

How Nursing Students Perceive Neurofeedback Training as an Independent Nursing Intervention: Pilot Study Focusing on Attitude

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Abstract

This study aimed to evaluate the practical feasibility of neurofeedback training (NFT) as an independent nursing intervention and to find out the predictive factors of participatory practice in NFT. Data were collected from 250 nursing students using self-reports. The questionnaire was based on the Knowledge-Attitude-Practice (KAP) survey model using Delphi methodology with 3-round surveys. The standardized contents of the scale were categorized into three domains, seven subgroups, and 57 items. The data were analyzed using a t-test, ANOVA, a Scheffé test, Pearson's correlation coefficients, a regression analysis, and a Sobel test. Students' knowledge level was 57%, a low score compared to attitude and practice. Significant barriers to NFT were associated with negative attitudes, such as fear of side effects or complications or using a computerized approach. The attitude toward NFT completely mediated the relationship between knowledge and practice ($R^2=.43$; $Z=7.44$, $p<.001$). For students to be able to apply NFT in the clinical field after graduation, a positive attitude should be cultivated in the regular nursing school curriculum. We suggest that NFT can act as a positive nursing intervention if students' positive attitudes are increased. Future research on a variety of types of NFT is needed. It is the condensed version of the full text of this article.

Keywords: Knowledge, Attitude, Practice, Neurofeedback, Nursing

1. Introduction

The quality of medical services is changing, resulting in healthier lives for human beings. Recent technological advances have led to the introduction of state-of-the-art medical equipment, information technology, and biotechnology into treatment areas, leading to the growth of traditional medical treatment approaches and new approaches to cognitive brain science [1][2]. As such, expectations for nurses' potential to perform their roles have increased, and nurses' independent and professional roles are required. It is time to seriously consider and respond to the growth of nursing technology and the development of interventions in nursing to actively respond to the anachronistic conditions and demands [2].

A Nurse Practitioner course in South Korea was developed in 2000 and has been conducted to educate professional staff since then. However, there still needs to be more independent nursing practice among professional nurses [3]. Therefore, it is

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necessary to develop a nursing curriculum and intervention through positive attitudes and awareness improvement of brain science intervention for symptom relief and maximal treatment of the subject.

Neurofeedback training is a bio-feedback arbitration method that optimizes brain function (peak performance) by reconfiguring the brain's networking by altering brain waves [4]. Meta-analysis of neurofeedback training to improve the brain's self-regulating ability through repetitive training shows that this training resulted in stress, depression, anxiety, and Attention Deficit Hyperactivity Disorder (ADHD) effects, with a medium-sized effect. Among these, ADHD is known to cause people to be extremely high in carelessness, memory, hyperactivity, and emotion [5].

Neurofeedback training interventions from licensed nurses have become available for outpatients, inpatients, communities, and homes since the 1990s [6]. The primary value of constant nursing interventions, even with changes in age, is based on mind-body medicine, which is based on psychological support and care for human beings' safety, disease, prevention, symptom control, and relaxation [7]. To develop new nursing interventions for the function of the brain, which is the body part of "mind and body," as described in mind and body medicine, it is necessary to understand the level and effect of attitudes in the relationship between knowledge and practical feasibility of nursing college students.

1.1. Objectives

This study aims to identify and correlate knowledge, attitudes, and practice levels of interpretation of neurofeedback training for college students based on the KAP model and to understand the relationship between knowledge and practice. The specific objectives are: First, to identify the extent to which the subject's knowledge, attitudes, and practice of interventions in the feedback training are conducted; second, to analyze the correlation between the subject's knowledge, attitudes, and practice of mediating in neuro-feedback training; and third, to understand the effectiveness of the practice's attitude as a parameter as it is validated in the relationship between the subject's knowledge of the neuro-feedback training arbitration and its practice.

2. Methods

2.1. Research Design and Participants

This study intends to identify and correlate the level and effectiveness of neurofeedback intercession, neurological therapy method, and neurography training and verify the relationship between knowledge and performance. The study was conducted on undergraduates with six months or more of clinical hands-on experience at the University of Nursing in D City. Using the G*power 3.1.9.2 program, with an effect size of .15, a significance level of 0.05, and a statistical power of 0.95, the total sample size for adequate power was estimated at 172 participants. The minimum number of samples required was 172, based on eight independent and ten research variables. Thus, a total of 250 questionnaires were distributed to account for the rate of omission. Among them, 233 questionnaires, excluding 17 that had insincere or incomplete responses, were included in the final analysis.

2.2. Research tools

Because there was no tool for measuring the knowledge, attitude, and practical feasibility of the intervention in neurofeedback training, we constructed the components of the tool based on the KAP model [8] and Roelens's sub-domain framework [9]. Then, a preliminary question for each area was developed using the Delphi survey with an expert panel—the 3-step structured Delphi technique for quantification of expert opinions and structural decision-making. The period was from October 25, 2016, to November 25, 2016. A total of five experts participated in the focus group interview. Among them, one professor of nursing (Certificate: No. E5869) and one doctoral student (Certificate: No. E6122) had obtained a Neurofeedback certification from Biofeedback Certification International Alliance (BCIA).

As a result, the knowledge domain consisted of 9 items of essential knowledge and 14 items of intervention knowledge. The attitude domain consisted of 4 items of preference and agreement, six items of motivation, four items of perceived self-efficacy, and six items of expected outcome. The attitude domain consisted of 14 items of feasibility. The Delphi survey was conducted three times to develop the constituent items of sub-domain attributes that reflect the knowledge, attitude, and practical feasibility. The third Delphi survey selected items with priorities and relevance and a Content Validity Index (CVI) of over 80%. A 5-point Likert scale, with one score for "definitely not sure" to a five score for "definitely sure," shows that the higher the score, the higher the knowledge, attitude, and practical feasibility of the neurofeedback training intervention. The internal reliability of the developed knowledge tool was .79, the internal reliability of the developed attitude tool was .87, and the internal reliability of the developed practical feasibility tool was .77.

2.3. Data collection

Data collection was conducted after the approval of the K University Institutional Review Board (No. KNU-2016-0122) to verify ethical and scientific feasibility and the safety and protection of human rights. Nursing students completed the questionnaire from November 28 to December 23, 2016. Nursing students thoroughly explained the purpose and method of the study. Then, students who voluntarily agreed were asked to read one piece of paper about neurofeedback training, the area of use, the training course, and an introduction to the exercise. Next, participants were asked to answer questions about the knowledge, attitude, and practical feasibility of neurofeedback. Participants were able to suspend their participation at any time voluntarily. The researcher collected the questionnaire, and a gift was given to all participants.

2.4. Data analysis

The collected data were analyzed using the SPSS 23.0 program. The subjects' general characteristics and the knowledge, attitude, and likelihood of neurofeedback training intervention were assessed using frequency, percentage, mean, and standard deviation. The difference in knowledge, attitude, and practical feasibility of neurofeedback training intervention according to general characteristics was verified using a t-test and a one-way ANOVA. Post hoc tests were analyzed using a Scheffé test. Pearson's correlation coefficients were used to determine the correlation between knowledge, attitude, and practical feasibility. To test the mediating effects of attitudes on the participants' knowledge and practical feasibility, a 3-step multiple regression

analysis was performed according to the procedure presented by Baron and Kenny [10]. The Sobel test verified the statistical significance of the mediator effect.

3. Results

3.1. General characteristics of participants

The general characteristics of the participants are as follows: 93.6% were female students, and the rest were male students; 53.6% were seniors and 46.4% juniors, all of whom had clinical experience; and 47.6% had less than one year of training, 34.3% less than two years, and 18.0% more than two years. The participants evaluated the practicum: 55.8% graded it in the middle, 39.1% as high, and 5.2% as low. 69.1% rated their satisfaction as being in the middle, 21.5% high, and 9.4% low. The satisfaction of the major was 58.6% in the middle, 34.3% in the high, and 6.9% in the low.

3.2. The level of knowledge, attitudes, and practical feasibility

The total average knowledge score on the neurofeedback training intervention was 3.57 out of 5 points. The essential knowledge sub-domain score was 3.82 points, and the intervention knowledge was 3.41 points. The average attitude score on the neurofeedback training intervention was 3.71 out of 5 points. The sub-domain's agreement and preference score was 3.80, that for perceived self-efficacy was 3.79, that for expected outcome was 3.77, and that for motivation was the lowest at 3.55. The total average score of practical feasibility on the neurofeedback training intervention was 3.03 out of 5 points.

3.3. Relationship between knowledge, attitude, and practical feasibility

There was a significant positive correlation between knowledge, attitude, and practical feasibility of the neurofeedback training intervention. Among them, the highest positive correlation was between attitude and practical feasibility ($r=.66$, $p<.001$), followed by knowledge and attitude ($r=.65$, $p<.001$) and knowledge and practical feasibility ($r=.49$, $p<.001$).

3.4. Mediating effect of attitude

In the regression analysis test, the Durbin-Waston index was independent of autocorrelation without convergence from 1.73 to 2.05, and the Variance Inflation Factor (VIF) was 1.00-1.91, which was less than 10, indicating that there was no multi-collinearity between variables. The fit of the regression model satisfied both the normality of the residuals (Kolmogorov-Smirnov's $p>.10$) and the equilibrium assumption (Breush-Pagan's $p>.05$).

To test the mediating effect of attitude on the relationship between the knowledge of neurofeedback training intervention and practical feasibility, the 3-step verification procedure from Baron and Kenny [10] was performed. In the first step of verifying the model, the effect of knowledge on attitudes was significant, and the attitude increased as knowledge increased ($\beta=.65$, $p<.001$). As a result of a multiple regression analysis of the effects of knowledge on practical feasibility in the second stage, the influence of knowledge on practical feasibility was shown to be significant; the higher the knowledge, the higher the likelihood of practical feasibility ($\beta=.49$, $p<.001$). In the third

stage, regression analysis verified the effect of knowledge and attitude on practical feasibility; attitude was entirely mediated by the non-standardized regression coefficient of expertise, which decreased from 0.55 to 0.53 and was insignificant ($\beta=.10$, $p=.130$). The Sobel test was conducted to test the significance of the mediating effects of attitudes. It was found that attitude was a significant complete mediator in the relationship between knowledge and practical feasibility ($Z=7.44$, $p<.001$).

4. Discussion

This study aimed to identify the obstacles and facilitators of neurofeedback training as an independent nursing intervention by analyzing the knowledge, attitude, and practical feasibility of neurofeedback training in nursing college students. Furthermore, this study was conducted to provide essential data on developing a new nursing intervention protocol and improvement direction of nursing education.

The knowledge of nursing college students about neurofeedback training was 57% or 3.57 out of 5 points. The basic understanding of the brain among the sub-items of knowledge was higher than the knowledge of an intervention. Knowledge about the brain's essential functions was high, but scores on the questions of the self-regulation potential of the brain needed to be higher. It is thought that existing nursing education is based on the brain structure and the function of each area, so students do not get accurate information about the neurofeedback mediation method of this relatively unfamiliar neurosurgery approach and do not receive the related education.

The attitude toward neurofeedback training returned a score of 3.71, indicating that attitude was higher than knowledge. Perceived self-efficacy, agreement, and preference were the highest among the sub-domains, but expected outcomes and motivation were low. In a previous study, the higher the self-efficacy, the higher the tendency to actively perform a task without avoiding it [11]. If systematic education is given to nursing college students with high self-efficacy for neurofeedback training, it can be used strategically as a nursing intervention. According to Bandura's social cognitive theory [12], mental factors such as motivation, expectation, and beliefs affect performance; proper nursing education should be given priority to have positive expectations and motivation.

The mean practical feasibility score of neurofeedback training was 3.03 points. The facilitating factor of performance is possible for children with ADHD, using non-invasive methods and for neurofeedback training for various diseases; it would be better if the participants could get certified.

After checking the mediating effect of attitude on the knowledge of neurofeedback training and its practical feasibility, it was found that knowledge influences practical feasibility when mediated by attitude as a complete mediator. In addition, since practical feasibility is higher when the attitude is mediated, education promotes positive attitudes.

5. Conclusion

This study was conducted when brain science approaches to nursing intervention have yet to be performed. The knowledge, attitude, and practical feasibility level of a neurofeedback training intervention in nursing college students were investigated based on the KAP model. This study will be used as primary data for developing a training course and protocol for neurofeedback training intervention. The theoretical knowledge based on the brain science of nursing students needed to be more sufficient, and the

attitude between knowledge and the performance possibility of nursing college students had a complete mediation effect. Therefore, it is necessary to cultivate attitudes to pursue various complicated nursing situations continuously, and it is required to repeat this type of study.

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