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Effect of Betty Neuman's systemic model on the anxiety of patients undergoing endoscopy: A randomized control trial

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Abstract

The present study aims to determine the effect of Betty Neuman's systemic model on the anxiety of patients undergoing endoscopy. This randomized control trial investigation involved 44 participants recruited from the endoscopy center of Golestan Province Hospital in the 2022, specifically those prescribed for endoscopic procedures. The data collection instruments employed in this research encompassed a demographic characteristics questionnaire focusing on age, gender, education, and occupation, as well as Spielberger's state-trait anxiety questionnaire (form Y) (STAI-Y). The pre-intervention anxiety levels were 111.41 (SD=17.61) in the intervention group and 109.27 (SD=6.64) in the control group. The Mann-Whitney U test indicated no statistically significant difference in the anxiety levels between the two groups before the intervention (P=0.29). Following the intervention, the anxiety levels were 116.56 (SD=12.25) in the intervention group and 111.95 (SD=4.70) in the control group. The independent t-test revealed a significant difference between the two groups (P<0.01). Furthermore, the Wilcoxon test demonstrated no significant difference in anxiety levels within the control group before and after the intervention (P=0.36), whereas a significant difference was observed in the intervention group before and after the intervention (P<0.01). Moreover, the ANCOVA revealed a statistically significant difference between the two groups after accounting for the pre-test effects (Eta=0.58, P<0.01). This indicates that 58% of the variance in post-test changes can be attributed to the training provided based on the Betty Neuman's systemic model. In conclusion, the implementation of Betty Neuman's systemic model has proven to be effective in reducing anxiety levels among patients undergoing endoscopy. The demonstrated efficacy of Betty Neuman's model suggests that nursing models can serve as a cost-efficient, impactful, and secure treatment approach in patient care.

Keywords: Betty Neuman's Systemic Model, Anxiety, Endoscopy, Nursing, Nurses.

1 | Introduction

Endoscopy, as a diagnostic and therapeutic procedure, is invasive and induces anxiety among patients [1, 2]. The utilization of this diagnostic tool involves the insertion of a tube from the digestive system into the body, leading to common experiences of pain, nausea, and heightened anxiety in individuals undergoing endoscopy [3]. This anxiety is particularly pronounced in the specific context of the endoscopy setting [4, 5]. While endoscopy proves effective in early disease detection, thereby enhancing patient survival and reducing treatment costs, it is not without associated complications [6]. Anxiety emerges as a fundamental concern for patients undergoing diagnostic and therapeutic procedures [7], representing an unpleasant state of worry or pressure prevalent in various facets of human life [8]. Elevated anxiety levels during invasive procedures like endoscopy not only contribute to complications but also result in adverse effects, prolonged procedure times, increased sedative drug requirements, and hindered patient recovery [1].

The primary cause of anxiety in this context often stems from the treatment process or fear of the procedural execution [4]. Previous research has yielded varied outcomes regarding factors influencing anxiety in endoscopy patients [1]. In the realm of nursing studies, a predominant focus revolves around the objective of pain relief in patient care [7]. Numerous studies have demonstrated the positive impact of interventions such as music therapy and relaxation on alleviating pain and anxiety in individuals undergoing endoscopy [4]. The incorporation of nursing theories and models assumes significance in enhancing the overall quality of nursing care [9].

One widely recognized nursing theory is Betty Neuman's systemic model [10], which serves as a comprehensive care framework predicting patients' stressors [11]. This model delineates the stress-inducing factors affecting individuals and the interventions nurses undertake to facilitate patient recovery [12]. The nurse's role in this model involves predicting stressors, addressing factors influencing stress, and providing supportive care to the patient [13]. Within the framework of Neuman's model, the nurse and the patient collaborate in the process of interacting with the environment and obtaining information, striving to achieve a balance amidst stressful processes [14].

Consequently, the underlying philosophy of Betty Neuman's systemic model is centered on the prediction and prevention of stress in patients [15]. With its open system perspective, Neuman's model emerges as a fitting framework for the implementation of patient care programs [16]. Recognizing the pivotal role of nursing models and theories in enhancing nursing performance [17], this study was undertaken to investigate the impact of Betty Neuman's systemic model on alleviating anxiety among patients undergoing endoscopy.

2 │ Methods

2.1 │ Study design

A randomized controlled trial was executed at Golestan Hospital, aiming to investigate the impact of Betty Neuman's systemic model on the anxiety levels of patients undergoing endoscopy.

2.2 │ Ethics consideration

This research was conducted after obtaining project approval from the Research Council and securing ethical clearance under the code IR.IAU.D.REC.1401.006 from the Bioethics Committee of the Islamic Azad University, Dezful Branch. The researcher provided detailed explanations regarding the research objectives, safety assurances, and the preservation of participant anonymity. Participants were explicitly informed of their right to withdraw from the study at any stage, and written informed consent was obtained from all research participants.

2.3 │ Sample size

The determination of the sample size for this study was conducted utilizing the G*Power software, guided by the parameters established in a study by Ahmadi et al., (2021). The calculation, based on an effect size of 1.03, a test power of 95%, and a significance level of 0.05, resulted in a sample size of 44 individuals [13]. Subsequently, individuals meeting the inclusion criteria were enlisted using the available method, and a subset of 44 participants was selected through a simple random sampling approach. The distribution of these participants into two groups, namely the intervention and control groups, each comprising 22 individuals, was achieved through random allocation utilizing the simple random method.

2.4 │ Participants

This randomized control trial investigation involved 44 participants recruited from the endoscopy center of Golestan Province Hospital in the 2022, specifically those prescribed for endoscopic procedures. Inclusion criteria encompassed patients seeking outpatient endoscopy services based on a specialist doctor's diagnosis and excluding individuals with chronic mental illnesses. The sole criterion for study withdrawal pertained to participants expressing unwillingness to partake in the research.

2.5 │ Intervention

The data collection instruments employed in this research encompassed a demographic characteristics questionnaire focusing on age, gender, education, and occupation, as well as Spielberger's anxiety questionnaire. Spielberger's state-trait anxiety questionnaire (form Y), (STAI-Y), was initially developed by Spielberger (1970) for the assessment of anxiety [18]. Subsequently, it underwent revisions in 1983 [19]. The STAI-Y comprises 40 questions for adults, divided into the Mood subscale, consisting of twenty items gauging the respondent's current feelings, and the trait subscale, comprising twenty items assessing the respondent's general feelings.

Responses to each questionnaire statement are scored on a scale of 1 to 4. For the state-anxiety subscale, participants choose the number that best describes the intensity of their feelings from (1) never, (2) somewhat, (3) moderately, (4) extremely. For the trait-anxiety subscale, participants rate the frequency of their feelings on a four-point scale, ranging from (1) rarely, (2) sometimes, (3) often, and (4) almost always. A score of 4 in response to ten

state-anxiety statements and eleven trait-anxiety statements indicates a high level of anxiety, while for the remaining ten state-anxiety statements and nine trait-anxiety statements, a score of 4 suggests the absence of anxiety. Scores for both subscales range from a minimum of 20 to a maximum of 80.

The internal correlation reliability of Cronbach's alpha coefficients ranges from 0.86 to 0.95, and test-retest reliability coefficients range from 0.65 to 0.75 over 2 months. The reliability was confirmed with a Cronbach's alpha coefficient of 92% on the state anxiety scale and 90% on the trait anxiety scale. Content validity was affirmed by experts in the field of psychology [19]. Abdoli et al., (2020) confirmed the validity and reliability of the Persian version of the state-trait anxiety questionnaire, reporting a Cronbach's alpha of 0.886 for trait anxiety and 0.846 for state anxiety. Convergent validity was 0.612 for trait anxiety and 0.643 for state anxiety (P<0.001) [20].

Upon obtaining ethical approval from the Biological Ethics Committee of Islamic Azad University, Dezful Branch, the study commenced. Informed consent was obtained from participants, ensuring the explanation of research objectives, safety assurances, and the preservation of participant anonymity. Participants were assured of their right to withdraw from the study at any stage. Subsequently, routine interventions were administered in the control group, while the intervention group received training based on Betty Neuman's systemic model in a single face-to-face session lasting 15-30 minutes. The assessment phase identified potential and actual stressors, followed by anxiety level assessment and implementation of necessary training at three levels: primary prevention, secondary prevention, and tertiary prevention. Primary prevention aimed to prevent anxiety, secondary prevention addressed anxiety reduction, and tertiary prevention involved post-anxiety environmental and supportive condition training.

2.5 │ Statistical analysis

The statistical analysis for this study was carried out using SPSS software (version 21.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics, including mean (standard deviation [SD]) for continuous variables and frequency (percentage) for categorical variables, were employed to present a comprehensive overview of the data. Furthermore, various statistical tests such as the Chi-square, Wilcoxon, independent t-test, Mann-Whitney U, and analysis covariance (ANCOVA) were utilized in the analytical framework of this study.

3 │ Results

3.1 │ Participants

In the examination of demographic characteristics between the intervention and control groups, the independent t-test revealed no statistically significant difference in terms of age (P=0.52). Similarly, the chi-square test did not demonstrate any significant differences in gender (P=0.45), education (P=0.25), and occupation (P=0.56) between the two groups.

3.2 │ The effect of Betty Neuman's systemic model on the anxiety of patients undergoing endoscopy

As depicted in Table 1, the pre-intervention anxiety levels were 111.41 (SD=17.61) in the intervention group and 109.27 (SD=6.64) in the control group. The Mann-Whitney U test indicated no statistically significant difference in the anxiety levels between the two groups before the intervention (P=0.29). Following the intervention, the anxiety levels were 116.56 (SD=12.25) in the intervention group and 111.95 (SD=4.70) in the control group. The independent t-test revealed a significant difference between the two groups (P<0.01). Furthermore, the Wilcoxon test demonstrated no significant difference in anxiety levels within the control group before and after the intervention (P=0.36), whereas a significant difference was observed in the intervention group before and after the intervention (P<0.01).

Moreover, the ANCOVA revealed a statistically significant difference between the two groups after accounting for the pre-test effects (Eta=0.58, P<0.01). This indicates that 58% of the variance in post-test changes can be attributed to the training provided based on the Betty Neuman's systemic model.

Table 1. Anxiety of patients undergoing endoscopy in intervention and control groups (N=44).

	Groups		P-value
	Control (N=22)	Intervention (N=22)	
Before	109.27 (SD=6.64)	111.41 (SD=17.61)	0.29*
After	111.95 (SD=4.70)	116.56 (SD=12.25)	<0.01**
P-value	0.36***	<0.01***	

Values are given as a mean for continuous variables.
*P-value was obtained with a Mann-Whitney U test.
**P-value was obtained with an independent t-test.
***P-value was obtained with a Wilcoxon test.

4 | Discussion

The findings of this study indicate a reduction in anxiety levels within the intervention group following the intervention, while the control group experienced an increase in anxiety. Notably, a significant proportion of patients exhibited severe anxiety before undergoing endoscopy, with a lack of awareness identified as a contributing factor [2, 3]. Severe anxiety has implications for the procedural performance and post-procedural outcomes of patients [21].

Consistent with a study by Sadeghi et al., (2021), which demonstrated a decrease in patient anxiety before the endoscopy process through the application of the Betty Neuman's model [6], our study underscores the efficacy of Neuman's systemic model in influencing the anxiety levels of patients undergoing endoscopy. Ahmadii et al., (2021) similarly reported a reduction in tension and anxiety among mothers of hospitalized children using the Betty Neuman's model [10]. A study by Montano (2021) aligns with these findings, highlighting the model's role in stress reduction and enhanced adaptation among patients by fostering an understanding of stress [14].

The application of Betty Neuman's systemic model in a study by Akhlaghi et al., (2021) demonstrated anxiety reduction in heart surgery patients [22]. Additionally, the study by Ahmadi et al., (2021) indicated the model's efficacy in alleviating anxiety and worries among hospitalized mothers [13]. A study by Başoğul & Buldukoğlu (2020) revealed that, in the context of the Betty Neuman's model, increasing patient understanding of cognition led to decreased feelings of depression and expedited cognitive processes [23]. Nasiry Zarrin Ghabaee et al., (2015) further supported the model's effectiveness in reducing anxiety associated with pre-surgery anesthesia [24].

Collectively, these studies underscore the practical utility of Betty Neuman's systemic model in nursing care, particularly in its systemic paradigm that emphasizes interprofessional collaboration and stress prevention through the identification and planning of stressful factors [14]. The model's foundation in prevention principles, interpersonal communication, and understanding the diverse dimensions of patients contributes to its effectiveness in addressing their needs [10, 25, 26].

This study suggests that Betty Neuman's systemic model serves as a cost-effective yet impactful nursing intervention [22]. Furthermore, the widespread application of this model in nursing education, management, and research is evident in the literature, highlighting its versatile and comprehensive nature [14]. The use of nursing models, including Betty Neuman's, has demonstrated a positive impact on increasing self-efficacy, reducing anxiety, enhancing care quality, and elevating nursing standards [27]. The outcomes of this research affirm that nursing models, such as Betty Neuman's systemic model, can serve as valuable guides for clinical care [13, 28].

4.1 | Limitations

The study's sample size may present a constraint, potentially limiting the generalizability of its findings to a broader population. A larger and more diverse sample would enhance the robustness of insights into the efficacy of the model across diverse demographic groups. Furthermore, as the study was conducted within a single center, it may lack the diversity and variability inherent in multi-center investigations. Consequently, findings derived from a solitary center may not comprehensively reflect the nuances of the broader population or diverse healthcare settings.

4.2 | Recommendations for future research

Execute multicenter trials to augment the generalizability of results. The inclusion of diverse healthcare settings and populations will afford a more comprehensive comprehension of the efficacy of Betty Neuman's systemic model across diverse contextual scenarios. Undertake longitudinal investigations featuring extended follow-up durations to scrutinize the persistent influence of Betty Neuman's systemic model on anxiety levels. This approach will yield insights into the enduring efficacy and prolonged effects of the intervention over an extended temporal framework. Conduct a rigorous cost-effectiveness analysis to appraise the economic implications associated with the implementation of Betty Neuman's systemic model in contrast to alternative interventions or standard care. Such an assessment holds intrinsic value for healthcare decision-makers in resource allocation and planning.

5 | Conclusions

In conclusion, the implementation of Betty Neuman's systemic model has proven to be effective in reducing anxiety levels among patients undergoing endoscopy. The demonstrated efficacy of Betty Neuman's model suggests that nursing models can serve as a cost-efficient, impactful, and secure treatment approach in patient care. These findings underscore the potential utility of nursing models, such as Betty Neuman's systemic model, as valuable tools in optimizing the overall quality and outcomes of patient care interventions. Further exploration and integration of nursing models in clinical practice may enhance the comprehensiveness and efficiency of healthcare delivery, contributing to improved patient experiences and well-being.

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Authors' contributions

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: RM, ML, FG, NA; Drafting the work or revising it critically for important intellectual content: RM, ML, FG, NA; Final approval of the version to be published: RM, ML, FG, NA; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: RM, ML, FG, NA.

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Ethics approval and consent to participate

This research was conducted after obtaining project approval from the Research Council and securing ethical clearance under the code IR.IAU.D.REC.1401.006 from the Bioethics Committee of the Islamic Azad University, Dezful Branch. Before participation, all individuals provided informed consent after receiving detailed information about the study's aims. Participants were explicitly in-formed of their right to withdraw from the study at any time if they chose to do so.

Competing interests

We do not have potential conflicts of interest with respect to the research, authorship, and publication of this article.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on request.

Using artificial intelligent chatbots

None.

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