

Research Innovations in Nursing: A Comprehensive Review and Meta-Analysis

Nursah Buyukcamsari Sanlier^{1*}, Fadime Cinar¹, Fatma Eti Aslan²

¹Department of Nursing, Faculty of Health Sciences, Nisantasi University, Istanbul, Turkey.

²Department of Nursing, Faculty of Health Sciences, Bahçeşehir University, Istanbul, Turkey.

*E-mail ✉ nursah.buyukcamsari@nisantasi.edu.tr

Abstract

The evolving healthcare needs necessitate the development of innovative approaches. While these changes lead to improvements in the quality of nursing care, unforeseen changes also introduce significant risks to patients. This meta-analysis aimed to explore innovations in nursing. The study used databases such as Google Scholar, MEDLINE, TÜRKMEDLINE, ULAKBIM, and CINAHL. A total of ten studies, published between January 2009 and February 2020, were identified using the search terms “nurse,” “nursing,” and “innovation.” After screening, 856 studies were reviewed, of which 10 studies were included in the analysis. Of these, four were descriptive cross-sectional studies, and one was descriptive correlation type. The sample sizes ranged from 165 to 1040 participants. Most studies used various instruments in addition to demographic information forms, such as innovation scales, online learning readiness scales, barriers to innovation, entrepreneurship tendencies, online information search strategies, entrepreneurship scales, and California critical thinking tendency scales. The findings showed that innovation positively affects research strategies, curiosity, entrepreneurship tendencies, and critical thinking. It is suggested that educational methods should be used to foster creativity and entrepreneurship in educational content, promote innovative perspectives, and enhance critical thinking and that future research should focus on assessing nurses’ innovative characteristics and the factors that influence them, using studies with high levels of evidence.

Keywords: Turkey, Innovation, Individual innovation, Innovative approaches, Nursing practices, Nursing

Introduction

Technological advancements are a driving force behind societal and individual progress. As technology continues to evolve, there is an increasing need for innovative approaches to meet the growing demands of educational processes [1]. Innovation is commonly understood as the renewal of science and technology in ways that generate economic and social benefits, introduce inventions, and embrace uniqueness. According to TDK (2023), “innovation refers to the adaptation and implementation of new creative ideas or inventions in economic sectors” [2]. Rogers [3] describes

innovation as “an idea, practice, or object that is regarded as new by either individuals or society” and outlines its key attributes, including relative utility, compatibility, complexity, trialability, and observability. Furthermore, individuals’ attitudes toward innovation are categorized into groups such as innovators, pioneers, the curious, skeptics, and traditionalists (those who are resistant to change, and delay adoption until others have tested and observed the innovation) [4].

The International Council of Nurses (ICN, 2023) defines innovation within healthcare as transforming a promising idea into a feasible and achievable outcome aimed at health promotion, disease prevention, and improved patient care [5]. “Innovative behavior” encompasses developing new ideas, technologies, and techniques, proposing novel methods to achieve goals, testing new procedures in the workplace, modifying routines, and introducing new approaches [6]. In global trend studies, it is evident that healthcare innovation will continue to rise as technology advances [7-9]. The National Nursing Association (NLN) has called for significant changes and

Access this article online

Website: <https://smerpub.com/>

E-ISSN: 3108-4818

Received: 18 November 2021; Revised: 15 January 2022; Accepted: 18 January 2022

How to cite this article: Sanlier NB, Cinar F, Aslan FE. Research Innovations in Nursing: A Comprehensive Review and Meta-Analysis. *Int J Soc Psychol Asp Healthc.* 2022;2:1-7. <https://doi.org/10.51847/a8KrMgMqvC>

innovation in nursing education [10]. The NLN recommended designing evidence-based curricula that integrate technology to meet the needs of both students and healthcare systems. In 2009, Nursing Week focused on “nursing and innovation,” and the International Council of Nursing emphasized the importance of nurses as leaders in developing innovative care practices. The Council advocated for nurses' creative behaviors and innovations, highlighting their proactive roles in healthcare in collaboration with educational institutions and professional organizations [11, 12].

The 2010 report by the American Institute of Medicine (IOM) highlighted the importance of health informatics, innovation, and technology in the competencies nurses need to develop to enhance healthcare technologies [13]. This underscores the continued relevance of innovation in nursing's growth and progress. Personal entrepreneurship plays a crucial role in healthcare. Entrepreneurship involves the processes of taking risks, pursuing opportunities, implementing ideas, and innovating [14]. It requires significant effort in establishing and managing organizations [5, 15]. Entrepreneurship is vital in nurses' decision-making and career development [14]. Given this context, the significance of innovation in nursing is clear. However, upon reviewing the literature, there appears to be no meta-analysis specifically addressing individual innovativeness in nursing. This study was conducted to explore the personal characteristics of innovation in nursing.

Research hypotheses

H1: The influence of innovation on individual creativity in nursing

Materials and Methods

This research employed a meta-analysis approach, incorporating a literature review method. As no direct involvement with humans or animals was required, ethical committee approval was not necessary. The article search was based on keywords selected from the Turkish Science Terms and the MeSH (Medical Subject Headings) database [16]. The primary keywords used in the search were “nurse,” “nursing,” and “innovation.”

Searches were conducted in both English and Turkish across multiple databases, including Google Scholar, Medline, Turk Medline, ULAKBIM, and Cinahl, focusing on studies published between January 2009 and February 2020. After removing duplicates and irrelevant articles, the review process proceeded through the stages of title, abstract, and full-text reading. Initially, 856 articles were identified from the five databases. After filtering out duplicates and articles not aligning with the study topic, the relevant articles were analyzed. Articles that did not fit the scope of the study were excluded after thorough classification. The final data was presented according to the MOOSE framework, detailing the authors, publication year, study type, sample size, and innovation quality assessment. The implementation of the study followed the PRISMA [17] and MOOSE guidelines, which are summarized in **Figure 1** and **Table 1**.

Implementation steps of the study

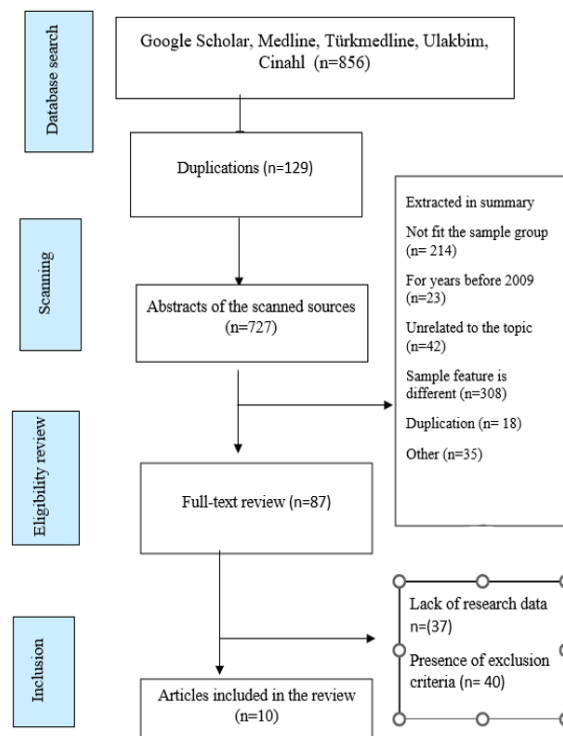


Figure 1. Prisma (preferred reporting items for systematic reviews and meta-analysis statements)

Table 1. Moose (meta-analysis of observational studies in epidemiology)

Author (year)	Study	Sample size	Innovator	Pioneer	interrogator	Skeptical	Quality score (A: 9-12) (B: 5-8)(C: 1-4)
Bodur (2018)	Descriptive cross-sectional	155	×	×	×	×	B
Ozden <i>et al.</i> (2019)	Descriptive correlation	548	×	×	×	×	A
Hediye and Doğru (2018)	Descriptive cross-sectional	369	×	×	×	×	B
Hulya Leblebicioglu <i>et al.</i> (2018)	Descriptive	216	×	×	×	×	A
Durmuş İskender <i>et al.</i> (2018)	Descriptive	534	×	×	×	×	A
Başıoğlu and Edeer (2017)	Descriptive cross-sectional	650	×	×	×	×	B
Ertuğ and Kaya (2017)	Descriptive	277	×	×	×	×	A
Erol <i>et al.</i> (2018)	Descriptive	530	×	×	×	×	A
Ceylan (2019)	Descriptive cross-sectional	279	×	×	×	×	A
Sürme <i>et al.</i> (2019)	Descriptive	573	×	×	×	×	A

Criteria for article inclusion and quality assessment

- i. Only quantitative studies were considered,
- ii. Studies published in English or Turkish were eligible,
- iii. Full-text access was required, with the articles being published in peer-reviewed national or international journals,
- iv. The focus had to be on nursing and innovation,
- v. Studies published between 2009 and 2020 were included.

To minimize publication bias, two independent researchers evaluated the selected articles. The following information was extracted from the articles:

- i. Year of publication,
- ii. Type of study,
- iii. Sample size,
- iv. Individual innovation characteristics,
- v. Quality assessment score.

The quality assessment of studies was carried out using Kappa statistics [15] as proposed by Polit and Beck, alongside 12 research quality evaluation criteria. Researchers independently assessed each study based on these criteria, assigning a “1” for full compliance and a “0” for non-compliance. Studies that met the inclusion criteria were included in the final analysis. The quality of each study was rated as follows: low quality for scores ranging from 0-4 points, medium quality for scores from 5-9 points, and high quality for scores between 9-12 points [18]. The highest score among the studies was 11, and the lowest was 7. A score of 12 indicated excellent

quality. **Table 1** provides the quality assessment of the seven studies included in the meta-analysis, along with the scores for each domain. To evaluate the consistency between researchers in article selection and bias scoring, Cohen's kappa statistic was used. A kappa value of 0.41 to 0.60 was considered moderate agreement, 0.61 to 0.80 indicated substantial agreement and values above 0.80 represented excellent agreement. The kappa statistic for the study's article selection and bias scoring process was calculated using SPSS version 25, yielding a Cohen's kappa value of 0.718 (95% confidence interval: 0.645-0.986). This demonstrated a high level of reliability in the assessment process.

Data analysis

The “Comprehensive Meta-Analysis Academic/Non-profit Pricing (Version 3)” software was utilized to analyze the data. Heterogeneity across studies was assessed using “Cochran's Q statistic,” with the following categorization for I² values: no heterogeneity if under 25%, low heterogeneity for 25-50%, moderate for 51-75%, and high when exceeding 75% [19]. In cases where the p-value in the heterogeneity test was ≤ 0.05 , the random effects model was employed for group analysis. When $P > 0.05$, the fixed effects model was applied. To evaluate the overall effect size for binary data, “RR and OR” values were used, with statistical significance accepted at $P \leq 0.05$. “Classic Fail-Safe N” and “Tau coefficient” were utilized to examine potential publication bias.

Results and Discussion

Initially, 856 articles were identified. After applying the inclusion criteria, 10 studies were selected for review. These included four cross-sectional studies, five descriptive studies, and one descriptive correlation study.

Methodological quality assessment

For quality assessment, Kappa statistics [18] and a 12-item quality checklist proposed by Polit and Beck were used. The articles were independently reviewed, with “1 point” awarded for fully meeting each criterion, and “0 points” for not meeting it. The studies were classified into weak (0-4 points), medium (5-9 points), and strong (9-12 points) quality based on their total score [18]. The highest score was 11, and the lowest was 7, with a perfect score of 12 indicating high quality. Seven of the studies were rated as “strong,” while three were rated as “moderate.” The quality ratings and score distributions for the studies are presented in **Table 1**.

Three independent evaluators assessed the studies, and inter-rater agreement was measured using Cohen's kappa statistic. The kappa statistic, calculated using SPSS version 25, resulted in a value of 0.718 (95% CI = 0.645-0.986), indicating substantial agreement between the raters [20].

Effect sizes and heterogeneity

The analysis of individual innovativeness in nursing and innovation considered innovativeness as a covariate for leading, questioning, and skeptical articles. Heterogeneity across the studies was tested using Cochran's Q statistic. The p-value was found to be less than 0.05, and the Q statistic value (6093.496) exceeded the critical value, confirming significant heterogeneity across studies. The I² statistic was calculated as 99.360, indicating high heterogeneity. The overall effect size was assessed using the random effects model.

Table 2. Heterogeneity test results for individual innovation traits variable

Effect size and 95% confidence interval				
Model	Number studies	Point estimate	Lower estimate	Upper limit
Fixed	10 (40 sub-dimensions)	0.213	0.197	0.231
Random	10 (40 sub-dimensions)	0.080	0.029	0.217
Test of null (2-tail)				
Model	Z-value	P-value		
Fixed	-38.664	0.000		
Random	-4.995	0.000		
Heterogeneity				
Model	Q-value	Df (Q)	P-value	I-squared
Fixed	6093.436	9 (39 sub-dimensions)	0,000	99.360
Random				
Tau-squared				
Model	Tau squared	Standard error	Variance	Tau
Fixed	10.116	3.065	9.364	3.181
Random				

The analysis conducted using the random effects model revealed an overall effect size of 0.080 (CI = 0.029-0.217; $P < 0.05$), as shown in **Table 2**. Based on the confidence interval, if the study were replicated 100 times using different samples from the same population, the odds ratio would likely fall between 0.029 and 0.217

in 95% of cases. Although the odds ratio of 0.080 is below 1, it remains statistically significant ($P = 0.000$). This suggests that the individual innovativeness traits of nurses tend to have a diminishing impact on broader innovation. Therefore, the H1 hypothesis is not supported.

Table 3. The effect of individual innovation variable.

Study	Statistics for each study				Study	Statistics for each study				
	Lower	Upper	Z-value	P-		[26]2	0.042	0.014	0.123	-5.772 0

	Odde ratio	Limit	Limit	value						
[21] ^a	0	0	0.001	-7.1	0	[26] ^b	0.042	0.014	0.123	-5.772 0
1221 ^b	0.55	0.361	0.863	-2.603	0	[26] ^c	0.042	0.014	0.123	-5.772 0
[21] ^c	1000	0.641	1.561	0	1	[26] ^d	0.042	0.014	0.123	-5.772 0
[21] ^d	0.007	0.003	0.016	-11.66	0	[27] ^a	0	0	0	-31.559 0
[22] ^a	6.549	4.49	9.563	9.758	0	[27] ^b	0	0	0	-29.468 0
12316	5.62S	3.883	8.158	9.122	0.509	[27] ^c	0	0	0	-29.007 0
[22] ^c	7278	4.967	10.664	10.182	0	[27] ^d	0.001	0.001	0.002	-26.773 0
[22] ^d	10.251	6.884	15266	11.155	0	[28] ^a	0.55	0.41	0.718	-3.98S 0
[23]2	0.159	0.108	0,234	9.389	0	[28] ^b	0.001	0	0.002	-15.397 0
1241 ^b	0.001	0	0.003	13.52	0	[28] ^c	0.061	0.042	0.08S	-15.048 0
[23] ^c	0.045	0.029	0.072	13.308	0.002	[28] ^d	0	0	0	-11.685 0
[23] ^d	0.001	0	0.002	11.384	0	[29] ^a	0.045	0.029	0	-13.898 0
25 ^a	2.881	1.734	4.785	4.086	0	[29] ^b	0.075	0.05	0.112	-12.566 0
256	1.505	0.922	2.457	1.635	0.102	[29] ^c	1.919	1.371	2.687	3.796 0
[24] ^c	3.129	1.878	5.215	4.378	0	[29] ^d	0.001	0	0.003	-14.195 0
[24] ^d	2.869	1.727	4.765	4.072	0	[30] ^a	0.007	0.005	0.011	-22.425 0
[25] ^a	6.972.250	1.729.375	28.109.734	12.441	0	[30] ^b	0	0	0	-14.901 0
125 ^b	0.137	0.087	0.215	-8.591	0	[30] ^c	0.07	0.063	0.003	-18.298 0
						[30] ^d	0.1S1	0.14	0.233	-13,241 0
[25] ^c	458.329	9.068.123	231621	6.513	0	The general effect size	0.08	0.029	0.217	4.965 0
[25] ^d	28.224.000	3.952.642	201.534.632	102.18	0	General				

^askeptical of innovation, ^bpioneer innovation, ^cinnovation questioner, ^dinnovative, Odds(R) > 1.000, P < 0.05

The random effects model applied in **Table 3** indicates the effect size for the individual innovativeness characteristics variable. Based on the analysis, the overall effect size for individual innovativeness in nursing was found to be 0.080 (CI = 0.029-0.217; P < 0.05), but it wasn't statistically significant. This lack of significance is likely attributed to the small number of studies available on this topic in the existing literature.

Reliability and validity of the research

To ensure the meta-analysis was both reliable and valid, a range of methods were employed, including the funnel plot, Rosenthal's Safe N method, and Orwin's Safe N method, to assess the presence of publication bias. The studies examining nursing and innovation were evaluated through a funnel scatter plot. A symmetrical distribution of effect sizes in the plot indicates no bias, while an asymmetrical distribution signals the possibility of bias [31]. In examining **Figure 2**, the distribution of effect

sizes appears close to symmetrical, suggesting no significant publication bias.

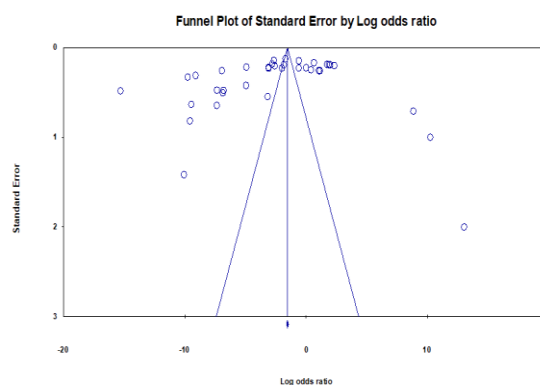


Figure 2. Funnel scatterplot

The Begg-Mazumdar and Egger tests were used to assess the potential bias in the funnel plot, yielding the following results: Begg-Mazumdar Kendall's tau = 0.164, P = 0.138, and Egger: bias = 1.49 (95% CI = 0.197

to 0.230), $p=0.06$. Given that the p -value exceeded 0.05 ($P = 0.06 > 0.05$), the analysis concluded there was no significant bias present. Furthermore, Rosenthal's fail-safe number, an additional test for study bias, corroborated the findings from the funnel plot, further supporting the absence of bias (**Figure 2**).

Innovation plays a vital role in enhancing nursing care and contributing to the creation of new ideas in the healthcare field [21]. One notable example of innovation is the virtual nurse character, developed through a collaboration between Boston Medical Center and Northeastern University, aimed at improving discharge processes. This computerized program assists in various nursing activities such as gathering patient data, providing educational material, assessing health status, giving discharge instructions, and offering counseling services [22].

In a study by Sawatzky *et al.* [23] conducted at a 500-bed tertiary care center in Canada, it was discovered that patients who underwent cardiac surgery experienced fatigue, sleep disturbances, shortness of breath, palpitations, anorexia, movement restrictions, and emotional issues after discharge. The study emphasized the importance of informing patients on how to handle these challenges once they are home [23]. Incorporating home visits, follow-up phone calls, and interviews with individuals who had successfully navigated the recovery process helped to reduce patient readmission rates.

The results of this study indicated a statistically significant effect of individual innovativeness in nursing. When analyzing the six components of individual innovativeness, it was found that the innovation variable played a significant role. However, dimensions such as pioneering, questioning, and skepticism showed a negative influence [24-30, 32-34]. No previous studies were identified with results matching those of this research. When comparing this study's outcomes with existing literature, similar findings were observed.

Conclusion

It is advisable to employ teaching methods that foster creativity, entrepreneurial thinking, and the development of an innovative outlook to enhance individual innovativeness in nursing. Additionally, these methods should focus on boosting critical thinking skills.

Acknowledgments: The authors express gratitude to the researchers who contributed to this research.

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

1. Çuhadar C, Bülbül T, Ilgaz G. Exploring of the relationship between individual innovativeness and techno-pedagogical education competencies of pre-service teachers. *Elementary Educ Online*. 2013;12(3):797-807.
2. Türk Dil Kurumu (TDK). Current Turkish dictionary. 2023. Available from: www.tdk.gov.tr
3. Rogers ME. Diffusion of innovations. New York: Free Press; 2003.
4. Kılıçer K, Odabaşı HF. Individual innovativeness scale: the study of adaptation to Turkish, validity and reliability. *Hacet Üniv Eğit Fak Derg*. 2010;38:150-64.
5. International Union of Nurses-ICN. Delivering quality, serving communities: nurses leading care innovations. International Nurses Day Kit. 2009. Available from: <http://www.icn.ch/Images/Stories/Documents/Publications/İnd/İndkit2009.Pdf>
6. Sönmez B, Yıldırım A. Determination of nurses' innovative behaviours and their views about the factors affecting their innovative behaviours: a qualitative study in a university hospital. *J Health Nurs Manag*. 2014;2(1):49-59.
7. European commission, directorate-general for research and innovation, the junction of health, environment and the bio economy – foresight and implications for European research & innovation policies, publications office, 2015. Available from: <https://op.europa.eu/en/publication-detail/-/publication/375971b3-ba8a-11e5-8d3c-01aa75ed71a1>
8. European Strategy and Policy Analysis System (ESPAS). Global trends to 2030: can the EU meet the challenges ahead? 2015. Available from: https://espas.eu/files/espas_files/about/espas-report-2015.pdf
9. Omachonu VK, Einspruch NG. Innovation in healthcare delivery systems: a conceptual framework. *Innov J: Public Sector Innov J*. 2010;15(1):1-20.

10. National League for Nursing. Innovation in nursing education: a call to reform. New York, US; 2003.
11. Dil S, Uzun M, Aykanat B. Innovation in nursing education. *Int J Hum Sci.* 2012;9(2):1217-28.
12. Herdman EA. Nursing and innovation. *Educ Nur Res J.* 2009;6(2):2-4.
13. IOM (Institute of Medicine). The future of nursing: leading change, advancing health, the national academies press, Washington DC; 2010.
14. Arslan H, Şener DK. A new and important concept in nursing: entrepreneurship. *Istanbul Univ Florence Nightingale Nurse Fak Derg.* 2012;20(2):140-5.
15. Kılıç R, Keklik B, Çalış N. A study on entrepreneurship tendency of university students: example of Bandırma department of business administration. *SDU Econ Adm Sci Fac J.* 2012;17(2):423-35.
16. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Int J Surg.* 2021;88:105906. Available from: <http://prismastatement.org/prismastatement/flowdiagram.aspx?AspxAutoDetectCookieSupport=1> (Access Date: 15.02.23).
17. National Library of Medicine. Medical subject headings. 2023. Available from: <https://meshb.nlm.nih.gov>
18. Polit DF, Beck CT. Literature reviews: finding and reviewing research evidence. In: Polit, Df., Tatano, Bc., Eds. *essentials of nursing research: appraising evidence for nursing practice.* 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2009. p. 169-93.
19. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33(1):159-74.
20. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ.* 2003;327(7414):557-60.
21. McSherry RO, Douglas M. Innovation in nursing practice: a means to tackling the global challenges facing nurses, midwives and nurse leaders and managers in the future. *J Nurs Manag.* 2011;19(2):165-9.
22. Abbott MB, Peggy Shaw MS. Virtual nursing avatars: nurse roles and evolving concepts of care. *Online J Issues Nurs.* 2016;21(3):1C.
23. Sawatzky JA, Christie S, Singal RK. Exploring outcomes of a nurse practitioner-managed cardiac surgery follow-up intervention: a randomized trial. *J Adv Nurs.* 2013;69(9):2076-87.
24. Bodur G. The relationship between nursing students' individual innovativeness levels and entrepreneurial tendencies. *Health Sci Vocational J.* 2018;5(2):139-48.
25. Ozden G, Cevik S, Saritas SC. Do the online information searching strategies affect individual innovativeness in nursing students? *Ann Med Res.* 2019;26(4):629-35.
26. Hediye UT, Doğru BV. Evaluation of individual innovativeness characteristics of nursing and midwifery students. *Gümüşhane Univ Health Sci J.* 2018;7(3):23-32.
27. Hulya Leblebicioglu RN, Ebru Baysal RN, Leyla Khorshid RN. Investigation of relationship between entrepreneurship and individual innovativeness in nurse academicians. *Int J Caring Sci.* 2018;11(3):1812-21.
28. Durmuş İskender M, Kaş Güner C, Oluk A. Determination of the relationship between nursing students' critical thinking tendencies and individual innovation characteristics. *J Int Soc Res.* 2018;11(56):490-7.
29. Başoğlu M, Edeer AD. Comparison of individual innovation awareness of nurses and nursing students in generation X and Y. *Gümüşhane Univ Health Sci J.* 2017;6(4):77-84.
30. Ertuğ N, Kaya H. Examination of nursing students' individual innovation profiles and barriers to innovation. *Nurs Educ Res J.* 2017;14(3):192-7.
31. Borenstein M, Higgins JP. Meta-analysis and subgroups. *Prev Sci.* 2013;14(2):134-43.
32. Erol ÖZ, Yacan LA, Hayta RA, Şahin İD, Yağcı M. Innovation characteristics of nursing students and affecting factors. *Nurs Educ Res.* 2018;15(3):142-6.
33. Ceylan S. Innovativeness levels and perceived barriers to innovativeness of nursing students. *Gümüşhane Univ Health Sci J.* 2019;8(4):363-71.
34. Sürme Y, Efe YS, Ceyhan Ö, Korkut S, Caner N. Do individual innovation characteristics affect readiness online learning? *Higher Educ Sci J.* 2019;8(2):342-8.