Relationship Between the Problem-Solving Skills and Empathy Skills of Operating Room Nurses

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ABSTRACT

Background: The use of empathy in problem solving and communication is a focus of nursing practice and is of great significance in raising the quality of patient care.

Purpose: The purposes of this study are to investigate the relationship between problem solving and empathy among operating room nurses and to explore the factors that relate to these two competencies.

Methods: This is a cross-sectional, descriptive study. Study data were gathered using a personal information form, the Interpersonal Problem Solving Inventory, and the Basic Empathy Scale (N = 80). Descriptive and comparative statistics were employed to evaluate the study data.

Results: Age, marital status, and career length were not found to affect the subscale scores of cognitive empathy (p > .05). A negative correlation was found between the subscale scores for “diffidence” and “cognitive empathy.” Moreover, the emotional empathy scores of the graduate nurses were higher than those of the master’s/donate degree nurses to a degree that approached significance (p = .078). Furthermore, emotional empathy levels were found to decrease as the scores for insistent/persistent approach, lack of self-confidence, and educational level increased (p < .05). The descriptive characteristics of the participating nurses were found not to affect their problem-solving skills.

Conclusions/Implications for Practice: Problem solving is a focus of nursing practice and of great importance for raising the quality of patient care. Constructive problem-solving skills affect cognitive empathy skills. Educational level and career length were found to relate negatively and level of self-confidence was found to relate positively with level of cognitive empathy. Finally, lower empathy scores were associated with difficult working conditions in operating rooms, intense stress, and high levels of potential stress-driven conflicts between workers in work settings.

Key Words: operating room, critical thinking, surgery, cognitive, emotional.

Introduction

Healthcare institutions are where individuals seek remedies to their health problems. These institutions face problems, which relate to both employees and care recipients. These problems may occur spontaneously and require immediate solution. Moreover, these problems require that the preferred remedies be adapted to address the unique nature of both organizational circumstances and individual requirements. Therefore, it is important that nurses, who are a major component of the healthcare system, have problem-solving skills.

Operating rooms are complex, high-risk environments with intense levels of stress that require rapid judgment making and fast implementation of appropriate decisions to increase patients’ chances of survival (Kanan, 2011; Jeon, Lakanmaa, Meretoja, & Leino-Kilpi, 2017). Furthermore, aseptic principles may never be compromised, and a high level of coordination and cooperation among team members should be maintained in these areas (Kanan, 2011; Sandelin & Gustafsson, 2015). The members of a surgical team may vary in the operating room (Sandelin & Gustafsson, 2015; Sonoda, Onozuka, & Hagihara, 2018). Under these difficult conditions, time management and workload are important stress factors for nurses (Happell et al., 2013; Suresh, Matthews, & Coyne, 2013). At the same time, operating room nurses are legally responsible for the nature and quality of the healthcare service received by patients before, during, and after their surgical intervention (Kanan, 2011). The American Nurses Association defines a nurse as “the healthcare professional establishing, coordinating and administering the care while applying the nursing process in an aim to meet the identified physiological, psychological, sociocultural and spiritual needs of patients who are potentially at the risk of jeopardized protective reflexes or self-care ability because of surgery or invasive intervention” (Association of periOperative Registered Nurses, 2015).

Problem solving is the most critical aspect of the nursing practice. The fact that nursing requires mental and abstract
skills, such as identifying individual needs and finding appropriate remedies, was first stated in 1960s. In 1960s, the nursing theorists Abdellah, Orem, and Levin emphasized the mental aspect of nursing. They argued that the most critical requirement of nurses in the clinical field is the ability to decide on and plan the right action and that nursing care should be founded on a sound knowledge base (Taşçı, 2005).

The World Health Organization has stated that “taking measures and applying a problem-solving approach to provide appropriate care is one of the compulsory competencies of nurses” (Taşçı, 2005). Thus, enhancing the problem-solving skills of nurses is of great importance in raising the quality of patient care (Taylor, 2000; Yu & Kirk, 2008). On the other hand, Bagnal (1981) argued that people with problem-solving skills need to be equipped with personal traits including innovation, clear manifestation of preferences and decisions, having a sense of responsibility, flexible thinking, courage and adventurousness, ability to show distinct ideas, self-confidence, a broad area of interest, acting rationally and objectively, creativity, productivity, and critical perspective (as cited in Çam & Tümkaya, 2008).

To provide the best surgical care to a patient, team members must work together effectively (Sonoda et al., 2018). One of the most important factors affecting the quality of healthcare service delivery is effective communication between healthcare professionals and healthcare recipients, with empathy forming the basis for effective communication.

Because of the intrinsic nature of the nursing profession, nurses should have empathy skills. Thus, empathy is the essence of the nursing profession (Fields et al., 2004; Vioulac, Aubree, Massy, & Untas, 2016). A review of resources in the literature on problem solving reveals that gathering problem-related data is the first major step toward determining the root causes of a problem. In this respect, empathy is an important skill that helps properly identify a problem. On the basis of the definition of empathy, sensing another person’s feelings and thoughts and placing oneself in his or her position or feeling from within his or her frame of reference should work to improve one’s problem-solving skills, particularly those skills related to social problem solving (Taşçı, 2005; Topçu, Baker, & Aydin, 2010; Vioulac et al., 2016). It is possible to explain empathic content emotionally as well as cognitively. Emotional empathy (EE) means feeling the emotions of another person and providing the most appropriate response based on his or her emotional state. This is very important in patient–nurse communications. Cognitive empathy (CE) is the ability to recognize the feelings of another without experiencing those feelings yourself (de Kemp, Overbeek, de Wied, Engels, & Scholte, 2007).

Gender, age, level of education, marital status, years of work, duration working at current institution, and problem-solving situations have been shown in the literature not to affect the problem-solving or empathy skills of nurses (Abaan & Alntoporak, 2005; Kelleci & GölbAŞ, 2004; Yu & Kirk, 2008). Empathy is especially critical to the quality of nursing care and is an essential component of any form of caring relationship. The findings in the literature regarding empathy among nurses are inconsistent (Yu & Kirk, 2008), and no findings in the literature address the relationship between problem-solving skills and empathy skills in operating room nurses.

Today, the healthcare system demands that nurses use their professional knowledge to handle patient problems and needs in flexible and creative ways. Problem solving is a primary focus of the nursing practice and is of great importance to raising the quality of patient care (Kelleci & GölbAŞ, 2004; Yu & Kirk, 2008). Enhancing the problem-solving and empathy skills of nurses may be expected to facilitate their identification of the sources of problems encountered during the delivery of healthcare services and their resolution of these problems.

The purposes of this study are to investigate the relationship between problem solving and empathy in operating room nurses and to explore the factors related to these two competencies.

**Methods**

**Study Model and Hypotheses**

This study is a cross-sectional and descriptive study. The three hypotheses regarding the relationships between the independent variables are as follows:

- **H1**: Sociodemographic characteristics affect problem-solving skills.
- **H2**: Sociodemographic characteristics affect level of empathy.
- **H3**: Problem-solving skills are positively and significantly correlated with empathy.

**Study Population and Sample**

The study was conducted during the period of May–June 2015 at three hospitals affiliated with Istanbul University. The study population consisted of 121 nurses who were currently working in the operating rooms of these hospitals. The study sample consisted of the 80 nurses who volunteered to participate and answered all of the questions on the inventory.

**Data Collection Tool**

Study data were gathered using a personal information form, the Interpersonal Problem Solving Inventory (IPSI), and the Basic Empathy Scale.

**Personal information form**

This questionnaire, created by the researchers, is composed of 10 questions on the age, gender, educational background, organization and department, position, and organizational and professional functions of the respondent.

**Interpersonal problem solving inventory**

The IPSI, developed and validated by Çam and Tümkaya (2008), was used in this study. The Cronbach’s α internal
In this study, the Cronbach’s \( \alpha \) coefficients that were calculated for the reliability study range between .76 and .80. The lowest possible scores are 9 and 45 and the highest possible scores are 11 and 55 for the CE and EE subscales, respectively. A high score on the CE subscale indicates that the CE level is high, and a high score on the EE subscale indicates that the EE level is high (Topçu et al., 2010). The two subscales of the Basic Empathy Skill Scale have been found to be highly reliable. The Cronbach’s \( \alpha \) reliability coefficients in this study were .782 for the CE subscale and .649 for the EE subscale.

### Data Collection

The study was conducted between May and June 2015 at three hospitals affiliated with Istanbul University. The researcher explained the study to those nurses who agreed to participate. The questionnaire form was distributed to the participants, the purpose of the investigation was clarified, and permission to use participant data was obtained. The participants completed the questionnaire on their own, and the completed questionnaires were collected afterward. The time required to complete the questionnaire was 15–20 minutes in total.

### Evaluation of Data

Number Cruncher Statistical System 2007 (Kaysville, UT, USA) software was used to perform statistical analysis. To compare the quantitative data, in addition to using descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum), the Student \( t \) test was used to compare the parameters with the regular distribution in the two groups and the Mann–Whitney \( U \) test was used to compare the parameters without normal distribution in the two groups. In addition, a one-way analysis of variance test was used to compare three or more groups with normal distribution, and a Kruskal–Wallis test was used to compare three or more groups without normal distribution. Pearson’s correlation analysis and Spearman’s correlation analysis were used to evaluate the relationships among the parameters. Finally, linear regression analysis was employed.

### Basic empathy skill scale

The Basic Empathy Skill Scale was developed by Jolliffe and Farrington (2006) and validated by Topçu et al. (2010) in Turkish. It is a 5-Likert scale (1 = strictly disagree and 5 = strictly agree) consisting of 20 items, of which nine measure CE and 11 measure EE. The Cronbach’s \( \alpha \) coefficients that were calculated for the reliability study range between .76 and .80. The lowest possible scores are 9 and 45 and the highest possible scores are 11 and 55 for the CE and EE subscales, respectively. A high score on the CE subscale indicates that the CE level is high, and a high score on the EE subscale indicates that the EE level is high (Topçu et al., 2010). The two subscales of the Basic Empathy Skill Scale have been found to be highly reliable. The Cronbach’s \( \alpha \) reliability coefficients in this study were .782 for the CE subscale and .649 for the EE subscale.

### Score Distribution for Interpersonal Problem-Solving Skills and Basic Empathy Skills

| Subdimension of the scale                  | Min–Max | Median | Mean   | SD     |
|--------------------------------------------|---------|--------|--------|--------|
| Interpersonal Problem-Solving Skills       |         |        |        |        |
| Negative approach to the problem           | 18–62   | 33.0   | 35.69  | 10.95  |
| Constructive problem solving               | 36–77   | 48.5   | 51.66  | 8.99   |
| Lack of self-confidence                    | 7–26    | 12.0   | 13.19  | 4.17   |
| Abstaining from responsibility             | 5–20    | 12.0   | 11.28  | 3.44   |
| Persistent approach                        | 10–29   | 19.5   | 19.87  | 4.21   |
| Basic Empathy Skills                       |         |        |        |        |
| Cognitive empathy                          | 27–45   | 36.0   | 35.77  | 4.34   |
| Emotional empathy                          | 31–53   | 39.5   | 39.96  | 5.25   |
to evaluate multivariate data. Significance was determined by a \( p \) value of < .05.

**Ethical Considerations**

Ethical conformity approval was obtained from the Non-Interventional Clinical Research Ethics Board at Istanbul Medipol University (108400987-165, issued on March 30, 2015). Written consent was obtained from the administrations of the participating hospitals. Furthermore, the informed consent of nurses who volunteered to participate was obtained. Permission to use the abovementioned scales that were used in this study as data collection tools was obtained via e-mail from their original authors.

**Results**

Eighty nurses (97.5% female, \( n = 78 \); 2.5% male, \( n = 2 \)) were enrolled as participants. The age of participants ranged between 24 and 64 (mean = 37.56 ± 8.12) years, mean years of professional nursing experience was 15.84 ± 8.30, and mean years working in the current hospital was 13.19 ± 8.23. Other descriptive characteristics for the participants are provided in Table 2.

A comparison of scale subdimension scores revealed a negative and statistically significant correlation at a level of 22.3%. Statistical significance was reached only between the LSC subscale and the CE subscale (\( r = .223, p = .047 \); Table 3). Thus, a higher LSC score was associated with a lower CE score.

Comparisons between participants’ descriptive characteristics and subdimension scores on the problem-solving skill scale revealed no significant differences. Thus, demographic characteristics such as age, educational background, and career length were found to have no influence on problem-solving skills (\( p > .05 \); Table 4).

Age, marital status, and professional career length were not found to affect the CE and EE subscale scores, with no statistically significant correlations found between the two subscales (\( p > .05 \); Table 4). However, the EE scores of undergraduate nurses were found to be higher than those of postgraduate nurses, at a level that approached statistical significance (\( p = .078 \)). In addition, the average CE scores of nurses who had worked for 1–10 and 11–20 years were higher than those of nurses who had worked for 21 years or more, at a level that approached statistical significance (\( p = .066 \)).

A statistically significant difference was found between mean years working in the current hospital and educational background, respectively, and CE scores (\( p = .027 \) and \( p = .013 \); Table 4). On the basis of paired comparison analysis, the CE scores of participants with 1–10 years of working experience at their current hospital were higher than those with ≥ 21 years of working experience at their current hospital (\( p = .027 \)). Also on the basis of paired comparison analysis, the CE score of participants educated to the undergraduate level was found to be higher at a statistically significant level than those educated to the master’s/doctorate degree level (\( p = .013 \)).

The comparison of problem-solving skill scores by descriptive characteristics revealed no statistically significant difference between subscale scores and the variables of age, marital status, length of professional and organizational career, or educational background (\( p > .05 \)). Thus, the descriptive characteristics of the participants did not affect their problem-solving skills.

**TABLE 2. Distribution of Descriptive Characteristics**

| Characteristic                        | \( n \) | %  |
|---------------------------------------|--------|----|
| Age (M and SD; years)                 | 37.56  | 8.12|
| ≤ 35                                  | 33     | 41.2|
| > 36                                  | 47     | 58.8|
| Gender                                |        |    |
| Female                                | 78     | 97.5|
| Male                                  | 2      | 2.5 |
| Marital status                        |        |    |
| Married                               | 64     | 80.0|
| Single                                | 16     | 20.0|
| Duration working as a nurse (years; M and SD) | 15.84 | 8.30|
| 1–10                                  | 23     | 28.7|
| 11–20                                 | 35     | 43.8|
| ≥ 21                                  | 22     | 27.5|
| Duration working at current hospital (years) |        |    |
| 1–10                                  | 42     | 52.4|
| 11–20                                 | 21     | 26.3|
| ≥ 21                                  | 17     | 21.3|
| Educational level                     |        |    |
| High school                           | 5      | 6.3 |
| Associate degree                     | 8      | 10.0|
| Undergraduate                         | 54     | 67.5|
| Master’s/doctorate degree             | 13     | 16.2|

**TABLE 3. Correlation Between Basic Empathy Skills and Problem-Solving Skills**

| Basic Empathic Skill     | Cognitive Empathy | Emotional Empathy |
|--------------------------|-------------------|-------------------|
|                          | \( r \) | \( p \) | \( r \) | \( p \) |
| Negative approach to the problem | -.092 | .418 | .113 | .320 |
| Constructive problem solving | .200* | .075 | .036 | .749 |
| Lack of self-confidence | -.223* | .047* | -.211 | .060 |
| Abstaining from responsibility | -.037 | .742 | -.071 | .533 |
| Persistent approach      | .118  | .296 | .189 | .093 |

Note. \( r \) = Pearson correlation test.

*aSpearman’s correlation test.

*\( p < .05 \).
Regression Analysis of Risk Factors Affecting Cognitive and Empathy Skills

Variables found after univariate analysis to have significance levels of $p < .01$ were subsequently modeled and evaluated. A regression analysis was conducted to determine the effect on CE skills of educational level, duration of institutional work, CPS level, and self-insecurity level. The explanatory power of this model was 29.9% ($R^2 = .299$), and the model was significant ($p < .001$). As a result of the analysis, CPS ($p = .006$), educational status of graduate ($p < .001$), and working for the current hospital for a period of more than 20 years ($p = .004$) were found to have a significant and positive influence on the CE score.

A 1-unit increase in the CPS score was found to increase CE skills by 0.139 points ($\beta = 0.139$, 95% CI [0.041, 0.237], $p < .01$). For education, graduate education was found to decrease the CE score by 4.520 points ($\beta = -4.520$, 95% CI [-6.986, -2.054], $p < .001$). For duration working for the current hospital, working for the same institution for a period exceeding 20 years was found to decrease the CE score by 3.429 points ($\beta = -3.429$, 95% CI [-5.756, -1.102], $p < .05$). In addition, a 1-unit increase in the LSC score was found to decrease the CE score by 0.114 points, which did not achieve statistical significance ($\beta = 0.114$, 95% CI [-0.325, 0.096], $p > .05$).

Regression analysis was used to evaluate the effects of education, PA, and LSC on the risk factors affecting EE. As a result of this evaluation, the explanatory power of the model was determined as 15.3% ($R^2 = .153$), which was significant despite the low level ($F = 3.388$, $p = .001$). The effects of PA ($p = .021$) and educational status ($p = .015$) on the EE score were shown through analysis to be statistically significant (Table 5). A 1-unit increase in PA score was found to increase the EE score by 0.323 points ($\beta = 0.323$, 95% CI [0.049, 0.596], $p < .05$). For education, having a graduate education was found to decrease the EE score by 3.989 points ($\beta = -3.989$, 95% CI [-7.193, -0.786], $p < .05$). Moreover, the LSC score was found to be 0.119 points lower than the EE score. However, this result was not statistically significant ($\beta = -0.193$, 95% CI [-0.467, 0.080], $p > .05$). Dummy variables were used in the regression analysis of sociodemographic characteristics (educational status and years working for the current hospital).

Discussion

This study found that age, marital status, educational background, years of professional working experience, and years working for the current hospital did not affect the problem-solving skills of the participants. In the literature, the findings of several studies indicate that characteristics such as age, educational background, department of service, and career length do not affect the problem-solving skills of nurses (Abaan & Altıntoprak, 2005; Kelleci & Gölbaşı, 2004; Yu & Kirk, 2008), whereas other studies indicate that these variables do affect these skills (Ançel, 2006; Watt-Watson, Garfinkel, Gallop, Stevens, & Streiner, 2000; Yu & Kirk, 2008). However, beyond these characteristics, some studies have reported a positive correlation between the problem-solving skills of nurses and their educational level, with this correlation mediated by the physical conditions of the workplace, good relationships with colleagues, and educational background (Yıldız & Güven, 2009). These findings suggest that factors affecting the empathy and problem-solving skills of nurses working in operating rooms differ from known and expected factors.

Operating room nurses deliver dynamic nursing care that requires attention and close observation because of the fast turnover of patients. In addition to the problem-solving skills that they use during the patient care process, these nurses must use or operate a myriad of lifesaving technological devices and equipment (AbuAlRub, 2004; Özgür, Yıldırım, & Aktaş, 2008). The circumstances in which nurses employ their problem-solving skills are generally near-death critical conditions and emergencies. Furthermore, operating rooms are more isolated than other areas of the hospital, which affects nurses who work in operating rooms and intensive care units (AbuAlRub, 2004; Özgür et al., 2008).

Communication is a critical factor that affects the delivery of healthcare services. Communication does not only take place between a service recipient and a provider. To establish a teamwork philosophy between employees, it is essential to build effective communication (Sandelin & Gustafsson, 2015). Empathic communication helps enhance the problem-solving skills of nurses as they work to learn about individual experiences (Kumçağız, Yılmaz, Çelik, & Avci, 2011). Studies in the literature have found that nurses who are satisfied with their relationships with colleagues, physicians, and supervisors have a high level of problem-solving skills (Abaan & Altıntoprak, 2005; Kumçağız et al., 2011) and that higher problem-solving skills are associated with a higher level of individual achievement (Abaan & Altıntoprak, 2005; Chan, 2001). Another finding of this study is that CPS increases the cognitive empathic level. This may be attributed to constructive problem-solving skills increasing CE, as these skills are associated with feelings, thoughts, and behaviors that contribute to problem resolution.

A review of the literature on empathy and communication skills revealed, as expected, that these skills increased with level of education (Kumçağız et al., 2011; Vioulac et al., 2016). However, a number of studies have reported no significant correlation between age, marital status, and professional working experience and empathy skills or communication abilities in nurses (Kumçağız et al., 2011; Yu & Kirk, 2008).

EE is assumed to be a more intuitive reaction to emotions. Factors that affect EE are nurses working with small patient groups, frequent contact with patient groups, and long periods spent accompanying or being in close contact with patient groups (Vioulac et al., 2016). Studies in the literature have reported no correlation between the empathy skills of nurses and demographic characteristics (Vioulac et al., 2016). This study supports this finding, with the empathy
skills of operating room nurses found to be close to the peak value of the scale.

Studies in the literature reveal a positive correlation between empathy and career length (Watt-Watson et al., 2000; Yu & Kirk, 2008) as well as a correlation between increased professional experience and lower empathy (Yu & Kirk, 2008). This study found an association between longer periods working for the same hospital and higher levels of education with lower empathy scores. This may be attributed to the difficult working conditions in operating rooms, intense stress, and high level of potential stress-driven conflicts between employees in work settings.

**TABLE 4.**

**Evaluation of Problem-Solving Skills Score, by Descriptive Characteristics**

| Characteristic                                | Cognitive Empathy |          | Emotional Empathy |          | Negative Approach to the Problem |          |
|-----------------------------------------------|-------------------|----------|-------------------|----------|----------------------------------|----------|
|                                               | M     | SD    | M     | SD    | M     | SD    | M     | SD    |       |       |       |       |
|                                               | Median |       | Median |       | Median |       | Median |       |       |       |       |       |
| Age (years)                                   |        |        |        |        |        |        |        |        |       |       |       |       |
| ≤ 35                                          | 36.52  | 4.53  | 39.45  | 5.76  | 34.45  | 11.01 |       |       |       |       |       |       |
| ≥ 36                                          | 35.26  | 4.17  | 40.30  | 4.90  | 36.55  | 10.94 |       |       |       |       |       |       |
| p                                             | .203a  |       | .483a  |       | .402a  |       |       |       |       |       |       |       |
| Marital status                                |        |        |        |        |        |        |        |        |       |       |       |       |
| Married                                       | 35.50  | 4.52  | 39.75  | 4.75  | 35.48  | 1.14  |       |       |       |       |       |       |
| Single                                        | 36.88  | 3.42  | 40.75  | 7.06  | 36.50  | 10.46 |       |       |       |       |       |       |
| p                                             | .260a  |       | .598a  |       | .742a  |       |       |       |       |       |       |       |
| Duration working as a nurse (years)           |        |        |        |        |        |        |        |        |       |       |       |       |
| 1–10                                          | 36.61  | 4.58  | 40.52  | 6.02  | 34.48  | 9.26  |       |       |       |       |       |       |
| 11–20                                         | 36.37  | 3.99  | 39.34  | 5.13  | 36.34  | 12.50 |       |       |       |       |       |       |
| ≥ 21                                          | 33.95  | 4.27  | 40.32  | 4.71  | 35.91  | 10.29 |       |       |       |       |       |       |
| p                                             | .066c  |       | .660c  |       | .817c  |       |       |       |       |       |       |       |
| Duration working at current hospital (years)  |        |        |        |        |        |        |        |        |       |       |       |       |
| 1–10                                          | 36.45  | 4.26  | 39.88  | 5.76  | 34.36  | 10.38 |       |       |       |       |       |       |
| 11–20                                         | 36.43  | 4.04  | 39.52  | 4.56  | 37.86  | 13.16 |       |       |       |       |       |       |
| ≥ 21                                          | 33.29  | 4.22  | 40.65  | 4.97  | 36.29  | 9.41  |       |       |       |       |       |       |
| p                                             | .027*  |       | .805c  |       | .479c  |       |       |       |       |       |       |       |
| Educational level                             |        |        |        |        |        |        |        |        |       |       |       |       |
| High school and associate degree              | 35.31  | 5.11  | 38.92  | 3.71  | 35.54  | 9.27  |       |       |       |       |       |       |
| Undergraduate                                 | 36.61  | 3.83  | 40.81  | 5.22  | 35.93  | 10.97 |       |       |       |       |       |       |
| Master’s/doctorate degree                     | 32.77  | 4.48  | 37.38  | 6.02  | 34.85  | 13.07 |       |       |       |       |       |       |
| p                                             | .013*  |       | .078c  |       | .950c  |       |       |       |       |       |       |       |

*aStudent t test. bMann–Whitney U test. cOne-way analysis of variance test. dKruskal–Wallis test.
*p < .05.
Stress is a major factor that affects the empathy skills and relationship-building abilities of nurses (Vioulac et al., 2016). Nurses are exposed to a wide variety of stressors such as quality of the service, duration of shifts, workload, time pressures, and limited decision-making authority (Patrick & Lavery, 2007; Shimizutani et al., 2008; Vioulac et al., 2016). In particular, environments evoking a sense of death (e.g., operating rooms) is another factor known to elevate perceived stress (Ashker, Penprase, & Salman, 2012). High stress may lead to negative consequences such as reduced problem-solving abilities (Zhao, Lei, He, Gu, & Li, 2015). Both having a long nursing career and working in stressful environments such as operating rooms can lead to problems such as reduced problem-solving abilities (Zhao, Lei, He, Gu, & Li, 2015). Both having a long nursing career and working in stressful environments such as operating rooms can lead to problems such as reduced problem-solving abilities (Zhao, Lei, He, Gu, & Li, 2015). 

| Constructive Problem Solving | Lack of Self-Confidence | Abstaining From Responsibility | Persistent Approach |
|-----------------------------|-------------------------|--------------------------------|---------------------|
| **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** |
| Median | Median | Median | Median | Median | Median |
| 52.52 | 10.51 | 13.30 | 4.30 | 11.79 | 3.31 | 19.45 | 4.94 |
| 51.06 | 7.82 | 13.11 | 4.12 | 10.91 | 3.51 | 20.17 | 3.64 |
| 51.59 | 8.96 | 13.33 | 4.22 | 11.14 | 3.43 | 19.73 | 4.12 |
| 51.94 | 9.40 | 12.63 | 4.06 | 11.81 | 3.53 | 20.44 | 4.66 |
| 52.52 | 10.99 | 12.65 | 3.31 | 11.78 | 2.54 | 20.04 | 4.76 |
| 51.83 | 8.19 | 13.31 | 4.64 | 11.29 | 3.94 | 19.80 | 3.98 |
| 50.50 | 8.16 | 13.55 | 4.31 | 10.73 | 3.47 | 19.82 | 4.15 |
| 52.55 | 10.10 | 12.83 | 3.89 | 11.36 | 3.19 | 20.02 | 4.80 |
| 50.52 | 7.19 | 13.52 | 4.26 | 11.67 | 4.05 | 19.90 | 3.40 |
| 50.88 | 8.30 | 13.65 | 4.86 | 10.59 | 3.32 | 19.47 | 3.73 |
| 50.15 | 6.38 | 14.54 | 5.16 | 11.54 | 3.31 | 20.08 | 3.07 |
| 50.91 | 8.98 | 12.56 | 3.43 | 11.07 | 3.46 | 19.28 | 4.26 |
| 56.31 | 10.32 | 14.46 | 5.50 | 11.85 | 3.67 | 22.15 | 4.45 |

The Problem Solving Skills and Empathy
However, the Cronbach’s \( \alpha \) in the study was between .60 and .80 and is highly trustworthy. The variables remaining in Model A affected level of low for the CE (\( R^2 = .299 \)). Having constructive problem-solving skills (\( p = .006 \)), having a high level of education (\( p < .001 \)), and working for the current hospital for over 20 years (\( p = .004 \)) were found to be significantly related to CE.

Other variables were found to have no significant effect. According to the results of the regression analysis, all of the remaining variables in Model B accounted for a relatively low portion of the CE (\( R^2 = .153 \)). When the \( t \) test results for the significance of the regression coefficients were examined, it was determined that PA (\( p = .021 \)) and educational status (\( p = .015 \)) were significant predictors of EE. Other variables had no significant effect (Table 5). The increase in the level of education of nurses may have increased their cognitive and emotional development. Thus, working in the same hospital for over 20 years was found to increase the levels of CE and EE. This result may be because of greater professional experience and regular experience handling numerous, different problems. In addition, the low explanatory power of the models may also be because of the fact that many other arguments that may affect empathy were not modeled. When constant values are fixed and the value of the independent variables entering the regression formula is zero, constant value is the estimated value of the dependent variable. According to findings of this study, sociodemographic characteristics and problem-solving abilities did not affect empathy level, although the CE value was 31.707 and the EE value was 37.024. Repeating this research in larger and different nurse groups may be useful to verify these research results.

**Conclusions**

The following results were derived from this study: First, constructive problem-solving skills affect CE skills. CE is adversely affected by the PA and LSC. Second, no correlation was found between the demographic characteristics of nurses and their problem-solving skills. Third, as level of education increases, cognitive and emotional levels of empathy decrease.

Duration of time spent working at one's current health care institution and educational level were both found to correlate negatively with the CE score. The higher the educational level and PA and the lower the self-confidence of the participants, the lower their EE levels. Finally, higher constructive problem-solving scores were associated with higher CE skills.

**Limitations**

The major limitation of the study is that it was conducted in the affiliated hospitals of one healthcare organization. The study data were obtained from operating room nurses who currently worked in these hospitals and who volunteered to

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**TABLE 5. Regression Model of Risk Factors Affecting Cognitive and Emotional Empathy**

| Model     | \( \beta \) | SE  | t    | \( p \)   | 95% CI             |
|-----------|-------------|-----|------|----------|--------------------|
| **Model A** |             |     |      |          |                    |
| (Constant) | 31.707      | 3.049 | 10.398 | < .001** | [25.630, 37.784]   |
| Constructive problem solving | 0.139      | 0.049 | 2.825  | .006** | [0.041, 0.237]    |
| Lack of self-confidence | -0.114     | 0.106 | -1.084 | .282    | [-0.325, 0.096]  |
| Education (high school)   | 0.154      | 1.273 | 0.121  | .904    | [-2.384, 2.691]  |
| Education (postgraduate)  | -4.520     | 1.237 | -3.653 | < .001** | [-6.986, -2.054] |
| Duration working as a nurse (≥ 21 years) | -3.429     | 1.168 | -2.937 | .004** | [-5.756, -1.102] |
| Duration working at current hospital (11–20 years) | -0.565     | 1.081 | -0.523 | .603    | [-2.719, 1.589] |
| **Model B** |             |     |      |          |                    |
| (Constant) | 37.024      | 3.302 | 11.212 | < .001** | [30.446, 43.602]   |
| Persistent approach | 0.323      | 0.137 | 2.352  | .021*   | [0.049, 0.596]    |
| Lack of self-confidence | -0.193     | 0.137 | -1.408 | .163    | [-0.467, 0.080]  |
| Education (high school)   | -1.766     | 1.562 | -1.130 | .262    | [-4.876, 1.346]  |
| Education (postgraduate)  | -3.989     | 1.608 | -2.481 | .015*   | [-7.193, -0.786] |

*Dependent variable: cognitive empathy \( R^2 = .299 \). *Dependent variable: emotional empathy \( R^2 = .153 \).

\( *p < .05 \). **p < .01. 
participate. The conditions of nurses who did not participate in the study cannot be ascertained. A second important limitation is that the data reflect the subjective perceptions and statements of the participants. A third important limitation is that participant characteristics such as trust in management, trust in the institution, burnout, and communication skills were not assessed. For this reason, the effects of these variables on problem-solving and empathy skills remain unknown.

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Critical revision of the article: FA

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