Phillips, D. R., & Leung, T. W. (2003). Age differences in safety attitudes and safety performance in Hong Kong construction workers. Journal of Safety Research, 34(2), 199-205.

Stergiou-Kita, M., Mansfield, E., Bezo, R., Colantonio, A., Garritano, E., Lafrance, M., ... & Travers, K. (2015). Danger zone: Men, masculinity and occupational health and safety in high risk occupations. Safety science, 80, 213-220.

US Navy, 2017. Comprehensive review of surface force incidents. Norfolk, VA. http://s3.amazonaws.com/chinfo/comprehensive+review_final.pdf (Dec. 12, 2019).

Wang, D., Sheng, Z., Wang, X., Griffin, M. A., Zhang, Y., & Wang, Z. (2022). How team safety stressors affect proactive and prosocial safety behaviors: Felt safety responsibility and affective commitment as mediators. Safety science, 147, 105625.

Weick, K. E. (2004). Normal accident theory as frame, link, and provocation. Organization & Environment, 17(1), 27-31.

Zhang, G., & Thai, V. V. (2016). Expert elicitation and Bayesian Network modeling for shipping accidents: A literature review. Safety science, 87, 53-62.

Table 1. Summary statistics for the regression models predicting safety climate attitudes about personal responsibility for safety and non-compliance.

		Statistics	
Regression Model	*Adj. R^2*	β	*p*
Personal Responsibility for Safety	.22		
Affective Commitment		.399	< .001
Years of Service		.274	< .001
Interaction		-.076	< .01
Non-compliance	.04		
Affective Commitment		-.087	< .001
Years of Service		-.084	< .001
Interaction		-.068	.02

Tier 1 (Officers)	Tier 2 (E7-E9)	Tier 3 (E4-E6)	Tier 4 (E1-E3)
.805 (.768 to .842)	.821 (.777 to .864)	.831 (.811 to .850)	.841 (.808 to .873)
.772 (.729 to .815)	.698 (.634 to .762)	.770 (.746 to .793)	.779 (.732 to .826)
.843 (.811 to .875)	.834 (.798 to .869)	.833 (.816 to .849)	.802 (.765 to .839)
.701 (.661 to .740)	.720 (.678 to .761)	.628 (.604 to .652)	.699 (.657 to .740)
.825 (.797 to .853)	.828 (.793 to .864)	.797 (.780 to .814)	.824 (.794 to .855)
-.467 (-.521 to -.412)	-.539 (-.593 to -.485)	-.363 (-.397 to -.329)	-.252 (-.329 to -.175)
-.372 (-.432 to -.312)	-.308 (-.381 to -.234)	-.194 (-.231 to -.157)	-.033 (-.115 to .048)
.571 (.525 to .617)	.501 (.443 to .558)	.510 (.482 to .538)	.611 (.558 to .664)
.872 (.848 to .896)	.867 (.839 to .894)	.840 (.825 to .856)	.863 (.836 to .891)

Figure 1. Contributing measures to safety climate as reported across position in the organizational hierarchy. Values in parentheses represent the 95% confidence interval for the corresponding pathway. Values at the right are aligned with the safety climate measure to the left. For example, the first row provides values pertaining to error management, whereas the last row provides values pertaining to safety communication.

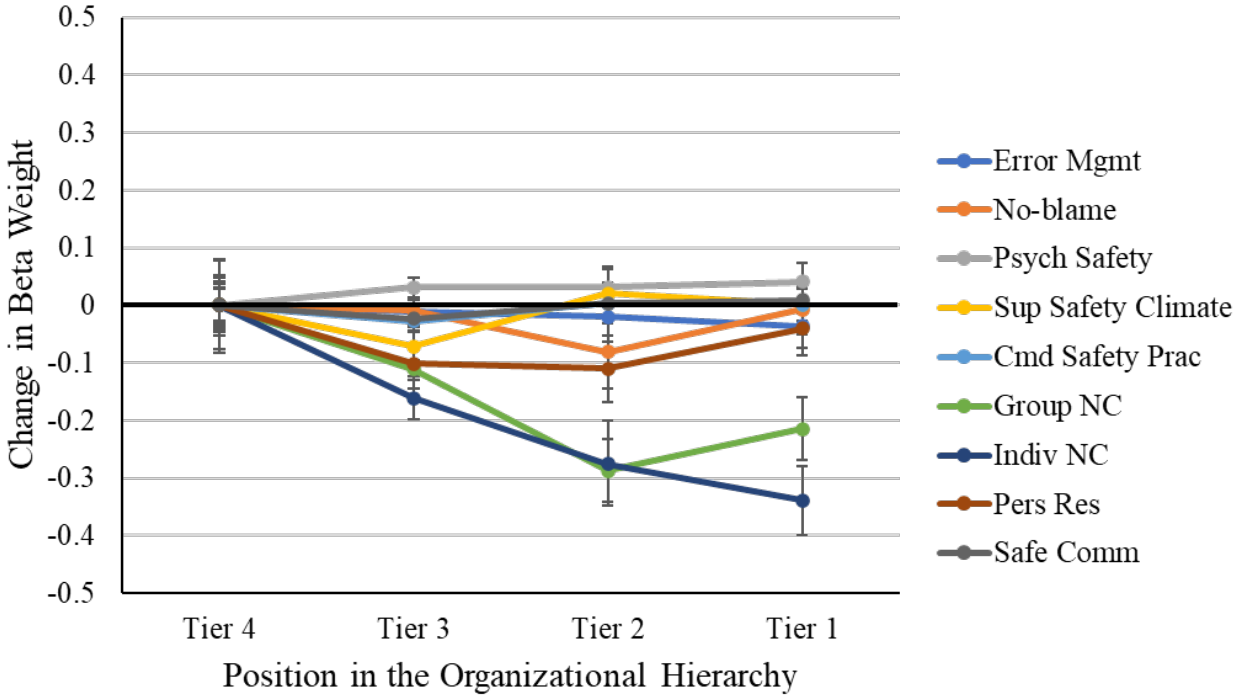

Figure 2. Relative change in beta weight values related to the safety climate as divided by position in the organizational hierarchy (using Tier 4 as the baseline) and corresponding contributing factor. Error Mgmt = error management, No-blame = No-blame error reporting, Psych Safety = psychological safety, Sup Safety Climate = supervisor safety climate, Cmd Safety Prac = command safety practices, Group NC = group non-compliance, Indiv NC = individual non-compliance, Pers Res = personal responsibility for safety, Safe Comm = safety communication.

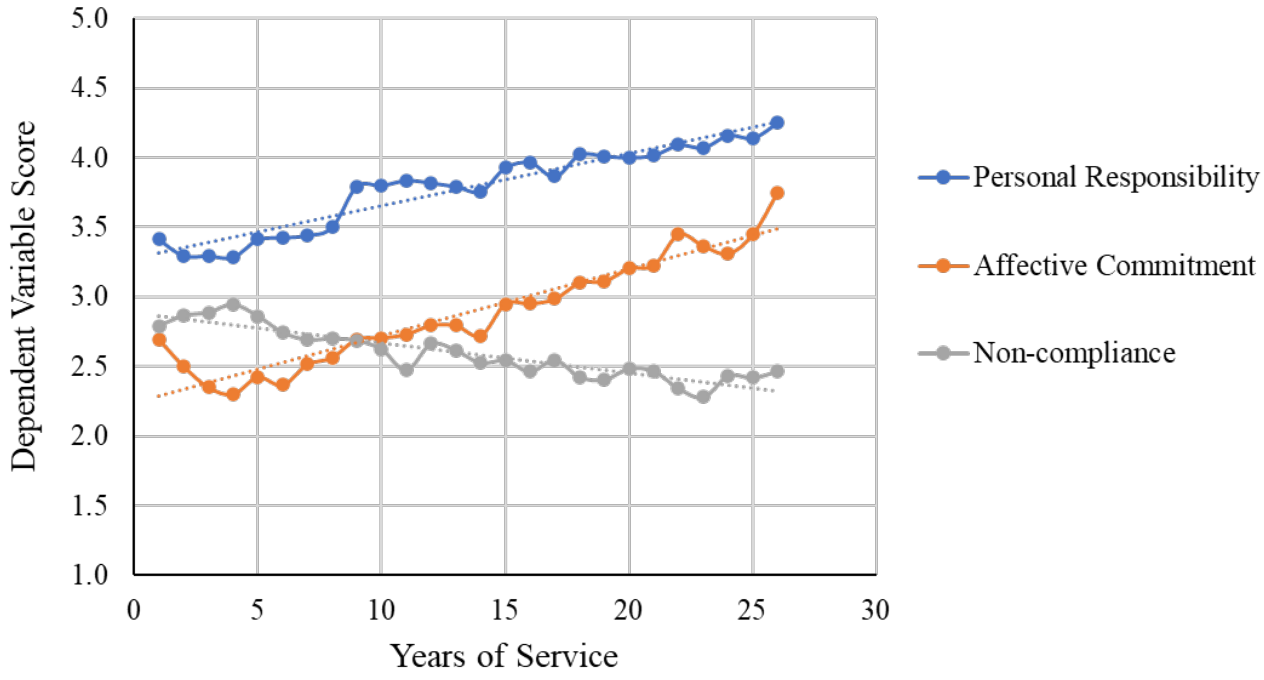

Figure 3. Overview of key variables included in this study (personal responsibility for safety in blue, affective commitment in orange, and attitudes toward non-compliance in grey) separated by years of service on the x-axis. Key variables were measured on Likert-type scales from 1 to 5, and values represent the average score across the questions asked. Dotted lines represent a linear trend fit to the data.