KMAN PUBLISHING INSTITUTE
Journal Website

Article history:
Received 08 September 2024
Revised 15 November 2024
Accepted 24 November 2024
Published online 01 July 2025

Journal of Assessment and Research in Applied Counseling

Volume 7, Issue 3, pp 1-12

E-ISSN: 3041-8518

Comparison of the Effectiveness of Problem-Solving Approach-Based Training and Critical Thinking Training on Reducing Academic Self-Handicapping Behaviors and Academic Procrastination in Nursing Students with Test Anxiety

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Ganjifard, M., Jafar Tabatabaei, S. S., Jafar Tabatabaei, T. S., & Shahabizadeh, F. (2025). Comparison of the Effectiveness of Problem-Solving Approach-Based Training and Critical Thinking Training on Reducing Academic Self-Handicapping Behaviors and Academic Procrastination in Nursing Students with Test Anxiety. *Journal of Assessment and Research in Applied Counseling, 7*(3), 1-12.
http://dx.doi.org/10.61838/kman.jarac.7.3.8

A B S T R A C T

Objective: The present study aimed to compare the effectiveness of problem-solving approach-based training and critical thinking training on reducing academic self-handicapping behaviors and academic procrastination in nursing students with test anxiety.

Methods and Materials: This research was a quasi-experimental study with a pretest-posttest design involving two intervention groups and one control group. The study population included nursing students with test anxiety in Birjand during the academic year 2022-2023. According to Cohen's table, 36 students were selected through purposive sampling and randomly assigned to three groups. The measurement tools in this study included the Academic Procrastination Questionnaire (Savari, 2011) and the Academic Self-Handicapping Questionnaire (Schwinger & Stiensmeier-Pelster, 2011). The experimental groups underwent 8 sessions of 80-minute training based on problem-solving and critical thinking, while the control group received no such training. After the training period, a post-test was administered to all groups. The obtained data were analyzed using multivariate covariance analysis (MANCOVA) with SPSS statistical software.

Findings: The study results showed that problem-solving and critical thinking training significantly reduced academic self-handicapping behaviors and academic procrastination in nursing students with test anxiety. However, no significant difference was found between the two training approaches regarding their effect on reducing academic self-handicapping behaviors and academic procrastination.

Conclusion: This study demonstrated that both problem-solving approach-based training and critical thinking training significantly reduced academic self-handicapping behaviors and academic procrastination in nursing students with test

anxiety. The effects of the interventions were maintained during follow-up, highlighting the long-term benefits of these methods. Given the critical role these skills play in improving academic performance and reducing negative behaviors, integrating problem-solving and critical thinking training into educational and clinical programs is recommended to enhance student outcomes and well-being.
Keywords: *problem-solving, critical thinking, academic self-handicapping, academic procrastination, nursing students, test anxiety.*

1. Introduction

Test anxiety is defined as a feeling of discomfort or apprehension before, during, or after an exam due to worry or fear, and it affects individuals of all ages who are in the process of evaluating, assessing, and grading their abilities or achievements (Dadzie et al.). Moreover, students' learning methods can also influence test anxiety, as research has shown that learning processes play a significant role in academic performance (Janiesch et al., 2021). In some sources, learning processes are also referred to as cognitive engagement in learning (Tannoubi et al., 2022), which is classified into two categories: surface and deep learning (Hoffmann et al., 2021). In surface learning, the student is only focused on completing their academic course, whereas in deep learning, the student strives to understand and comprehend the subject matter (Zhou et al., 2022).

These learning processes can lead to both academic improvement and decline. If a student's learning process is deep, they will not only face fewer challenges with exams and assignments but also experience greater academic progress in the long term (García et al., 2014). It is evident that both academic self-handicapping behaviors, academic procrastination, and learning processes (deep and surface) are among the factors influencing academic performance, particularly for nursing students. Therefore, educational interventions can be employed to reduce anxiety symptoms in such students.

Various factors can disrupt learning processes, including academic self-handicapping behaviors (Jia et al., 2021). For instance, students with test anxiety may exhibit academic self-handicapping behaviors (Barutçu Yıldırım & Demir, 2020). Academic self-handicapping refers to any action or background situation that allows an individual to attribute their failure to external factors and their success to internal factors (Wusik & Axsom, 2016). Self-handicapping is the process of creating obstacles to achieving successful performance, designed to protect individuals' sense of competence (Berglas & Jones, 1978). This phenomenon, where self-handicapping correlates positively with test anxiety, has been uncovered in a qualitative study, with a higher likelihood that individuals with high self-handicapping tendencies are more likely to seek excuses for postponement, withdrawal, or failure (Martin et al., 2003). In other words, individuals with high self-handicapping experience more pressure before exams but do not work hard enough, resulting in lower final grades than others (Molaei Moghbeli et al., 2022).

As mentioned earlier, individuals with high self-handicapping may procrastinate, deliberately skip educational content, strategically withdraw efforts, or avoid practicing prior skills, leading to a decline in their academic performance (Martin, 2007; Putwain, 2019). As a major barrier to realizing personal potential and achievements, self-handicapping has numerous negative correlations with physical and mental health as well as academic life (Barutçu Yıldırım & Demir, 2020). During the COVID-19 pandemic, the use of academic self-handicapping strategies was one of the key factors influencing the physical and mental health growth of nursing and medical students, potentially leading to negative outcomes, such as poor learning status and lack of effort (Jia et al., 2021). On the other hand, self-handicapping strategies can help individuals manage problems and obstacles more effectively and find appropriate solutions. This can prevent stress and frustration, which may lead to academic procrastination (Muliani et al., 2020).

Procrastination is a complex phenomenon involving behavioral, emotional, and cognitive elements. It is commonly defined as the postponement of responsibilities (tasks or assignments) and decision-making, which not only affects task completion but also impacts individuals' self-efficacy levels (Brando-Garrido et al., 2020). Academic procrastination is prevalent among medical and nursing students, with approximately 13.8% to 49.9% of medical and nursing students reporting procrastination in completing learning tasks (Madhan et al., 2012). Studies have shown that academic procrastination not only leads to reduced academic progress and negatively impacts students' learning attitudes but also contributes to negative emotions such as depression and anxiety (Martinčeková & Enright, 2020). Additionally, academic procrastination can exhaust students

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E-ISSN: 3041-8518

and prevent them from acquiring further nursing knowledge and skills, which is detrimental to the training of nurses and the improvement of nursing education quality worldwide (Alipour et al., 2024; Almurumudhe et al., 2024; Evriani, 2024; Shaw et al., 2016). According to previous research, students with more surface-level learning strategies tend to procrastinate in completing academic tasks and responsibilities (Zacks & Hen, 2018).

It is clear that academic self-handicapping behaviors, academic procrastination, and learning processes (deep and surface) are factors that significantly affect the academic performance of students, particularly nursing students. Therefore, educational interventions can reduce anxiety symptoms in them. One intervention that has been effective in reducing test anxiety symptoms is problem-solving training (Izadifard & Sepasi Ashtiani, 2010). Molaei Moghbeli et al. (2022) focused on the effectiveness of problem-solving skills training on academic self-handicapping in students (Molaei Moghbeli et al., 2022).

In problem-solving training, individuals learn how to break down a problem into smaller steps, find a response for each step, and eventually reach a final solution to the problem (Song et al., 2022; Zyoud et al., 2022). Problem-solving ability is an important skill for life in the current era, and today, whether in general, technical, or everyday life activities, problem-solving ability is essential (Babazadeh et al., 2021). Acquiring problem-solving skills plays a crucial role in mental and physical health, especially when individuals face adverse events and negative life stresses. All cognitive-behavioral actions are considered forms of problem-solving, teaching individuals how to think when confronting problems rather than what to think (Zamani et al., 2017).

Creative and critical thinking foster motivation and interest among nurses, which are the foundations of the learning process. When a nurse is well-versed in creative and critical thinking, they can effectively identify behaviors that nurture these two types of thinking and use them to achieve the goal of learning. It is important to note that "cognitive scientists believe that curiosity and certain intellectual talents are innate human characteristics" (Alt et al., 2023; Jiménez-Gómez et al., 2019; Li et al., 2019; Song et al., 2022). Given this, there is currently an increasing demand for the nursing profession to combat diseases and epidemics globally. Therefore, it is essential to cultivate more passionate and professional nursing students. As such, it is necessary for researchers to examine the risk factors and mechanisms associated with test anxiety among nursing students and implement interventions to reduce it. Hence, based on what has been discussed, the present study poses the following research question: Is there a difference in the effectiveness of problem-solving approach-based training and critical thinking training in reducing academic self-handicapping behaviors, academic procrastination, and learning processes (deep and surface) among nursing students with test anxiety?

2. Methods and Materials

2.1. Study Design and Participants

The research method was applied in terms of its objective and classified as quantitative in terms of data collection. It was a quasi-experimental study with a pre-test, post-test design including a control group. The statistical population comprised all nursing students with test anxiety in Birjand during the academic year 2022-2023. From among the students who were willing to participate in the study, the Test Anxiety Questionnaire was administered, and 45 eligible nursing students with higher test anxiety scores were selected using purposive sampling based on the inclusion criteria. These 45 students were randomly assigned to three groups of 15 participants. It should be noted that Cohen's table was used to determine the sample size, with a confidence level of 95%, an effect size of 0.70, and a statistical power of 0.91, determining 15 participants per group.

The inclusion criteria included informed consent to participate in the study, being a medical student, studying nursing in the School of Nursing, no consultation with a psychiatrist in the past four months, no psychological issues, attending all educational sessions, not simultaneously participating in other educational sessions during the study, and scoring above 50 on the Test Anxiety Questionnaire. The exclusion criteria included incomplete responses to the questionnaires in the post-test and follow-up stages.

After coordinating with the authorities at Azad University, an announcement was made for registration of interested participants in the research project. After the specified time, 45 students with test anxiety scores above 50 were selected through purposive sampling and randomly assigned to three groups (15 students in the problem-solving approach training group, 15 in the critical thinking training group, and 15 in the control group). Then, under similar conditions, the Academic Self-Handicapping Behavior Questionnaire, Academic Procrastination Questionnaire, and Learning Processes (deep and surface) were

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administered as a pre-test to all three groups. After this phase, the first experimental group received ethical approval and was subjected to educational interventions, while the control group received no interventions from the educational approaches in this study and continued their regular daily activities, remaining on a waiting list. Upon completion of the training sessions, a post-test was administered to all three groups under the same conditions. During this stage, all three groups answered the post-test questions under similar circumstances. After collecting the pre-test and post-test data, the gathered information was analyzed using appropriate statistical tests.

2.2. Measures

2.2.1. Test Anxiety

This inventory consists of 25 questions developed by Abolghasemi et al. (1996). It is scored on a four-point Likert scale, where "never" is scored 0, "rarely" is scored 1, "sometimes" is scored 2, and "often" is scored 3. The minimum score in this test is 0, and the maximum is 75. The higher the score, the greater the test anxiety. The creators of the questionnaire assessed its reliability using Cronbach's alpha method, and the Cronbach's alpha for the entire sample was reported as 0.94, 0.95 for females, and 0.95 for males. The test-retest reliability for the entire sample was reported with a correlation coefficient of 0.77, 0.88 for females, and 0.67 for males, all significant at the 0.01 level. The creators also assessed concurrent validity with the Coopersmith Self-Esteem Scale, yielding correlation coefficients of -0.57 for the entire sample, -0.68 for females, and -0.43 for males, significant at the 0.01 level. In Iran, Cronbach's alpha has been used to assess the reliability of the inventory in other studies, with an estimated coefficient of 0.92, and the correlation of each item with the total score ranged from 0.45 to 0.72, indicating internal consistency (Ghaffari & Arfa Baluchi, 2011). Other studies reported Cronbach's alpha coefficients of 0.91 (Javadi et al., 2016) and 0.93 (Gharibnavaz et al., 2017). In another study, split-half reliability coefficients were 0.89 for the entire sample, 0.90 for females, and 0.88 for males (Moradizadeh et al., 2016). A study on students reported a Cronbach's alpha of 0.96 (Esmalian et al., 2021). The Cronbach's alpha in this study was 0.78.

2.2.2. Academic Self-Handicapping

This unidimensional scale consists of 7 questions developed by Schwinger and Stiensmeier-Pelster (2011). The scale is scored on a Likert scale where "strongly disagree" is scored 1, "disagree" is scored 2, "neutral" is scored 3, "agree" is scored 4, and "strongly agree" is scored 5. A higher score indicates a greater tendency for self-handicapping. The creators reported a Cronbach's alpha of 0.80 for the scale (Schwinger & Stiensmeier-Pelster, 2011). In Iran, the validity and reliability were assessed using factor analysis, and the Root Mean Square Error of Approximation (RMSEA) was 0.01. Cronbach's alpha for reliability was calculated as 0.66 (Sabzi et al., 2021). In another study, Cronbach's alpha was 0.79, and confirmatory factor analysis was used to determine validity, with an RMSEA of 0.06 reported (Mousavi et al., 2020). The Cronbach's alpha in this study was 0.81.

2.2.3. Academic Procrastination

This questionnaire consists of 12 questions developed by Savari (2011). It measures three components of procrastination: intentional procrastination (items 1, 2, 3, 4, 5), procrastination due to physical/mental fatigue (items 6, 7, 8, 9), and procrastination due to poor planning (items 10, 11, 12) (Khosravi et al., 2022). The questionnaire is scored on a 5-point Likert scale, where "never" is scored 0, "rarely" is scored 1, "sometimes" is scored 2, "often" is scored 3, and "always" is scored 4 (Hatefnia et al., 2019). The creator reported Cronbach's alpha coefficients of 0.77 for intentional procrastination, 0.60 for procrastination due to fatigue, 0.70 for procrastination due to poor planning, and 0.85 for the entire questionnaire (Savari, 2011). In another study, a Cronbach's alpha of 0.85 was reported (Mirarab Razi & Jafari, 2015). Another study reported a Cronbach's alpha of 0.83, indicating the reliability of the questionnaire (Zarei & Khoshouei, 2016). In this study, the Cronbach's alpha was 0.77.

2.3. Interventions

2.3.1. Problem-Solving Skills Training

This package was based on adaptations from D'Zurilla and Goldfried (1971) and Mohammadkhani (2004). The problem-solving skills training program was conducted over eight 80-minute sessions, held once or twice per week by the instructor (Babazadeh et al., 2021; Ghavipanah et al., 2014; Izadifard & Sepasi Ashtiani, 2010; Khorami & Zaboli, 2018;

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Molaei Moghbeli et al., 2022; Song et al., 2022; Zamani et al., 2017).

Session 1: Introduction and Preparing for Problem-Solving Training

In this session, students were introduced to the foundational concepts of problem-solving. They were informed that rigidly relying on one solution for various challenges often leads to feelings of helplessness when the solution fails. They were encouraged to explore different solutions instead of giving up. The session highlighted the importance of adopting a flexible approach and emphasized that problem-solving is an active process, not passive avoidance. Students were introduced to the five essential steps of problem-solving, which would be covered in subsequent sessions.

Session 2: Adopting a Problem-Solving Mindset

This session focused on fostering the belief, "I can solve problems." Students learned that when faced with significant issues, they often experience anxiety, which clouds their judgment. The session emphasized the importance of staying calm and maintaining positive inner dialogue when tackling problems. Students were taught to identify negative self-talk, which might hinder problem-solving, and replace it with positive affirmations like, "I can handle this." They were also asked to reflect on their strengths and repeat to themselves that they are capable of resolving challenges.

Session 3: Defining the Problem

In this session, students learned the importance of clearly defining the problem as the second step of problem-solving. They were guided to answer four key questions: What is the problem? When did it start? Where did it occur? Who is involved? The students were taught to break large problems into smaller steps and focus on solving one part at a time. They were then given a worksheet to define a recent problem clearly, which was collected for feedback and guidance.

Session 4: Generating a List of Possible Solutions

Building on the previous sessions, students were introduced to the third step of problem-solving: brainstorming possible solutions. The emphasis was on generating as many solutions as possible. They were taught that the more potential solutions they can identify, the more likely they are to find an effective one. The importance of brainstorming without judging solutions was stressed. Worksheets for brainstorming different solutions were provided for practical exercises.

Session 5: Brainstorming Techniques

In this session, students were taught the "brainstorming" technique as a method for generating multiple solutions. The session encouraged free-flowing ideas without immediate evaluation of their quality or feasibility. Students were reminded to ask trusted peers or mentors for additional ideas. To aid this process, students were instructed to write down all solutions and later assess their advantages and disadvantages, with guidance provided by the instructor.

Session 6: Selecting the Best Solution

This session focused on evaluating the potential solutions generated in the previous sessions. Students were taught how to compare solutions by predicting the outcomes of each using a "cost-benefit" analysis. They were instructed to assess the short-term and long-term consequences, as well as the alignment of each solution with personal and family values. The students learned the "if...then..." technique to anticipate the possible results of each option before making a final decision.

Session 7: Implementing the Chosen Solution

In this session, students learned how to implement their chosen solution. They were taught to carefully plan their actions by considering what needs to be done, where, when, and by whom. Practical considerations, such as gathering necessary materials, were discussed. Students were reminded of the importance of logical decision-making and to avoid impulsive or emotional decisions. They also received guidance on addressing potential social pressures and challenges.

Session 8: Evaluation and Conclusion

The final session was dedicated to evaluating the effectiveness of the implemented solutions. Students were taught to assess whether the solution was successful in resolving the problem and, if not, to revisit the problem-solving steps to identify areas for improvement. They reflected on their problem-solving experiences and were encouraged to share their thoughts. A post-test was administered, and students were invited to express their feelings about the problem-solving training.

2.3.2. Critical Thinking Training

This package was adapted from the research of Elder and Paul (2010). The critical thinking training program was conducted over eight 80-minute sessions, held once or twice per week by the instructor (Barzegar et al., 2022; Elder & Paul, 2010; Jafari Panji et al., 2018; Jiménez-Gómez et al., 2019; Li et al., 2019; Nikpey et al., 2017; Song et al., 2022).

Session 1: Elements of Thought (Reasoning: Purpose, Hypotheses, and Effort)

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This session introduced the first elements of critical thinking: identifying purpose, formulating hypotheses, and putting in effort. Students were taught that reasoning begins with a clear goal, such as solving a problem or achieving a specific outcome. They learned to create hypotheses based on limited information and test these hypotheses through research and analysis.

Session 2: Elements of Thought (Perspective, Data, and Concepts)

In this session, students explored how perspectives, data, and concepts shape reasoning. They were encouraged to consider different viewpoints, such as thinking from a consumer's perspective instead of a producer's. The importance of gathering relevant data and supporting evidence was discussed, along with integrating key concepts and theories related to the problem or issue.

Session 3: Elements of Thought (Conclusions and Implications)

This session focused on drawing conclusions based on evidence and reasoning. Students learned how to derive potential solutions and interpretations from their analysis. Additionally, the implications of their reasoning, including practical applications and consequences, were explored.

Session 4: Intellectual Standards (Clarity and Accuracy)

Students were introduced to the intellectual standards of clarity and accuracy. They learned to ask questions like, "Can you clarify that?" or "How can we verify this information?" The session emphasized the importance of ensuring that reasoning is both clear and accurate, using examples and validations to support conclusions.

Session 5: Intellectual Standards (Precision and Relevance)

This session focused on precision and relevance. Students were encouraged to ask for more details and specificity in their reasoning and to assess how their solutions or conclusions relate to the problem at hand. They learned to ensure that their reasoning directly contributes to solving the issue.

Session 6: Intellectual Standards (Depth and Breadth)

In this session, students explored the complexity of problems by examining their depth and breadth. They were taught to consider underlying causes and the multifaceted nature of issues. Additionally, students were encouraged to approach problems from different perspectives, considering alternative viewpoints and methods.

Session 7: Intellectual Traits (Intellectual Humility and Courage)

This session introduced the intellectual traits of humility and courage. Students were taught the importance of recognizing the limits of their knowledge and the potential for bias. Intellectual courage was discussed as the ability to present and evaluate ideas fairly, even when they challenge personal beliefs or assumptions.

Session 8: Intellectual Traits (Intellectual Empathy and Integrity)

In the final session, students learned about intellectual empathy and integrity. They practiced putting themselves in others' shoes to understand their reasoning and perspectives. The concept of intellectual integrity was emphasized, focusing on consistency in applying reasoning standards and avoiding contradictions.

2.4. Data analysis

In this study, descriptive statistics such as means and standard deviations were used, along with inferential statistics, including mixed analysis of variance (ANOVA with repeated measures). Before performing the mixed ANOVA, assumptions were tested, including the Shapiro-Wilk test for normality, the Levene's test for homogeneity of variances, and M-Box test for checking covariance matrix homogeneity, as well as testing for multicollinearity. To compare the problem-solving approach-based training and critical thinking training and to compare pre-test and post-test phases, Bonferroni post-hoc tests and SPSS version 24 were used.

3. Findings and Results

The majority of participants, 26 individuals (65%), were female. In terms of age distribution, 35.5% were between 18 and 19 years old, 40% were between 20 and 21 years old, and 24.5% were between 22 and 23 years old. Based on the collected data and its analysis through statistical software, the main central indicators of the research variables are presented in Table 1.

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Table 1

Descriptive Statistics of Research Variables

Variable	Stage	Pre-test M(SD)	Post-test M(SD)	Follow-up M(SD)
Academic self-handicapping	Problem-solving approach	29.86 (0.86)	17.60 (0.77)	17.46 (0.76)
	Critical thinking training	30.26 (0.65)	18.26 (0.51)	18.16 (0.43)
	Control	31.30 (0.72)	29.50 (0.68)	29.40 (0.66)
Academic procrastination	Problem-solving approach	50.86 (1.04)	24.60 (0.72)	24.26 (0.78)
	Critical thinking training	50.46 (1.12)	25.20 (0.84)	24.86 (0.92)
	Control	53.06 (0.96)	51.00 (0.93)	51.20 (0.86)

The results in Table 1 indicate that in the post-test phase, the mean scores for academic self-handicapping behaviors and academic procrastination in the two experimental groups decreased significantly compared to the pre-test phase.

In this section of the research, the assumption of normality of the data was first tested using the Shapiro-Wilk test to determine the use of parametric or non-parametric tests. Based on the research hypotheses, the relationships between the variables were examined. According to the measurement level of the variables, appropriate statistical tests were selected to address the research hypotheses.

The results of the Kolmogorov-Smirnov test and the significance levels for the research variables ($p>0.05$) suggest that the distribution of variables is likely normal. To examine the impact of the problem-solving approach-based training and critical thinking training on reducing academic self-handicapping behaviors in nursing students with test anxiety, analysis of covariance (ANCOVA) was used. The Levene's test results indicated homogeneity of variances.

Table 2

ANCOVA Results

Variable	Source of Variation	Stage	Sum of Squares	df	Mean Square	F	Sig
Academic self-handicapping	Group	Post-test	46.74	2	23.33	16.43	0.02
		Follow-up	0.895	2	0.447	0.32	0.027
Academic procrastination	Group	Post-test	89.38	2	44.69	4.013	0.026
		Follow-up	25.15	2	12.58	14.38	0.025

As shown in Table 2, based on the F values and their significance levels in the post-test and follow-up phases, there is a significant difference between the research groups. To further explore the nature and extent of the differences between the research groups, post-hoc pairwise comparisons using Bonferroni tests were conducted, as presented in Table 3.

Table 3

Bonferroni Test Results

Variable	Dependent Variable	Group (I)	Group (J)	Standard Error	Sig
Academic self-handicapping	Post-test	Problem-solving	Critical thinking	0.94	1
		Problem-solving	Control	0.94	0.000
		Critical thinking	Control	0.94	0.000
	Follow-up	Problem-solving	Critical thinking	0.90	1
		Problem-solving	Control	0.90	0.000
		Critical thinking	Control	0.90	0.000
Academic procrastination	Post-test	Problem-solving	Critical thinking	1.18	1
		Problem-solving	Control	1.18	0.000
		Critical thinking	Control	1.18	0.000
	Follow-up	Problem-solving	Critical thinking	1.22	1
		Problem-solving	Control	1.22	0.000
		Critical thinking	Control	1.22	0.000

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E-ISSN: 3041-8518

The Bonferroni test results for the comparison of means in Table 3 show that the mean academic self-handicapping behaviors in both the problem-solving approach-based training group and the critical thinking training group were significantly lower than in the control group. However, there was no significant difference between the problem-solving approach and critical thinking training groups. This indicates that both interventions effectively reduced negative academic self-handicapping behaviors compared to the control group, but there was no significant difference between the two experimental groups.

Similarly, the Bonferroni test results for academic procrastination show that both the problem-solving approach-based training group and the critical thinking training group had significantly lower mean scores compared to the control group. However, no significant difference was found between the two experimental groups, indicating that both approaches effectively reduced academic procrastination, but no significant difference was observed between them.

4. Discussion and Conclusion

The results of repeated measures ANOVA showed that problem-solving approach-based training and critical thinking training had a significant effect on reducing academic self-handicapping behaviors in nursing students with test anxiety, and the effect of the intervention was maintained in the follow-up stage. No previous research has compared the effectiveness of the two training methods, problem-solving and critical thinking, in reducing academic self-handicapping behaviors in nursing students with test anxiety. The results are aligned with Molaei-Moghbeli et al. (2022), who showed that the effect size of problem-solving skills training with a storytelling approach on academic self-handicapping in students was 45.7% and significant (Molaei Moghbeli et al., 2022).

Given that the use of academic self-handicapping strategies is one of the main obstacles to student progress, and that students who frequently employ these strategies tend to have weaker academic performance and, in the long run, experience issues such as lack of confidence in their abilities, fear of expressing enthusiasm, low hope for repeating past successes, lower self-esteem, belief in the immutability of ability, poorer mental health, negative mood, more symptomatic behaviors, dissatisfaction with life, and exaggeration of illness and pain, it must be acknowledged that self-handicapping has negative and destructive consequences. Since self-handicapping is an avoidance behavior that leads to a decrease in academic performance and can have lasting effects on a person's personality and adaptation, many studies have focused on identifying the factors and processes associated with self-handicapping and its consequences. Multiple studies have shown that problem-solving skills training can positively impact individuals' motivation and, by reducing self-handicapping, can enhance their professional success. Studies have also indicated that nurses who participated in problem-solving training, in addition to gaining deeper learning, acquired skills such as interpersonal communication, critical thinking, decision-making, reasoning, the use of multiple information sources, teamwork, cooperation, respect for group members, curiosity, and patience, which significantly affect their future job performance (Molaei Moghbeli et al., 2022).

Therefore, given that problem-solving skills training helps improve the quality of students' learning and promotes their independence in solving everyday life issues, it also reduces their self-handicapping behaviors.

In explaining the hypothesis, it can be said that self-handicapping is associated with psychological symptoms such as stress and anxiety. Lack of self-confidence, low hope for repeating past successes, low self-esteem, belief in the immutability of abilities, poor mental health, negative mood, dissatisfaction with life, and exaggeration of illness and pain are among the potential consequences of self-handicapping. On the other hand, problem-solving skills training as a therapeutic method teaches individuals to use a conscious, logical, and goal-oriented process to effectively cope with a wide range of psychological stressors by applying their cognitive skills to deal with various shared and challenging situations. Based on the above discussion, it can be concluded that problem-solving skills training can positively impact students' negative moods. Additionally, it can be stated that for self-handicapping individuals, effort is like a double-edged sword: while effort can lead to success, failure after effort may negatively affect their self-worth, as they may attribute failure to a lack of ability.

Critical thinking refers to the ability to analyze and logically evaluate information and issues, and it can facilitate academic performance improvement. On the other hand, academic self-handicapping behavior includes negative beliefs and self-defeating thoughts about one's abilities and talents, which can lead to decreased motivation and self-confidence. Critical thinking helps individuals make the best decisions regarding academic matters,

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E-ISSN: 3041-8518

evaluate information accurately, and find effective solutions to academic problems. Conversely, self-handicapping behavior can lead to negative thoughts and a fear of failure, which may prevent individuals from completing tasks. Therefore, critical thinking helps individuals distance themselves from self-handicapping behaviors, building confidence and motivation to improve academic performance. Enhancing critical thinking, along with developing motivation and confidence, can help individuals achieve academic success (Bahrami, 2019). In explaining this finding, it can be said that critical thinking allows students to analyze academic situations logically, identify their strengths and weaknesses, and develop effective strategies for solving problems, thereby reducing challenging academic behaviors.

The results of repeated measures ANOVA also showed that problem-solving approach-based training and critical thinking training significantly reduced academic procrastination in nursing students with test anxiety, and the effect of the intervention was maintained during follow-up. No research has compared the effectiveness of problem-solving and critical thinking training on reducing academic procrastination in nursing students with test anxiety. In this regard, Khorami and Zabli (2018), who found that problem-solving orientation and confidence in problem-solving indirectly affected academic procrastination through academic self-efficacy (Khorami & Zaboli, 2018).

Problem-solving skills are essential life skills that enable students to solve problems systematically. The main benefit of learning problem-solving is that it helps individuals seek multiple solutions, evaluate them, and select the best one. Individuals face various personal, daily, academic, and social issues, and problem-solving skills allow them to address these challenges without procrastinating.

In explaining this finding, it can be said that students with active and confident minds face problems and challenges head-on. Those with good problem-solving skills are more resilient to severe stress, conflict, and frustration, and they solve problems more effectively, using their thinking abilities. These individuals rarely feel ineffective or hopeless, which leads to less procrastination. Critical education focuses on reasoning, critique, and change as valuable educational goals and aims to uncover real social conditions, requiring critical thinking. Studies have shown that critical thinking training is effective in reducing students' procrastination.

In explaining this result, it can be stated that critical thinking, as a positive thought process, plays a crucial role in students' lives. Critical thinking, defined as the ability to analyze, infer, and solve problems, fosters motivation for learning and creativity. Acquiring this skill can reduce academic procrastination and delays in completing academic tasks. Through critical thinking, students can overcome procrastination behaviors and take positive steps in their academic performance and pursuit of academic goals.

5. Limitations & Suggestions

This study was conducted on nursing students with anxiety in Birjand, and generalizing its results to other populations should be done with caution. Another limitation is that the research variable was measured through self-reported questionnaires, which may have introduced response bias. Some respondents might have provided incomplete answers due to fatigue or a lack of focus caused by their anxiety-related issues, potentially affecting the accuracy of the results. Since the effectiveness of problem-solving and critical thinking training on improving academic self-handicapping behaviors in anxious nurses has been demonstrated, it is recommended that clinical centers incorporate problem-solving and critical thinking training alongside pharmacological and clinical treatments to improve the recovery and morale of anxious nurses. Furthermore, given that the effectiveness of problem-solving and critical thinking training on reducing academic procrastination in anxious nurses has been established, it is suggested that clinical centers employ these training methods alongside medical treatments to help these nurses. Additionally, problem-solving and critical thinking training has proven effective in improving study processes in anxious nurses, so clinical centers are encouraged to integrate these methods for better treatment outcomes. It is also recommended that similar studies be conducted in other cities. Given the importance and necessity of problem-solving and critical thinking training, it is suggested that future research explores these methods with other variables, such as emotional regulation and mindfulness. Moreover, it is recommended to collect data through interviews with psychology professors, patient counselors, and center administrators to mitigate personal biases in questionnaire responses.

Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contributed in this article.

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