

Original Article

Safety Organizing Scale: Translation and validation in Greek

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Abstract

Background: Although the Safety Organizing Scale (SOS) has been translated and validated in several languages, there is no Greek version of the scale. **Aim:** To translate and validate the Safety Organizing Scale in Greek language. **Methods:** We employed the forward-backward method to translate and adapt the SOS in Greek language. In particular, two scholars translated the English version of the SOS in Greek, and then two other scholars back translated the Greek version in English. Another scholar overviewed the translation procedure solving any discrepancies. We examined the reliability of the SOS by calculating Cronbach's alpha. Also, we performed a test-retest study to examine the reliability of the SOS by calculating the intraclass correlation coefficient. We examined the construct validity of the SOS by performing confirmatory factor analysis. We examined the concurrent validity of the SOS using the Gaslighting at Work Scale (GWS). **Results:** We found that the SOS had very good reliability since intraclass correlation coefficient for the test-retest was 0.989 (95% confidence interval = 0.981 to 0.994, $p < 0.001$). Moreover, Cronbach's coefficient alpha for the SOS was 0.882. We found that the Greek version of the SOS had a one-factor structure as the original version. All indices indicated an acceptable one-factor model. In particular, χ^2/df was 4.435, RMSEA was 0.088, GFI was 0.964, AGFI was 0.910, TLI was 0.936, IFI was 0.968, NFI was 0.959, and CFI was 0.968. Concurrent validity of the Greek version of the SOS was very good since we found statistically significant correlation between the SOS and the GWS ($r = -0.222$, $p < 0.001$). **Conclusion:** The Greek version of the Safety Organizing Scale is a reliable and valid tool to measure safety culture in hospital nursing units.

Keywords: Safety Organizing Scale; Gaslighting at Work Scale; validation; Greek; validity; reliability

Introduction

Patient safety remains a central imperative for health systems because adverse events continue to contribute to preventable morbidity, mortality, and excess costs, and because the reliability of care emerges from how clinical teams organize their work in complex, dynamic conditions. Despite ongoing debate about the true frequency of medical errors and the extent to which they are preventable, it is widely acknowledged that such errors occur often and impose substantial human and financial costs on the healthcare system (Hayward & Hofer, 2001; Leape, 2000; McDonald et al., 2000; Thomas et al., 2000). In efforts to reduce these events and enhance patient safety, recent research increasingly points to systemic flaws in care delivery as the most productive targets for intervention (Leape et al., 1995). One widely endorsed strategy is the development of a culture of safety within healthcare organizations. A strong safety culture depends on continually gathering, analyzing, and disseminating information about errors, as well as proactively monitoring organizational performance indicators to detect risks before they lead to adverse outcomes (Cooper, 2000; Edmondson, 1996).

Recent research indicates that supportive leadership plays a crucial role in fostering safety cultures and promoting patient safety (Edmondson, 1996; Thomas et al., 2005). Emerging empirical evidence has also begun to demonstrate associations between safety culture, medical error rates, and even patient mortality (Naveh et al., 2005). Although these findings are valuable, they primarily provide indirect insight into how safety culture contributes to reducing medical errors. The absence of tools that directly measure the

specific behaviors underlying a strong safety culture limits our ability to understand the precise pathways through which leadership and other interventions reduce errors. Consequently, it becomes difficult to design interventions that reliably activate the team behaviors necessary to lower the likelihood of adverse events.

The Safety Organizing Scale (SOS) operationalizes these behaviors in a concise, 9-item instrument. In the original multicenter validation across 1685 nurses and 125 hospital units, the SOS showed a unidimensional structure, strong internal consistency, and criterion-related validity, with higher unit-level SOS scores predicting fewer reported medication errors and patient falls over the following six months. This established the SOS as a pragmatic, behaviorally anchored indicator of team safety organizing with direct relevance to outcomes and improvement (Vogus & Sutcliffe, 2007).

Evidence since the initial study supports the generalizability of the scale across care settings and cultures. A nursing-home adaptation demonstrated robust internal structure and high reliability in a study of 627 staff members spanning 13 facilities, indicating that the underlying construct of safety organizing is not limited to acute care (Dietmar Ausserhofer et al., 2013). In parallel, multilingual European validations (German, French, Italian) in a large Swiss sample (n=1633; 35 hospitals) confirmed content validity, acceptable model fit, and reliability, and associated higher SOS scores with lower nurse-reported medication errors, reinforcing cross-cultural construct and concurrent validity (D. Ausserhofer et al., 2013).

Despite this international trajectory, there is no validated Greek version of the SOS. The absence of a linguistically and culturally adapted instrument constrains safety research and quality-improvement efforts in Greek healthcare organizations, where distinctive interprofessional communication norms, organizational arrangements, and resource contexts may shape how safety organizing is enacted.

This study translates and culturally adapts the SOS into Greek and evaluates its psychometric properties—including internal consistency, factorial validity via confirmatory factor analysis, and construct/concurrent validity—drawing on best practices demonstrated in prior SOS validations across hospital and long-term care contexts as well as across European languages. Delivering a conceptually equivalent and reliable Greek SOS will furnish researchers and leaders with a brief, actionable measure to assess and strengthen team safety behaviors in Greek clinical settings. In this context, we translated and validated the Safety Organizing Scale in a sample of nurses in Greece.

Methods

Study design: Study population included 448 nurses in Greece. We performed our study during July 2025. We employed the forward-backward method to translate and adapt the SOS in Greek language (Galanis, 2019). In particular, two scholars translated the English version of the SOS in Greek, and then two other scholars back translated the Greek version in English. Another scholar overviewed the translation procedure solving any discrepancies. We examined the reliability of the SOS by calculating Cronbach's alpha. Cronbach's alpha higher than 0.6 indicates acceptable internal reliability. Also, we

performed a test-retest study to examine the reliability of the SOS by calculating the intraclass correlation coefficient. We examined the construct validity of the SOS by performing confirmatory factor analysis (Galanis, 2013). We examined the concurrent validity of the SOS using the Gaslighting at Work Scale (GWS) (Aglaia Katsiroumpa et al., 2025; A Katsiroumpa et al., 2025; Moisoglou, Katsiroumpa, Konstantakopoulou, Mangoulia, et al., 2025; Moisoglou, Katsiroumpa, Konstantakopoulou, Papathanasiou, Katsapi, et al., 2025; Moisoglou, Katsiroumpa, Konstantakopoulou, Papathanasiou, Prasini, et al., 2025).

Ethical considerations: We applied the guidelines of the Declaration of Helsinki to perform this study (World Medical Association, 2013). Additionally, the study protocol was approved by the Ethics Committee of Faculty of Nursing, National and Kapodistrian University of Athens (protocol approval #55, June 23, 2025).

Statistical analysis: We performed confirmatory factor analysis (CFA) to examine the construct validity of the SOS. In particular, we calculated chi-square/degree of freedom (χ^2/df); root mean square error of approximation (RMSEA); goodness of fit index (GFI); adjusted goodness of fit index (AGFI); Tucker–Lewis index (TLI); incremental fit index (IFI); normed fit index (NFI); comparative fit index (CFI) (Baumgartner & Homburg, 1996; Hu & Bentler, 1998). Acceptable value for χ^2/df is <5 , for RMSEA is <0.10 , and for all other measures in the CFA >0.90 . We used the AMOS version 21 (Amos Development Corporation, 2018) to conduct the CFA. We calculated Pearson's correlation coefficient between the SOS and the GWS. Also, we calculated intraclass correlation coefficients

between the two SOS measurements in test-retest study. P-values less than 0.05 were considered as statistically significant. We used the IBM SPSS 28.0 (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp) for the analysis.

Results

Study population included 448 nurses. Among them, 87.3% (n=391) were females and 12.7% (n=57) were males. Mean age of our sample was 38.0 years (standard deviation; 10.3).

We found that the SOS had very good reliability since intraclass correlation coefficient for the test-retest was 0.989 (95% confidence interval = 0.981 to 0.994, $p < 0.001$). Moreover, Cronbach's coefficient alpha for the SOS was 0.882.

We found that the Greek version of the SOS had a one-factor structure as the original version. All indices indicated an acceptable one-factor model (Figure 1). In particular, χ^2/df was 4.435, RMSEA was 0.088, GFI was 0.964, AGFI was 0.910, TLI was 0.936, IFI was 0.968, NFI was 0.959, and CFI was 0.968. Moreover, standardized regression weights for the six items ranged from 0.58 to 0.89.

Concurrent validity of the Greek version of the SOS was very good since we found statistically significant correlation between the SOS and the

Discussion

Our findings demonstrate that the Greek version of the SOS exhibits strong psychometric properties, including high internal consistency and robust construct validity. These results align closely with the psychometric performance reported in the original development of the scale by Vogus and Sutcliffe, where the SOS showed a

unidimensional factor structure, strong internal reliability, and predictive associations with reduced medication errors and patient falls.

Consistent with prior studies conducted in diverse healthcare environments, our results further reinforce the conceptual stability and cross-cultural applicability of safety organizing as a measurable construct. For example, the scale's nursing-home adaptation also demonstrated excellent internal structure and reliability-comparable to the reliability indices observed in the current study-suggesting that the behavioral foundations of mindful safety organizing transcend care setting and workforce composition. Similar findings were reported in multilingual European validations (German, French, Italian), where the SOS maintained strong content validity, favorable model fit indices, and meaningful associations with nurse-reported safety outcomes, including fewer medication errors. This convergence of evidence across languages and systems strengthens confidence in the construct validity of the Greek version.

Importantly, the high reliability and validity found in our sample underscore that Greek healthcare teams exhibit observable patterns of safety organizing behaviors aligned with those documented internationally. This is particularly relevant given the growing recognition that improving patient safety depends on strengthening collective mindfulness and team-level organizing behaviors rather than focusing solely on individual performance.

Despite the strengths of this study, several limitations should be acknowledged. Our sample may not fully represent all Greek healthcare settings, and further testing across hospitals with varying structures, specialties, and organizational climates is warranted.

Although strong reliability and validity were established, future research should examine the predictive validity of the Greek SOS by linking scores to objective safety outcomes such as incident reports, medication-error rates, or patient-fall metrics, echoing the methodology of the original SOS validation work.

Overall, this study provides foundational evidence that the Greek version of the Safety Organizing Scale is a reliable and valid measure of safety-relevant team behaviors. By enabling systematic assessment of safety organizing, the instrument offers significant potential to advance patient-safety research and guide targeted interventions within Greek healthcare organizations.

WS ($r = -0.222, p < 0.001$).

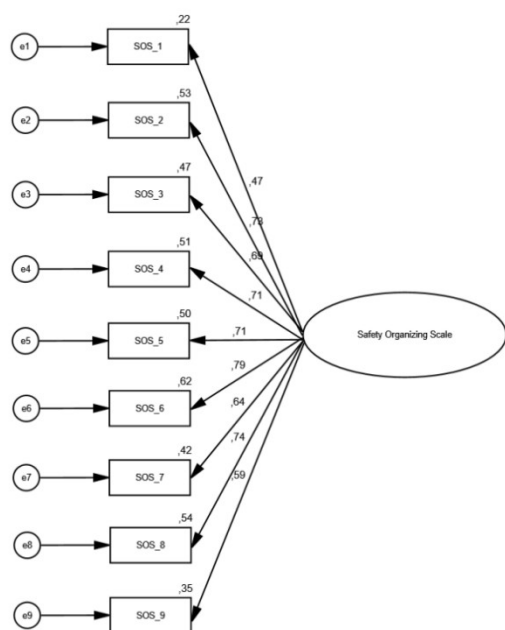


Figure 1. Confirmatory factor analysis for the Greek version of the Safety Organizing Scale.

References

Ausserhofer, Dietmar, Anderson, R. A., Colón-Emeric, C., & Schwendimann, R. (2013). First evidence on the validity and reliability of

the Safety Organizing Scale-Nursing Home version (SOS-NH). *Journal of the American Medical Directors Association*, 14(8), 616–622.

Ausserhofer, D., Schubert, M., Blegen, M., De Geest, S., & Schwendimann, R. (2013). Validity and reliability on three European language versions of the Safety Organizing Scale. *International Journal for Quality in Health Care*, 25(2), 157–166.

Baumgartner, H., & Homburg, C. (1996). Applications of structural equation modeling in marketing and consumer research: A review. *International Journal of Research in Marketing*, 13(2), 139–161.

Cooper, MD. (2000). Towards a model of safety culture. *Safety Science*, 36(2), 111–136.

Edmondson, A. C. (1996). Learning from Mistakes is Easier Said Than Done: Group and Organizational Influences on the Detection and Correction of Human Error. *The Journal of Applied Behavioral Science*, 32(1), 5–28.

Galanis, P. (2013). Validity and reliability of questionnaires in epidemiological studies. *Arch Hellen Med*, 30(1), 97–110.

Galanis, P. (2019). Translation and cross-cultural adaptation methodology for questionnaires in languages other than Greek. *Arch Hellen Med*, 36(1), 124–135.

Hayward, R. A., & Hofer, T. P. (2001). Estimating hospital deaths due to medical errors: Preventability is in the eye of the reviewer. *JAMA*, 286(4), 415–420.

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods*, 3(4), 424–453.

Katsiroumpa, Aglaia, Moisoglou, I., Konstantakopoulou, O., Tsiachri, M., Kolisiati, A., & Galanis, P. (2025). The gaslighting at work scale: Development and

- initial validation. *Journal of Workplace Behavioral Health*, 1–23.
- Katsiroumpa, A., Moisoglou, I., Tsiachri, M., Lamprakopoulou, K., Galani, O., Tsakalaki, A., & Galanis, P. (2025). Gaslighting at work scale: Determination of an optimal cut-off point. *International Journal of Caring Sciences*, 18(2), 614–621.
- Leape, L. L. (2000). Institute of Medicine medical error figures are not exaggerated. *JAMA*, 284(1), 95–97.
- Leape, L. L., Bates, D. W., Cullen, D. J., Cooper, J., Demonaco, H. J., Gallivan, T., Hallisey, R., Ives, J., Laird, N., & Laffel, G. (1995). Systems analysis of adverse drug events. ADE Prevention Study Group. *JAMA*, 274(1), 35–43.
- McDonald, C. J., Weiner, M., & Hui, S. L. (2000). Deaths due to medical errors are exaggerated in Institute of Medicine report. *JAMA*, 284(1), 93–95. <https://doi.org/10.1001/jama.284.1.93>
- Moisoglou, I., Katsiroumpa, A., Konstantakopoulou, O., Mangoulia, P., Tsiachri, M., Koinis, A., Kyriakatis, G. M., & Galanis, P. (2025). Workplace Gaslighting: Implications for Employees' Mental Health and Work Life in Greece. *Healthcare*, 13(24), 3255.
- Moisoglou, I., Katsiroumpa, A., Konstantakopoulou, O., Papathanasiou, I. V., Katsapi, A., Prasini, I., Chatzi, M., & Galanis, P. (2025). Workplace Gaslighting Is Associated with Nurses' Job Burnout and Turnover Intention in Greece. *Healthcare*, 13(13), 1574.
- Moisoglou, I., Katsiroumpa, A., Konstantakopoulou, O., Papathanasiou, I. V., Prasini, I., Rekleiti, M., & Galanis, P. (2025). Resilience Protects Nurses from Workplace Gaslighting and Quiet Quitting, and Improves Their Work Engagement: A Cross-Sectional Study in Greece. *Healthcare*, 13(16), 2064.
- Naveh, E., Katz-Navon, T., & Stern, Z. (2005). Treatment Errors in Healthcare: A Safety Climate Approach. *Management Science*, 51(6), 948–960.
- Thomas, E. J., Sexton, J. B., Neilands, T. B., Frankel, A., & Helmreich, R. L. (2005). The effect of executive walk rounds on nurse safety climate attitudes: A randomized trial of clinical units[ISRCTN85147255] [corrected]. *BMC Health Services Research*, 5(1), 28.
- Thomas, E. J., Studdert, D. M., Burstin, H. R., Orav, E. J., Zeena, T., Williams, E. J., Howard, K. M., Weiler, P. C., & Brennan, T. A. (2000). Incidence and types of adverse events and negligent care in Utah and Colorado. *Medical Care*, 38(3), 261–271.
- Vogus, T. J., & Sutcliffe, K. M. (2007). The Safety Organizing Scale: Development and validation of a behavioral measure of safety culture in hospital nursing units. *Medical Care*, 45(1), 46–54.
- World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *JAMA*, 310(20), 2191.