


RESEARCH

Open Access



The effect of transformational leadership on nurses' innovative behaviors: the mediating effect of psychological empowerment

Gülfer Bektaş¹ , Birsen Özcan Ünal^{1*}  and Mustafa Nal^{2*} 

Abstract

Background To increase the value of the nursing profession on a global scale, creating environments that support innovative behaviors and determining the factors that encourage innovative behaviors are of critical importance. The aim of this study is to investigate the relationship between transformational leadership and innovative behavior of nurses and the mediating role of psychological empowerment in this relationship.

Methods This study was conducted using a descriptive and cross-sectional design within the framework of quantitative research methods. The study was conducted in four private hospitals affiliated with a health institution in Türkiye. The study group consisted of a sample group of 317 nurses in total. The collected data were analyzed with Structural Equation Modeling (SEM) using Jamovi 2.4.11 statistical software.

Results The results showed that transformational leadership was positively and significantly related to psychological empowerment and innovative behavior ($p < 0.001$). There was a positive relationship between psychological empowerment and innovative behavior ($\beta = 0.406, p < 0.001$). Psychological empowerment had a positive mediating effect on the relationship between transformational leadership and innovative behavior ($\beta = 0.291, p < 0.001$).

Conclusions This study examined the effect of transformational leadership on innovative work behaviors and the role of psychological empowerment in mediating this relationship. The findings show that transformational leadership positively affects nurses' innovative work behaviors, and this effect is strengthened through psychological empowerment.

Clinical trial number Clinical trial number: not applicable.

Key points

- Transformational leadership can increase nurses' innovative behavior.
- Transformational leadership can increase psychological empowerment behavior.

*Correspondence:
Birsen Özcan Ünal
birsen_ozcan@hotmail.com
Mustafa Nal
mustafa.nal@ksbu.edu.tr

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

- Psychological empowerment can increase nurses' innovative behavior.
- Psychological empowerment can have a mediating role in the effect of transformational leadership on nurses' innovative behavior.

Keywords Nurses' innovative behaviors, Psychological empowerment, Transformational leadership

Introduction

Today, human resources have become one of the most important resources for organizations. To meet the demand for healthcare services, encouraging innovation in nursing has become an important strategy [1]. Because nurses play a patient-centered role, interacting frequently and directly with patients, they are in an important position in developing creative and innovative solutions in healthcare services [2]. It holds great potential to address health problems and increase access to services, but nurse entrepreneurs are not yet fully integrated into innovation processes [3]. Innovative behaviors contribute to sustainability by providing a competitive advantage to organizations and supporting organizational growth and success [4, 5]. Innovative behavior is “defined as the process of generating, creating, evaluating, and implementing creative ideas that can be reflected in research, management, education, clinical practice, and other aspects” [6]. The paradigm shift in healthcare services towards individual focus, quality, and efficiency has made nurses an important actor in developing innovation and improving patient and organizational outcomes [7–9]. The “ANA Enterprise 2023–2025 Strategic Plan” announced by the American Nursing Association aims to elevate the nursing profession at a global level; to lead the improvement in health through innovation, advocacy, equality and philanthropy, to promote standards of excellence with exemplary practices and work environments, and to increase the value of nursing by making its impact on health and society visible [10]. To achieve this goal, it is extremely important to determine the factors that increase the innovative behavior of nurses and to create work environments that support innovative behavior. When previous studies were examined, several factors were found to positively influence nurses' innovative behavior. For example, Wang et al. (2025) highlighted the role of information literacy and evidence-based nursing competence [11], while Kotb et al. (2024) emphasized the importance of psychological capital [12]. Similarly, Abdelwahab Ibrahim El-Sayed et al. (2024) identified collaborative leadership as a significant factor [9], and Pierre et al. (2024) demonstrated the impact of managers' proactive behavior [13]. Furthermore, Cheng et al. (2024) showed that both leader–member exchange and team–member exchange contribute positively [14], and Gabay et al. (2025) pointed to the influence of an innovative organizational environment [15].

Transformational leadership includes behavioral dimensions such as inspirational motivation, idealized influence, intellectual stimulation, and individualized consideration; these dimensions include creating a vision, influencing with charisma, encouraging innovation, and providing individual support to followers [16]. Many studies have shown that transformational leadership is one of the most effective approaches in promoting a variety of positive outcomes compared to other leadership styles [17].

“Psychological empowerment is a type of intrinsic motivation that reflects employees' involvement and perception of control in their work; it emerges in four dimensions: meaning, competence, self-determination, and impact” [18]. Psychological empowerment of nurses contributes to reducing occupational stress and burnout levels; this is a fundamental element that supports them to provide more effective, dedicated and quality service in patient care [19, 20]. Considering the decisive effect of psychological empowerment on the professional performance of nurses, it is of great importance to examine in depth the factors affecting this process and to implement strategies that will promote empowerment. Recent studies have shown that ethical leadership, as demonstrated by Wang et al. (2024) [21], authentic leadership, as discussed by Deng et al. (2023) [17], and transformational leadership, as examined by Ibrahim et al. (2024) [22], contribute to the psychological empowerment of nurses. In the present study, the authors investigate the effect of nurses' perceptions of transformational leadership on their innovative behaviors and examine the mediating role of staff empowerment in this relationship. However, limited studies are exploring the effects of transformational leadership on nurses' innovative behaviors [23–25]. Furthermore, to our knowledge, there is no research examining the mediating role of employee empowerment in this relationship. This study aims to fill an important gap in this area where existing research is limited.

The following questions are addressed:

- Q1. Does transformational leadership affect psychological empowerment?
- Q2. Does transformational leadership affect innovative behavior?
- Q3. Does psychological empowerment affect innovative behavior?

Q4. Does psychological empowerment have a mediating role in the relationship between transformational leadership and innovative behavior?

The model developed to answer the research questions is shown in Fig. 1.

Methodology

Study design

This study was designed as a descriptive and cross-sectional study. It was conducted on clinical nurses in four private hospitals in Istanbul, Turkey. A total of 1107 nurses work in these hospitals. These four hospitals were selected based on specific criteria, including geographical location, hospital volume, and data accessibility. The number of nurses working in these hospitals is 107, 133, 359, and 508. The sample size was determined as 286, with a 5% margin of error, a 95% confidence interval, and a universe size of 1107. A total of 325 participants were surveyed using the convenience sampling method. However, 8 participants were excluded due to missing data. Participants filled out the surveys independently without any intervention from the researcher. The inclusion criteria for the study were being a nurse, working in this hospital for at least one year, and voluntarily agreeing to participate in the study. Those who did not meet these criteria were excluded. Participants were informed that their participation in the study was voluntary and anonymous and that their data would be kept confidential. The study was designed and reported in accordance with the relevant articles of the STROBE guideline.

Data collection tools

Data collection tools consist of personal information form, transformational leadership scale, innovative behavior scale, and personnel empowerment scale.

Personal information form

The personal information form includes participants' gender, age, marital status, education level and years of work.

Transformational leadership scale

This scale was developed by Dönmez et al. (2024) [26] and adapted for healthcare professionals by Türk and Kumru (2021) [27]. It comprises 19 items and is a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). In this study, the reliability Cronbach's Alpha (CA) value of the scale was found to be 0.97.

Innovative behavior scale

To measure the innovative behavior of the participants, 5 statements belonging to the innovative behavior dimension, a sub-dimension of the Intrapreneurship Scale developed by Lumpkin et al., (1996) and adapted to Turkish by Şeşen (2010), were used [28, 29]. The scale is used in a 5-point Likert format (1 = never, 5 = always). The CA value of the scale in this study was found to be 0.84 (Table 2).

Personnel empowerment scale

This scale was developed by Lin (2002) and adapted to Turkish by Altay et al., (2019) [30, 31]. There are 19 statements in the scale. The scale is a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). In this study, the CA value of the scale was found to be 0.94 (Table 2).

Data analysis

Jamovi 2.4.11 software was used to analyze the data [32]. To test normality, skewness and kurtosis values were examined. The skewness and kurtosis values of the variables were between -1.5 and +1.5, and this result confirmed that the variables showed normal distribution [33]. Cronbach's Alpha (CA) value was used to test the internal consistency of the scales. The Cronbach alpha value of the scales was greater than 0.80 and the results showed that the scales were highly reliable [34].

Structural Equation Modeling (SEM) was used for hypothesis testing. SEM analysis comprehensively tests the relationship between variables in the entire model. It also provides information about the validity of the research model [35]. SEM was conducted using JAMM: Jamovi Advanced Mediation Models as suggested by [36].

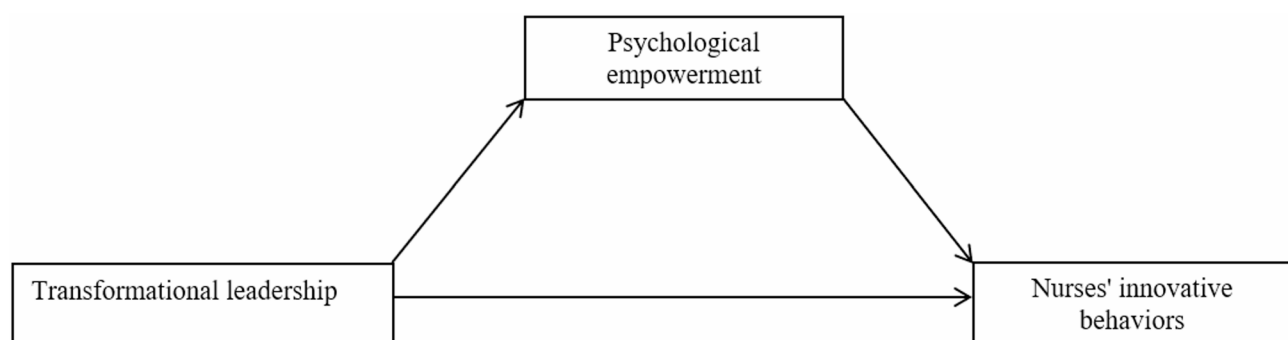


Fig. 1 Proposed theoretical model

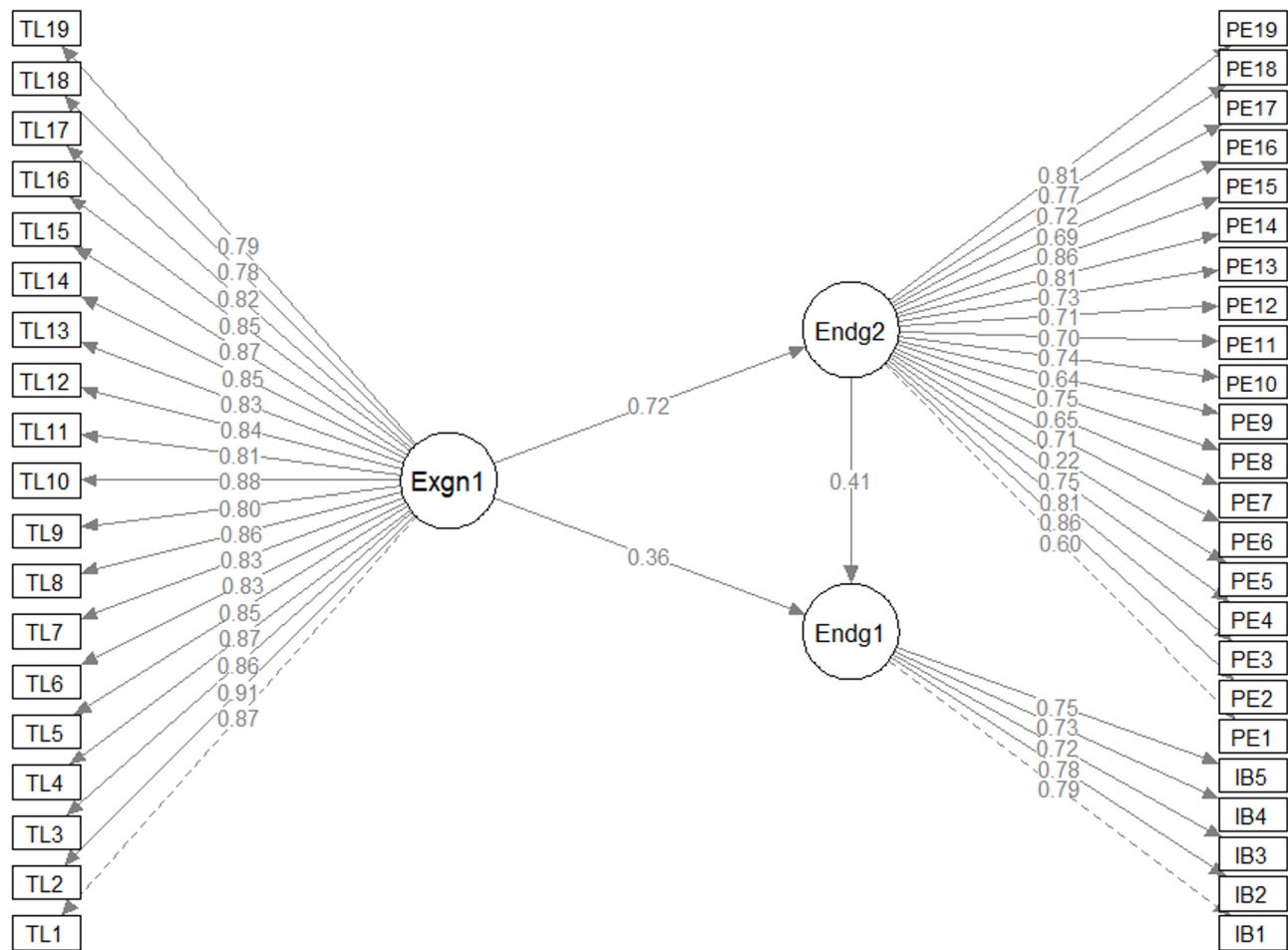


Fig. 2 SEM Diagram. Notes. Exgn1 =Transformational leadership, Endg1 =Nurses' innovative behaviors, Endg2 =Psychological empowerment

Table 1 Sample characteristics (n = 317)

Demographic characteristics		Frequency	Percentage
Gender	Female	245	77,3
	Male	72	22,7
Marital status	Married	84	26,5
	Single	233	73,5
Education	High school	64	20,2
	Associate's degree	135	42,6
	Bachelor's degree	99	31,2
	Postgraduate education	19	6,0
Average age		27.41 ± 5.32	
Years of work		6.61 ± 5.26	

To identify the connections between variables, we used SEM (Fig. 2; Table 3). All fit indices of the path model met the general criteria ($\chi^2/df=1.039$, RMSEA=0.011, CFI=0.999, NFI=0.987, TLI=0.999, $p < 0.01$). The findings reveal the validity and effectiveness of the path model [37, 38].

Results

The average age of the participants was 27.41 ± 5.32 years, 77.3% were female, 26.5% were married, 42.6% had an associate's degree, and the average years of work was 6.61 ± 5.26 years (Table 1).

Common method variance test (CMV)

Procedural measures were taken to increase the accuracy and candor of responses.

Harman's single factor test was applied to assess the risk of Common Method Variance (CMV). In addition, exploratory factor analysis was performed on all variables. If (CMV) is present, either the factor analysis reveals a single factor or a single factor explains most of the total variance [39]. As suggested, unrotated factor analysis revealed five factors explaining 51.58% of the total variance, with the first factor explaining 22.18%. Thus, no single factor emerged and no factor explained the majority of the variance. These results suggest that there are few serious concerns about common method variance and support the validity of our measures.

Table 2 Correlation analysis

Variables	CA	Mean	SD	TL		PE		NIB
TL	0.97	4.02	0.83	1				
PE	0.94	3.82	0.72	0.692**	<0.001	1		
NIB	0.86	4.18	0.69	0.599**	<0.001	0.614**	<0.001	1

Notes: Significant at the $p < 0,05$ (*), $p < 0,01$ (**), TL = Transformational leadership, PE = Psychological empowerment, NIB = Nurses' innovative behaviors.

Table 3 Mediation effect path analysis

Hypothesis	Paths	β	SE	95% C.I. (a)		p
				Lower	Upper	
H1	TL \Rightarrow PE	0.358	0.0244	0.229	0.424	<0.001
H2	TL \Rightarrow NIB	0.717	0.0144	0.411	0.867	<0.001
H3	PE \Rightarrow NIB	0.406	0.0437	0.226	0.598	<0.001
H4	TL \Rightarrow PE \Rightarrow NIB	0.291	0.019	0.188	0.361	<0.001

Notes: TL = Transformational leadership, PE = Psychological empowerment, NIB = Nurses' innovative behaviors.

Correlation analysis

The results of the Pearson correlation analysis conducted to examine the relationships between the variables are presented in Table 2. There was a significant, highly positive correlation between transformational leadership and psychological empowerment ($r = 0.692$; $p < 0.001$). There was a significant, mediating positive correlation between transformational leadership and innovative behavior ($r = 0.599$; $p < 0.001$). There was a significant, highly positive correlation between psychological empowerment and innovative behavior ($r = 0.614$; $p < 0.001$).

Testing of hypotheses

The hypothesis testing results are shown in Table 3. Hypothesis 1 predicted a positive relationship between transformational leadership and psychological empowerment. The result showed that transformational leadership was positively and significantly associated with PE ($\beta = 0.358$, $p < 0.001$), supporting Hypothesis (1) Hypothesis 2 suggested a positive relationship between transformational leadership and nurses' innovative behaviors. Our results confirmed the positive and significant relationship between transformational leadership and nurses' innovative behaviors ($\beta = 0.717$, $p < 0.001$), supporting Hypothesis (2) Hypothesis 3 predicted a positive relationship between psychological empowerment and nurses' innovative behaviors. The results showed that psychological empowerment was positively and significantly associated with nurses' innovative behaviors ($\beta = 0.406$, $p < 0.001$), thus supporting Hypothesis (3) Hypothesis 4 predicted a positive mediating effect of psychological empowerment on the relationship between transformational leadership and nurses' innovative behaviors. The results showed that psychological empowerment had a mediating effect on the relationship between transformational leadership and nurses' innovative behaviors ($\beta = 0.291$, $p < 0.001$), supporting Hypothesis 4.

Discussion

Innovation is an important factor to elevate the nursing profession at the global level [10], and creating work environments that support innovative behaviors has become extremely important. This study aims to reveal the effect of transformational leadership on the innovative behavior of nurses and the mediating role of staff empowerment in this relationship.

The results showed that transformational leadership has a positive effect on psychological empowerment. This result is in line with previous research that has shown that transformational leadership plays an effective role in promoting psychological empowerment [22, 40]. Transformational leadership stands out with its ability to increase employee motivation and encourage innovative thinking [41]. The results show that the visionary, supportive, and motivating approaches of transformational leaders transform employees' perceptions of their jobs. In particular, providing employees with meaningful goals, supporting their individual development, and providing them with the opportunity to actively participate in decision-making processes contribute to employees feeling more competent, effective, and psychologically stronger.

Our study revealed that transformational leadership positively affects nurses' innovative work behaviors. This result is in line with previous studies that have shown that transformational leadership plays an effective role in supporting employees' innovative behaviors [23–25]. By creating a vision for the future and fostering a culture of innovation, transformational leaders can significantly increase the capacity for innovation in the organization by motivating employees to embrace new ideas, drive change, and aim for excellence [42–45]. The results can be attributed to the fact that transformational leaders provide an inspiring vision to their employees, encouraging them to think beyond current boundaries. The need to produce fast and effective solutions to constantly changing needs, especially in the health sector, brings

nurses' creative and flexible thinking skills to the fore. Transformational leaders activate this potential in nurses, helping them go beyond traditional practices and develop innovative practices in clinical processes. In this context, transformational leadership can be considered not only as a managerial approach but also as a strategic element in the formation of an innovative organizational culture.

Our results revealed that psychological empowerment has a positive effect on nurses' innovative behavior. By developing a continuous and interactive relationship with the organization, empowered employees adopt a proactive approach to problems encountered in business processes and tend to offer strategic suggestions that can contribute to corporate development [46]. Psychological empowerment will provide employees with the courage to test unconventional ideas, research current issues, and use innovative approaches in fulfilling their responsibilities [47]. The findings indicate that nurses who perceive themselves as more competent, autonomous, and impactful in their work processes demonstrate a greater propensity to engage in creative thinking and generate innovative solutions. Psychological empowerment not only motivates employees to fulfill their formal responsibilities but also fosters proactive and novel approaches to addressing work-related challenges. Within this framework, psychological empowerment can be conceptualized as a fundamental intrinsic resource that facilitates innovative behavior and serves as a strategic determinant in enhancing an organization's capacity for innovation.

The results indicate that psychological empowerment serves as a significant positive mediator in the relationship between transformational leadership and innovative behavior. In the study conducted by Mohammed and Al-Abrow (2024) on public hospital employees in Iraq, it was determined that psychological empowerment has a mediating role in the effect of transformational leadership on innovative behavior [40]. The results show that transformational leaders indirectly encourage employees' innovative behaviors by increasing their psychological empowerment levels. Visionary and supportive attitudes of leaders pave the way for nurses to feel more competent, effective, and autonomous, which makes it easier for them to think creatively and engage in innovative practices. Therefore, psychological empowerment functions as a critical mediating mechanism that channels the influence of transformational leadership on innovative behavior, thereby reinforcing and sustaining this relationship over time.

Strengths and limitations

The study provides important theoretical contributions to the relationship between transformational leadership, psychological empowerment, and innovative work behavior in nurses. In particular, the mediating role of

psychological empowerment develops a new perspective on leadership theories and deeply examines how these relationships operate in nursing. The study used a comprehensive research design to examine complex relationships, and a robust data collection process was conducted. The research conducted in a critical sector, such as nursing, allowed for meaningful results to be obtained for practice. The study examining leadership approaches and employee behaviors in the nursing field offers valuable implications for putting theoretical findings into practice. Practical suggestions are presented to help develop strategies to increase innovation in nursing.

The study was conducted only on nurses in hospitals in Türkiye. This may limit the generalizability of the findings, and results may be obtained in different sectors or cultural contexts.

Since the data collection method used in the study was based on self-reports of participants, there is a possibility that the responses may be biased. This may cause the results to differ due to the influence of nurses' subjective views on their organizational experiences. The study only examined the relationship between transformational leadership, psychological empowerment, and innovative work behaviors. The effects of other leadership types or different psychological factors on innovative work behaviors were not examined.

The findings suggest that nursing managers should focus on increasing the transformational leadership and staff empowerment behaviors of nurse managers. Improving these behaviors will support nurses' innovative behaviors and advance the field of nursing.

Conclusion

This study examined the effect of transformational leadership on innovative work behaviors and the role of psychological empowerment in mediating this relationship. The findings show that transformational leadership positively affects nurses' innovative work behaviors, and this effect is strengthened through psychological empowerment. The clear vision, autonomy support, and creativity-encouraging approach provided by transformational leaders increase nurses' inclination towards innovative behaviors by enabling them to be more competent, autonomous, and creative. Psychological empowerment is an important mediating that reinforces the relationship between transformational leadership and innovative behaviors.

The theoretical contributions of this study expand leadership theories and emphasize the role of psychological empowerment in supporting innovation. Furthermore, practical implications reveal how transformational leadership practices and psychological empowerment strategies in the field of nursing are important in promoting innovation and improving organizational performance.

Future research should examine other mediating or moderating variables that affect this dynamic by testing the validity of these relationships in other sectors.

Future studies

The findings of this study are an important step in understanding the relationship between transformational leadership, psychological empowerment, and innovative work behaviors. However, given the limitations of the study, we have several recommendations for future studies. This study was limited to a sample of Turkish nurses only. Future studies can examine the effects of transformational leadership and psychological empowerment in different cultures and investigate whether this dynamic exhibits cultural differences. Future research could further examine the effects of different leadership styles on employee behavior by comparing the effects of transformational leadership and other leadership styles (e.g., authoritarian, transactional leadership) on innovative work behaviors. This study used a cross-sectional design to obtain momentary data. Future research could use longitudinal designs to observe the long-term effects of transformational leadership and psychological empowerment on employee behavior and examine how these dynamics evolve. This research examined only psychological empowerment as a psychological factor. Future studies can address the leadership and innovation relationship within a broader psychological framework by investigating other psychological factors (e.g., job satisfaction, organizational commitment, self-efficacy) that affect employees' innovative behavior.

Acknowledgements

We thank the nurses who participated in the research.

Author contributions

Conception and design of the research: GB, BÖÜ, MN. Acquisition of data: GB, BÖÜ. Analysis and interpretation of the data: GB, BÖÜ, MN. Statistical analysis: GB, BÖÜ, MN. Obtaining financing: None. Writing of the manuscript: MN, GB, BÖÜ. Critical revision of the manuscript for intellectual content: GB, BÖÜ, MN. All authors reviewed the manuscript.

Funding

No funding or any financial support.

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethical approval

To conduct this study, ethical approval was obtained from Acibadem Mehmet Ali Aydınlar University Research and Ethics Committee (Approval number: 2024-6/257) and approval from participating hospitals. Participants were given an informed consent form detailing the aims and procedures of the study. Written consent was obtained from the participants stating that they agreed to participate in the research. The Declaration of Helsinki was followed throughout the research.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Faculty of Health Sciences, The Department of Healthcare Management, Acibadem Mehmet Ali Aydınlar University, Istanbul, Turkey

²The Department of Healthcare Management, Kutahya Health Sciences University, Kutahya, Turkey

Received: 27 April 2025 / Accepted: 23 June 2025

Published online: 01 July 2025

References

- Xiang D, Ge S, Zhang Z, Twumwaah Budu J, Mei Y. Relationship among clinical practice environment, creative self-efficacy, achievement motivation, and innovative behavior in nursing students: A cross-sectional study. *Nurse Educ Today*. 2023;120:105656.
- Machon M, Cundy D, Case H. Innovation in nursing leadership: A skill that can be learned. *Nurs Adm Q*. 2019;43:267–73.
- Thepna A, Cochrane BB, Salmon ME. Self-efficacy in nurse entrepreneurs: A concept analysis. *Nurs Outlook*. 2023;71:1–9.
- Raza A, Saeed T, Iftikhar U. Psychological capital on employee creativity: mediating role of employee engagement. *J Posit School Psychol*. 2022;6:1132–47.
- Blasco-Giner C, Battistelli A, Meneghel I, Salanova M. Psychological capital, autonomous motivation and innovative behavior: a study aimed at employees in social networks. *Psychol Rep*. 2025;128:2620–48.
- Weng R-H, Huang C-Y, Chen L-M, Chang L-Y. Exploring the impact of transformational leadership on nurse innovation behaviour: a cross-sectional study. *J Nurs Manag*. 2015;23:427–39.
- McMillan K, Perron A. Change fatigue in nurses: A qualitative study. *J Adv Nurs*. 2020;76:2627–36.
- Salmond SW, Echevarria M. Healthcare transformation and changing roles for nursing. *Orthop Nurs*. 2017;36:12–25.
- Abdelwahab Ibrahim El-Sayed A, Shaheen RS, Farghaly Abdelalim SM. Collaborative leadership and productive work performance: the mediating role of nurses' innovative behavior. *Int Nurs Rev*. 2024;71:868–78.
- American Nurses Association. ANA Enterprise 2023–2025 Strategic Plan. <https://www.nursingworld.org/ana-enterprise/about-us/anae-strategic-plan-2023-2025/>. 2024.
- Wang Z, Wen N, Ren Y, Liang W, Ding Y, Ji M, et al. Mediating role of Evidence-Based nursing competence between specialist nurses' information literacy and innovative behaviour: A multicentre Cross-Sectional study. *J Adv Nurs*. 2025;81:2465–76.
- Kotb AHA, Shazly MM, Mostafa HA-A. Psychological capital educational program and its effect on nurse interns' innovative behavior. *BMC Nurs*. 2024;23:1–11.
- Pierre L, Cangialosi N, Déprez GRM. Nurse middle managers' proactive work behavior: antecedents and consequences on innovative work behavior and job performance. *J Health Organ Manag*. 2024;38:682–704.
- Cheng L, Wei W, Zhang J, Yao Y, Zhang Y, Zhu W. The association of leader-member exchange and team-member exchange with nurses' innovative behaviours: A cross-sectional study. *J Adv Nurs*. 2024;80:2813–21.
- Gabay G, Tikva S-S, Kagan I. Exploring entrepre nursing: the influence of internal locus of control and organizational innovativeness on nurses' innovative behavior - A cross-sectional study. *Appl Nurs Res*. 2025;81:1–5.
- Bass BM. Two decades of research and development in transformational leadership. *Eur J Work Organizational Psychol*. 1999;8:9–32.
- Deng C, Gulseren D, Isola C, Grocutt K, Turner N. Transformational leadership effectiveness: an evidence-based primer. *Hum Resource Dev Int*. 2023;26:627–41.
- Spreitzer GM. Psychological empowerment in the workplace: dimensions, measurement, and validation. *Acad Manag J*. 1995;38:1442–65.
- Malak MZ, Abu Safieh AM. Association between work-related psychological empowerment and quality of nursing care among critical care nurses. *J Nurs Manag*. 2022;30:2015–22.

20. Saleh MO, Eshah NF, Rayan AH. Empowerment predicting nurses' work motivation and occupational mental health. *SAGE Open Nurs*. 2022;23:23779608221076812.
21. Wang X, Zhou L, Wen X, Gou L. Exploring the relationship between ethical leadership and nurses' moral courage in china: the mediating effect of psychological empowerment. *J Nurs Manag*. 2024;2024:1–11.
22. Ibrahim IA, El-Monshed AH, Altheeb M, El-Sehrawy MG. Transformational leadership, psychological empowerment, and organizational citizenship behaviors among nursing workforce: A single mediation analysis. *J Nurs Manag*. 2024;2024:1–11.
23. Agaoglu FO, Bas M, Tarsuslu S, Ekinci LO. Serial mediating role of transformational leadership and perception of artificial intelligence use in the effect of employee happiness on innovative work behaviour in nurses. *BMC Nurs*. 2025;24:1–13.
24. Zhang M, Chen H, Wang N, Li Y, Liu Y. Does transformational leadership and psychological empowerment improve nurses' innovative behaviour during COVID-19 outbreak? A cross-sectional study. *J Nurs Manag*. 2022;30:4116–25.
25. Nguyen P. Effects of transformational leadership on the learning organization and nurses' innovative behavior in Vietnamese public hospitals. *Int J Public Leadersh*. 2024;20(3/4):256–69.
26. Dönmez S, Toker Y. Construction of a likert-type transformational leadership scale. *Ankara Univ J Fac Lang History-Geography*. 2017;57:753–75.
27. Türk N, Kumru S. Examining the validity of the transformational leadership scale in the sample of healthcare professionals. *Hacettepe Sağlık İdaresi Dergisi*. 2021;24:699–716.
28. Lumpkin GT, Dess GG. Clarifying the entrepreneurial orientation construct and linking it to performance. *Acad Manage Rev*. 1996;21:135.
29. Şeşen H. Intraorganizational entrepreneurship with its antecedents and consequences: A research in Turkish defense industry. Doctoral Thesis. Republic of Turkey, Military Academy, Defense Sciences Institute; 2010.
30. Lin CY-Y. Empowerment in the service industry: an empirical study in Taiwan. *J Psychol*. 2002;136:533–54.
31. Altay H, Ateş C. A local scale development study on personnel empowerment who work in three and upper stars hotels: the case work for Diyarbakir. *Int J Western Black Sea Social Humanit Sci*. 2019;3:93–107.
32. The Jamovi Project. Jamovi. (Version 2.4) [Computer Software]. 2023.
33. Tabachnick BG, Fidell LS. Using multivariate statistics. 6th edition. Boston: Pearson; 2013.
34. Schermelleh-Engel K, Moosbrugger H, Müller H. Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures. *Methods Psychol Res Online*. 2023;8:23–74.
35. Haryono S. Structural equation modelling Untuk Penelitian Manajemen Menggunakan AMOS. *J Ekonomi Dan Bisnis*. 2014;7:23–34.
36. Gallucci M. JAMM: jamovi Advanced Mediation Models. [jamovi module]. Retrieved from <https://jamovi-amm.github.io/>. 2020.
37. Byrne BM. Structural equation modeling with Amos: Basic concepts, applications, and programming. 2011.
38. Nunnally JC. Psychometric theory. New York: NY: McGraw-Hill Book Company;; 1978.
39. Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J Appl Psychol*. 2003;88:879–903.
40. Mohammed AA, Al-Abrow H. The impact of empowering and transformational leadership on innovative behaviour: the mediating role of psychological empowerment in health-care sector. *Leadersh Health Serv*. 2024;37:231–46.
41. Manu A. Transformational leadership. The philosophy of disruption. Emerald Publishing Limited; 2022. pp. 67–77.
42. Cuevas-Vargas H, Lozano-García JJ, Morales-García R, Castaño-Guevara S. Transformational leadership and innovation to boost business performance: the case of small Mexican firms. *Procedia Comput Sci*. 2023;221:1139–46.
43. Ahmad B, Shafique I, Qammar A, Ercek M, Kalyar MN. Prompting green product and process innovation: examining the effects of green transformational leadership and dynamic capabilities. *Technol Anal Strateg Manag*. 2024;36:1111–23.
44. Rojak JA, Sanaji S, Witjaksono AD, Kistyanto A. The influence of transformational leadership and organizational culture on employee performance. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*. 2024;5:977–90.
45. Al Maalouf NJ, Achi S, El. Project management and team performance: an applied transformational leadership perspective. *J Law Sustainable Dev*. 2023;11:e1830.
46. Singh SK, Singh AP. Interplay of organizational justice, psychological empowerment, organizational citizenship behavior, and job satisfaction in the context of circular economy. *Manag Decis*. 2019;57:937–52.
47. Khan MM, Mubarik MS, Islam T, Rehman A, Ahmed SS, Khan E, et al. How servant leadership triggers innovative work behavior: exploring the sequential mediating role of psychological empowerment and job crafting. *Eur J Innov Manage*. 2022;25:1037–55.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.