Iranian Journal of Educational Sociology

Journal Website

Article history:
Received 11 November 2023
Revised 10 January 2024
Accepted 03 February 2023
Published online 06 March 2024

Iranian Journal of Educational Sociology

Volume 7, Issue 1, pp 10-20

Quarterly
Iranian Journal of Educational Sociology

E-ISSN: 2645-3460

Comparing the Effectiveness of Instructional Mental Imagery and Tolerance of Ambiguity Training on Students' Academic Procrastination

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Mahvash, M., Yamini, M., & Mahdian, H. (2024). Comparing the Effectiveness of Instructional Mental Imagery and Tolerance of Ambiguity Training on Students' Academic Procrastination. *Iranian Journal of Educational Sociology*, *7*(1), 10-20.
http://dx.doi.org/10.61838/kman.ijes.7.1.2

A B S T R A C T

Purpose: Academic procrastination detrimentally affects students' other academic performances. Consequently, this study aimed to compare the effectiveness of instructional mental imagery and tolerance of ambiguity training on students' academic procrastination.

Methodology: This quasi-experimental research involved two experimental groups and one control group, with a pre-test, post-test, and two-month follow-up design. The study population consisted of all female twelfth-grade students in both public and private schools in Bojnurd during the 2023-2024 academic year. The sample included 45 students selected through purposive sampling and randomly assigned into three equal groups (each group containing 15 students). The first experimental group underwent twelve 90-minute sessions of instructional mental imagery training, and the second experimental group received nine 90-minute sessions of tolerance of ambiguity training based on the cognitive-behavioral approach, while the control group received no training. Data were collected using the Solomon and Rothblum (1984) Academic Procrastination Questionnaire and analyzed using repeated measures ANOVA and Bonferroni post-hoc test in SPSS-25.

Findings: The findings indicated significant differences between groups in terms of reducing students' academic procrastination. Both the instructional mental imagery and tolerance of ambiguity training methods significantly reduced academic procrastination in the post-test and follow-up stages compared to the control group ($P<0.05$). Moreover, there was no significant difference between the instructional mental imagery and tolerance of ambiguity training methods in reducing students' academic procrastination ($P>0.05$).

Conclusion: Given the effectiveness of both instructional mental imagery and tolerance of ambiguity training methods in reducing students' academic procrastination, school counselors and psychologists can utilize these methods alongside other educational approaches to reduce academic procrastination.

Keywords: *Instructional Mental Imagery Training, Tolerance of Ambiguity Training, Academic Procrastination, Students.*

[DOI: 10.61838/kman.ijes.7.1.2]

1. Introduction

Procrastination means the intentional delay of a decision, task, or duty, which is an ineffective defensive strategy used by individuals to avoid failure and preserve self-esteem and personal value (Melgaard et al., 2022). In another definition, procrastination is the purposeful and persistent delay in starting and completing tasks to the extent of experiencing distress, stress, and anxiety, and realizing failure in activities (Yang et al., 2021). The construct of procrastination in Latin is derived from two parts: Pro, meaning forward, in advance, and in support of, meaning of tomorrow, literally translating to "until tomorrow." Synonymous terms include cunctation, shillyshally, dilatoriness, procrastination, deferring to the future, and postponing a task due to carelessness, habit, and laziness (Zhou et al., 2024). One type of procrastination is academic procrastination, referring to procrastination in educational and learning situations, a common phenomenon among learners (Wieland et al., 2022). This construct has negative consequences for both academic and non-academic aspects and indicates an irrational tendency to delay the start of an academic activity or its continuation for completion (Gurumoorthy & Kumar, 2020). Academic procrastination is an irrational tendency to delay academic activities at the start or completion of an academic task, where learners, despite intending to perform the activity at a specific time, lack the necessary and sufficient motivation, ultimately leading to failure (Gustavson & Miyake, 2017). Alternatively, it is defined as the failure to perform academic activities within the requested timeframe or delaying the activity until the last minute, damaging academic performance (Wiwatowska et al., 2023). Generally, there are two types of academic procrastination: active and passive. Active academic procrastination is essentially a positive and constructive deterrent strategy, whereas passive procrastination reflects a negative behavior causing feelings and perceptions of fear, doubt, hesitation, and inability in academic activities (Ziegler & Opdenakker, 2018). Learners with academic procrastination tend to postpone studying for exams until the night before, and as a result, experience significant stress and anxiety and low self-esteem during the exam (Eisenbeck et al., 2019). From a motivational perspective, academic procrastination does not occur due to absolute laziness and lack of motivation but because procrastinators are interested in engaging in activities other than academic tasks, such as leisure time, enjoying social interactions, watching television, and browsing the internet (Hong et al., 2021).

One potentially effective method for reducing procrastination is instructional mental imagery training (Abedini, 2016). Mental imagery, as a meditation technique, is one of the greatest health resources using the mind's power for visualizing therapeutic goals (Saadati Anaraki et al., 2021). Mental imagery provides a framework indicating significant overlap in the brain's active structures during practice and mental imagery, and training areas of the brain shared between physical execution and mental imagery can lead to performance improvement (Niknasab et al., 2021). Mental imagery is a notable mental intervention in physical, emotional, and psychological change, enhancing control over life and improving relationships by modulating stress and anxiety (Lawrence et al., 2023). In mental imagery, the same brain area activates as when experiencing the activity. In other words, a person creates a precise and complete thought flow in which they can see, hear, smell, and feel whatever they wish to feel at that time and can visualize it in their imagination (Shahabi et al., 2020). Instructional mental imagery training, devised by Smuker in 1994, helps individuals overcome negative thoughts and distressing memories through cognitive reprocessing and alleviate psychological pressures and stresses (Sadeghi et al., 2018). The instructional mental imagery method results from the cognitive revolution, meaning the reconstruction of mental images and distressing memories in the absence of unpleasant stimuli. This method is used as "seeing with the mind's eye" along with cognitive reprocessing to overcome distressing memories (Zabet et al., 2021). This method consists of three stages: instructional mental imagery, overcoming mental imagery, and self-calming with reprocessing, helping individuals overcome negative thoughts and distressing memories through cognitive reprocessing. In other words, individuals express their negative thoughts and distressing images and then relieve psychological pressures through cognitive reprocessing (Safikhani et al., 2020). In the first stage of this intervention method, namely instructional mental imagery, the person visualizes their distressing images along with sounds, smells, and feelings with the therapist's help and verbally expresses them. In the second stage, namely overcoming mental imagery, the therapist encourages the person to dominate and overcome the distressing mental images, and the person also tries to overcome the painful mental images. In the third stage, namely self-calming with reprocessing, the therapist uses Socratic questions and other mental

[DOI: 10.61838/kman.ijes.7.1.2]

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E-ISSN: 2645-3460

techniques to help the person increase mental imagery dominance and cognitive reconstruction to change the meaning of stressors and heal themselves (Tarkhan, 2016).

Another potentially effective method for reducing procrastination is tolerance of ambiguity training (Doğanülkü et al., 2021). Ambiguity is created by the absence or inefficiency of knowledge and associated with internal factors that the individual cannot control, and intolerance of ambiguity is a cognitive bias affecting how a person perceives, interprets, and reacts to an uncertain situation on emotional, cognitive, and behavioral levels (Roth et al., 2022). Individuals with intolerance of ambiguity usually interpret ambiguous information as threatening, exacerbating anxiety and worry and impairing cognitive and behavioral functions (Matta et al., 2022). The construct of intolerance of ambiguity as a personality trait includes a set of negative beliefs about uncertainty, and such individuals perceive ambiguity as a disturbing, intolerable, and negative event that should be avoided (Borracci et al., 2021). Also, intolerance of ambiguity is a cognitive schema showing individuals' perspective of the environment, and people experiencing high levels of intolerance of ambiguity have more positive beliefs and attitudes towards worry and its usefulness compared to those experiencing lower levels (Lodewyk et al., 2020). Tolerance of ambiguity training, developed by Dugas in 1995 based on the cognitive-behavioral approach, plays an effective role in reducing worry (Dugas et al., 2022). In tolerance of ambiguity training, the person first learns about the role of intolerance of ambiguity in the persistence of pathological worry, for which there are only two ways to reduce the role of ambiguity in worry: reducing ambiguity and uncertainty itself and increasing the person's tolerance against ambiguity and uncertainty. The goal of cognitive reconstruction of intolerance of ambiguity beliefs is to teach individuals with disorder and problem that ambiguity and uncertainty are natural parts of life, and tolerating ambiguity is the only option since humans have limited ability to determine future events (Mosavinia et al., 2015).

Few studies have been conducted on instructional mental imagery and tolerance of ambiguity training, and no research was found on their effectiveness on academic procrastination. The study by Dehghan Mangabadi, Mojtabai, and Dortaj (2021) on mental simulation process training on academic procrastination among gifted students showed that this intervention method reduced their academic procrastination (Dehghan Mangabadi et al., 2021). Blouin-Hudon and Pychyl (2017), in a study on mental imagery intervention to increase future self-continuity and reduce procrastination, reported that the mentioned intervention method increased future self-continuity and reduced undergraduate students' procrastination (Blouin-Hudon & Pychyl, 2017). In another study, Abedini (2016) reported on mental imagery along with physical exercise on learning and retention of motor skills that the intervention method of mental imagery along with physical exercise improved students' learning and retention (Abedini, 2016). Blouin-Hudon and Pychyl (2015), in a study on the role of emotional states, clear mental imagery, and future self-continuity in predicting academic procrastination, reported that mental imagery played an effective role in predicting academic procrastination (Blouin-Hudon & Pychyl, 2015). Also, the results of the study by Sagone and Luisa (2023) on the role of academic self-efficacy and intolerance of ambiguity on decision-making procrastination among students showed that intolerance of ambiguity played an effective role in reducing academic self-efficacy and increasing decision-making procrastination among students (Sagone & Indiana, 2023). Mansouri, Ashouri, Gharraee, and Farahani (2021), in a study on predicting decision-making procrastination based on fear of failure, self-compassion, and intolerance of ambiguity among students, reported that intolerance of ambiguity had a positive and significant relationship with decision-making procrastination (Mansouri et al., 2021). In another study, Doganulku et al. (2021) reported on the impact of fear of COVID-19 on student procrastination with the mediating role of intolerance of ambiguity that high intolerance of ambiguity had a direct and positive effect on students' academic procrastination (Doğanülkü et al., 2021).

One of the important topics in the field of planning, education, and academic advancement is paying attention to academic procrastination as a common behavior in educational environments (Ram & Esmaeili Shad, 2018). The results of a study showed that 46% of individuals in writing articles, 30.1% in performing tasks, and 27% in studying for exams experience academic procrastination, and this construct is used for tasks and behaviors that are delayed without a specific reason (Dehghan Mangabadi et al., 2021). Academic procrastination is a common phenomenon among students and even university students, and the use of effective educational methods is recommended to reduce it. Various methods have been examined and approved for reducing academic procrastination, including instructional mental imagery and tolerance of ambiguity training, both of which benefit from the cognitive-behavioral approach. Another important point

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E-ISSN: 2645-3460

is that no study was found comparing the effectiveness of the two instructional mental imagery and tolerance of ambiguity training methods, and the results of this study can help school psychologists and counselors in identifying a more effective intervention method so that therapists, counselors, and psychologists, while aware of the effectiveness of instructional mental imagery and tolerance of ambiguity training methods, can use the appropriate intervention method to reduce academic procrastination. Academic procrastination causes a decline in other academic performances of students. Consequently, the present study aimed to compare the effectiveness of instructional mental imagery and tolerance of ambiguity training on students' academic procrastination.

2. Methods and Materials

2.1. Study Design and Participants

This study was a quasi-experimental research with two experimental groups and one control group, utilizing a pre-test, post-test, and two-month follow-up design. The research population consisted of all female twelfth-grade students in both public and private schools in the city of Bojnurd for the 2023-2024 academic year. The sample for this study was 45 students who were selected through purposive sampling and randomly assigned into three equal groups (each group with 15 students). In purposive sampling, samples are selected based on certain criteria that the entry criteria for the research included informed consent to participate in the study based on a set schedule, a high score on the Academic Procrastination Questionnaire, no history of receiving instructional mental imagery and tolerance of ambiguity training, no psychological interventions received in the past year, no diagnosis of psychiatric disorders in the past year, no use of psychiatric medications, no physical disabilities, and no other psychological disorders, with exit criteria including absence from more than two sessions and dropping out of the intervention process halfway.

The research procedure involved first coordinating with the Bojnurd Department of Education and explaining the importance and necessity of the research and ethical considerations to them. Subsequently, they were asked to facilitate the administration of the Academic Procrastination Questionnaire and its completion by female twelfth-grade students in Bojnurd. After collecting and scoring the questionnaire, 45 individuals who scored high on the Academic Procrastination Questionnaire and agreed to participate in the research were selected as the sample. These individuals, as well as one of their parents, were asked to sign an informed consent form to participate in the study. The importance and necessity of the research and ethical considerations were also explained to the female students, and they and their guardians were asked to sign the informed consent form. These students were then selected as the final sample and randomly assigned into three equal groups: instructional mental imagery, tolerance of ambiguity training, and control. The first experimental group received twelve 90-minute sessions of instructional mental imagery training, and the second experimental group received nine 90-minute sessions of tolerance of ambiguity training, while the control group did not receive any training during this period. In this study, two instruments were used: the first was a demographic information form including age, and the second was the Academic Procrastination Questionnaire

2.2. Measures

2.2.1. The Academic Procrastination Questionnaire

The Academic Procrastination Questionnaire, developed by Solomon and Rothblum (1984), consisted of 27 items and 5 components: preparation for exams, preparation of assignments, preparation of papers, feelings and emotions, and willingness to change. A 4-point scale ranging from never, rarely, most of the time, to always was used for responses. The score for each component was calculated by summing the scores of the items that make up that component, with a higher score in the components of preparation for exams, preparation of assignments, and preparation of papers, and lower in the components of feelings and emotions, and willingness to change indicating a worse condition or characteristic. They examined the construct validity of the instrument using exploratory factor analysis and reported the results indicating the presence of five components, and reported the overall reliability using Cronbach's alpha as 0.64. In Iran, Rasoli Khorshidi, Sangani, and Jangi (2019) reported the reliability of the Academic Procrastination Questionnaire using Cronbach's alpha as 0.82.

2.3. Measures

2.3.1. Mental Imagery Training

For the instructional mental imagery training, a researcher-created package based on the training program of Smucker et al. (1995) and O'Shea and Moran (2019) was

[DOI: 10.61838/kman.ijes.7.1.2]

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E-ISSN: 2645-3460

used. Based on these, a 12-session intervention package (each session lasting 90 minutes) was designed, and its goal and content were briefly presented in Table 1.

Table 1

The Objective and Content of Instructional Mental Imagery Training by Session

Session	Objective	Content
1	Understanding the concept of instructional mental imagery and its relation to thoughts	Discussion about the client's problem and its psychological impacts on interpersonal relationships, motivation for treatment cooperation, setting treatment goals, and introduction to instructional mental imagery, experimental visualization of distressing images, and assigning homework
2 & 3	Identifying distressing thoughts and images and their connection to mood and behavior	Review of homework, identifying negative thoughts, visualizing distressing images and how they affect mood, thinking, and behavior, visualizing distressing images with eyes closed and its relation to obsessive thoughts, and assigning homework
4	Muscle relaxation practice and visualization of intrusive thoughts and images	Review of homework, visualizing distressing thoughts and images in detail with eyes closed in a state of muscle relaxation and its relation to mood and insomnia, and assigning homework
5	Teaching guided and instructional mental imagery	Review of homework, teaching guided and instructional mental imagery by the therapist to control negative thoughts and distressing images and create positive images, and assigning homework
6	Teaching the technique of cognitive review and mental shifting	Review of homework, teaching cognitive review and mental shifting technique along with cognitive reprocessing to eliminate negative self-referential thoughts and create positive thoughts and mood, and assigning homework
7	Practice of cognitive reconstruction of negative thoughts and distressing images	Review of homework, employing cognitive review, mental shifting technique with reprocessing to control recurrent mental sparks and change the meanings of traumatic events, and assigning homework
8	Application of learned techniques	Review of homework, controlling recurrent mental sparks, continuous use of mental shifting technique along with changing the meanings of distressing thoughts and images to find positive thoughts, feelings, and mood, and assigning homework
9	Muscle relaxation practice and visualization of intrusive thoughts and images	Review of homework, visualizing distressing thoughts and images in detail with eyes closed in a state of muscle relaxation and its relation to mood and insomnia, and assigning homework
10 & 11	Application of learned techniques	Review of homework, controlling recurrent mental sparks, continuous use of mental shifting technique along with changing the meanings of distressing thoughts and images to find positive thoughts, feelings, and mood, and assigning homework
12	Practice and repetition of learned techniques	Review of homework and application of all techniques in real-life situations to control negative self-referential thoughts and ineffective attitudes

2.3.2. Tolerance of Ambiguity

For the tolerance of ambiguity training, a researcher-created package based on the training program of Dugas and Robichaud (2007) was used. Based on these, a 9-session intervention package (each session lasting 90 minutes) was designed, and its goal and content were briefly presented in Table 2.

Table 2

Objective and Content of Tolerance of Ambiguity Training per Session

Session	Objective	Content
1	Introduction	Providing explanations about the number and duration of sessions, collectively setting goals and group rules, emphasizing active participation between the client and the intervener, and explaining the key role of homework.
2	Teaching cognitive-behavioral principles and rules	Explaining the reciprocal relationship between thoughts, emotions, and behavior, using Socratic questions to increase students' awareness of these principles, and assigning homework.
3	Introducing academic procrastination and its consequences	Reviewing homework, providing clear explanations about the diagnostic criteria and prevalence of academic procrastination, and assigning homework.
4	Enhancing the ability to identify the antecedents and consequences of academic procrastination	Reviewing homework, teaching cycles of academic procrastination, antecedents, and consequences, evaluating and recording the highest level of academic procrastination over the next week, identifying triggering events, and assigning homework.
5	Describing worry and its dimensions	Reviewing homework, explaining worry and dividing it into current problems and future imaginary problems, reviewing the type of worry, its history, and timing of occurrence among students, and assigning homework.

[DOI: 10.61838/kman.ijes.7.1.2]

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E-ISSN: 2645-3460

6	Teaching strategies for coping with worry	Reviewing homework, teaching problem-solving methods and visual imagery techniques and how to apply them based on the type of worry, teaching problem-solving skills, and assigning homework.
7	Teaching the ability to perceive the relationship between intolerance of ambiguity and excessive worry, and identifying unavoidable situations in ambiguity	Reviewing homework, helping students understand the relationship between intolerance of ambiguity and excessive worry, the ability to identify unavoidable situations using allergy metaphor and filtered glasses, methods of ambiguity manifestation with examples, providing solutions, and assigning homework.
8	Identifying symptoms of intolerance of ambiguity and seeking and experiencing ambiguous situations	Reviewing homework, identifying situations where ambiguity arises and providing solutions, explaining the relationship between intolerance of ambiguity and excessive worry, conveying that achieving complete certainty is not possible with Socratic questions, and assigning homework.
9	Practice and repetition of learned techniques	Reviewing key points and techniques learned in previous sessions, preparing for confronting real-life problems at the end of treatment, and practicing and repeating the strategies learned during the course.

2.4. Data Analysis

The data of the present study were analyzed using repeated measures ANOVA and Bonferroni post-hoc test in SPSS-25 software at the significance level of 0.05.

3. Findings and Results

In this study, the mean and standard deviation of age were 17.80 ± 0.41 for the instructional mental imagery group, 17.67 ± 0.49 for the tolerance of ambiguity group, and 17.73 ± 0.46 for the control group. The results of the mean and standard deviation for the pre-test, post-test, and two-month follow-up of students' academic procrastination in the groups are reported in Table 3.

Table 3

Mean and Standard Deviation of Pre-test, Post-test, and Two-month Follow-up for Students' Academic Procrastination by Groups

Variable	Group	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Two-month Follow-up Mean	Two-month Follow-up SD
Preparation for Exams	Instructional Mental Imagery	16.60	2.03	12.87	1.77	12.87	1.68
	Tolerance of Ambiguity	16.87	1.77	12.87	1.88	12.93	1.71
	Control	16.13	1.96	16.20	1.74	16.13	1.81
Preparation of Assignments	Instructional Mental Imagery	18.13	3.25	14.60	3.11	14.07	3.37
	Tolerance of Ambiguity	18.60	3.52	14.20	3.69	14.33	3.31
	Control	18.53	3.25	18.80	3.00	18.87	3.42
Preparation of Papers	Instructional Mental Imagery	13.33	2.77	10.00	2.24	10.80	2.08
	Tolerance of Ambiguity	12.87	2.39	10.33	2.97	10.47	3.00
	Control	13.20	2.37	13.47	2.95	13.47	2.39
Feelings and Emotions	Instructional Mental Imagery	6.73	2.81	9.53	2.00	9.20	2.37
	Tolerance of Ambiguity	6.13	2.39	9.67	2.29	9.27	2.25
	Control	6.33	2.64	6.07	2.69	6.20	2.34
Willingness to Change	Instructional Mental Imagery	4.33	2.41	7.67	2.29	7.47	2.53
	Tolerance of Ambiguity	4.93	2.49	8.33	1.95	8.13	2.20
	Control	4.73	2.63	4.47	2.47	4.40	2.20

According to the results in Table 3, the scores for the three components of preparation for exams, preparation of assignments, and preparation of papers in the two experimental groups decreased more from the pre-test to the post-test and two-month follow-up stages compared to the control group. The scores for the two components of feelings and emotions and willingness to change in the two experimental groups increased more from the pre-test to the post-test and two-month follow-up stages compared to the control group.

The examination of the assumptions for repeated measures ANOVA indicated the normality of academic

[DOI: 10.61838/kman.ijes.7.1.2]

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

procrastination components at the pre-test, post-test, and two-month follow-up stages in all three groups using the Shapiro-Wilk test, homogeneity of variances of the variables using the Levene's test, and homogeneity of variance-covariance matrices using the Box's M test (P<0.05), but the sphericity assumption was violated as indicated by the Mauchly's test (P<0.05). Therefore, the Greenhouse-Geisser correction should be used in the analyses. The results of Wilks' Lambda from the multivariate tests showed that there was a significant difference between the intervention methods regarding at least one of the academic procrastination variables based on the test stages (P<0.001), but there was no significant difference between them based on group membership and the interaction between test stages and group membership (P>0.05). The results of repeated measures ANOVA to determine the effectiveness of intervention methods on the components of students' academic procrastination are reported in Table 4.

Table 4

Results of Repeated Measures ANOVA to Determine the Effectiveness of Intervention Methods on Academic Procrastination

Variable	Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Significance	Eta Squared
Preparation for Exams	Time	296.47	1.67	177.99	431.35	<0.001	0.94
	Group	0.28	1	0.28	0.03	0.86	0.001
	Time*Group	0.29	1.67	0.17	0.42	0.62	0.02
Preparation of Assignments	Time	331.36	1.49	222.75	114.70	<0.001	0.80
	Group	0.28	1	0.28	0.01	0.93	0.01
	Time*Group	3.09	1.49	2.08	1.07	0.34	0.04
Preparation of Papers	Time	149.07	1.40	106.63	56.78	<0.001	0.67
	Group	0.54	1	0.54	0.03	0.86	0.001
	Time*Group	2.76	1.40	1.97	1.05	0.34	0.04
Feelings and Emotions	Time	180.02	1.51	119.26	101.81	<0.001	0.78
	Group	0.40	1	0.40	0.03	0.87	0.001
	Time*Group	2.47	1.51	1.63	1.40	0.26	0.05
Willingness to Change	Time	214.02	1.52	140.64	83.28	<0.001	0.75
	Group	9.34	1	9.34	0.69	0.41	0.02
	Time*Group	0.02	1.52	0.02	0.01	0.98	0.01

According to the results in Table 4, there was no significant difference between the experimental groups (instructional mental imagery and tolerance of ambiguity training) and the control group in all components of academic procrastination including preparation for exams, preparation of assignments, preparation of papers, feelings and emotions, and willingness to change regarding group membership and the interaction between test stages and group membership (P>0.05), indicating no significant difference between the groups regarding the variables. However, there was a significant difference between them in all components of academic procrastination regarding the test stages (P<0.001). The results of the Bonferroni post-hoc test to compare the effectiveness of intervention methods on the components of students' academic procrastination based on the test stages are reported in Table 5.

Table 5

Results of Bonferroni Post-Hoc Test for Comparing the Effectiveness of Intervention Methods on Academic Procrastination

Variable	Group	Pre-test - Post-test Difference	Significance	Pre-test - Follow-up Difference	Significance	Post-test - Follow-up Difference	Significance
Preparation for Exams	Instructional Mental Imagery	3.73	<0.001	3.73	<0.001	0.01	0.99
	Tolerance of Ambiguity	4.00	<0.001	3.93	<0.001	-0.07	0.99
Preparation of Assignments	Instructional Mental Imagery	3.53	<0.001	4.07	<0.001	0.53	0.22
	Tolerance of Ambiguity	4.40	<0.001	4.27	<0.001	-0.13	0.99
Preparation of Papers	Instructional Mental Imagery	3.33	<0.001	2.53	0.002	-0.80	0.10

[DOI: 10.61838/kman.ijes.7.1.2]

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

	Tolerance of Ambiguity	2.53	<0.001	2.40	<0.001	-0.13	0.99
Feelings and Emotions	Instructional Mental Imagery	-2.80	<0.001	-2.47	<0.001	0.33	0.94
	Tolerance of Ambiguity	-3.53	<0.001	-3.13	<0.001	0.40	0.08
Willingness to Change	Instructional Mental Imagery	-3.33	<0.001	-3.13	<0.001	0.20	0.99
	Tolerance of Ambiguity	-3.40	<0.001	-3.20	<0.001	0.20	0.99

According to the results in Table 5 and the means, both intervention methods, instructional mental imagery training and tolerance of ambiguity training, significantly reduced the preparation for exams, preparation of assignments, and preparation of papers and significantly increased feelings and emotions and willingness to change among students in the post-test and follow-up stages ($P<0.05$). This indicates that both the difference between the pre-test and post-test and the difference between the pre-test and follow-up were significant. In other words, the instructional mental imagery and tolerance of ambiguity training methods significantly reduced students' academic procrastination, and the results were maintained at the follow-up stage.

4. Discussion and Conclusion

Academic procrastination is a common phenomenon among students and even university students. Since this construct plays a significant role in the decline of other academic and even non-academic performances, the present study aimed to compare the effectiveness of instructional mental imagery and tolerance of ambiguity training on students' academic procrastination.

The findings of this study showed that instructional mental imagery training significantly reduced academic procrastination (decreased preparation for exams, preparation of assignments, and preparation of papers, and increased feelings, emotions, and willingness to change) in students in the post-test and follow-up stages. This finding aligns with the research of Dehghan Mangabadi et al. (2021), Blouin-Hudon and Pychyl (2017; 2015), and Abedini (2016) (Abedini, 2016; Blouin-Hudon & Pychyl, 2015, 2017; Dehghan Mangabadi et al., 2021). It can be inferred that instructional mental imagery training is a promising method for addressing underlying cognitive and emotional beliefs, directly targeting their core and activating images of distressing experiences and the associated feelings. Thus, instructional mental imagery offers a more powerful tool than verbal techniques for accessing and improving cognitive and emotional characteristics. Furthermore, the effectiveness of instructional mental imagery training might partly stem from the fact that it activates primary emotional images and memories. Consequently, it provides access to situations where negative associations were formed, and accessing the memory of these situations can be beneficial. This is because it clarifies the basis of intense cognitive and emotional reactions that continue to distress the individual even in the absence of current danger. Students are required to repeatedly visualize or imagine events related to academic procrastination until they habituate to desired academic responses. Another strategy is the rewriting of images, where damaged images serve as a basis for change. Here, students mentally envision the event and are then asked to intervene and alter the ending as they prefer, creating clear mental images in addition. The success of these strategies may lie in the fact that the original event becomes very real through the activation of vivid mental images, allowing for fundamental changes in the memory of that event and the associated cognitive and emotional responses. As a result, instructional mental imagery training can significantly reduce academic procrastination.

Additionally, the findings of this study indicated that tolerance of ambiguity training significantly reduced academic procrastination (decreased preparation for exams, preparation of assignments, and preparation of papers, and increased feelings, emotions, and willingness to change) in students in the post-test and follow-up stages. This finding is consistent with the research of Sagone and Luisa (2023), Mansouri et al. (2021), and Doganulku et al. (2021) (Doğanülkü et al., 2021; Mansouri et al., 2021; Saadati Anaraki et al., 2021). It can be inferred that tolerance of ambiguity training directly and explicitly targets intolerance of ambiguity, with discussions on intolerance of ambiguity and the stress it causes being the core of the intervention. Individuals with high levels of intolerance of ambiguity show negative psychological reactions to uncertain situations and tend to respond to uncertainty with worry. Reducing intolerance of ambiguity during training may decrease worry and achieve desired performances (optimal academic performance in students) in various ways.

[DOI: 10.61838/kman.ijes.7.1.2]

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E-ISSN: 2645-3460

Moreover, interventions using the tolerance of ambiguity method promote behavioral exposure to uncertain situations, likely reducing reactivity to uncertainty. Therefore, if stress around uncertain situations decreases, a concurrent reduction in avoidant or delaying behaviors such as procrastination seems logical. Additionally, students in the tolerance of ambiguity intervention are encouraged to perform exposure exercises, confronting situations that generally cause stress and academic procrastination. However, exposure to tolerance of ambiguity training undoubtedly exists during encounters with stress and procrastination, and related cognitive restructuring may significantly impact procrastination beliefs. Consequently, tolerance of ambiguity training can significantly reduce academic procrastination.

Moreover, the findings of this study showed no significant difference between instructional mental imagery and tolerance of ambiguity training methods in the components of students' academic procrastination, including decreased preparation for exams, preparation of assignments, and preparation of papers, and increased feelings, emotions, and willingness to change. Although no research was found in this area, it can be inferred that both instructional mental imagery and tolerance of ambiguity training methods have a roughly similar theoretical basis and both utilize the cognitive-behavioral approach. Additionally, both employ a fundamental principle called exposure to improve various psychological characteristics, where students must confront events they have avoided for many years. This principle or technique not only targets thinking about a specific subject, image, and thoughts but also plays a crucial role in improving psychological characteristics by replacing negative thoughts and images with positive ones. These common features in both instructional mental imagery and tolerance of ambiguity training methods could explain the lack of significant differences in their effectiveness on the components of students' academic procrastination. Therefore, it seems logical that there would be no significant difference between the two training methods in the components of students' academic procrastination, including decreased preparation for exams, preparation of assignments, and preparation of papers, and increased feelings, emotions, and willingness to change.

Significant limitations of this study include the single-gender nature of the sample consisting of female twelfth-grade students, the use of purposive non-random sampling, reliance on self-report instruments for data collection, and low cooperation from some students in participating in the intervention. Therefore, it is recommended that future research be conducted on male twelfth-grade students and even other grades, periods, or university students. Other research suggestions include the use of structured interviews for data collection and random sampling methods to reduce sampling error. Future researchers are also advised to compare the effectiveness of instructional mental imagery and tolerance of ambiguity training with other educational methods, such as cognitive and metacognitive strategy training, self-regulation training, etc. The results of this study have numerous practical implications and suggestions for educational specialists and therapists, counselors, and psychologists, especially school counselors and psychologists. Given the effectiveness of both instructional mental imagery and tolerance of ambiguity training methods in reducing students' academic procrastination, school counselors and psychologists can use these methods alongside other educational approaches to reduce academic procrastination.

Authors' Contributions

In this study, the first researcher was responsible for data collection and analysis, and the other researchers supervised the data analysis and manuscript writing.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

The researchers of this study thank the officials of the Bojnurd Department of Education, the participating female students, and their parents.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

[DOI: 10.61838/kman.ijes.7.1.2]

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E-ISSN: 2645-3460

Ethical Considerations

The researcher committed to observing all ethical standards, including confidentiality, non-disclosure of the interviewees' names, and others. The researchers of the present study explained and observed all ethical considerations for both the students and their guardians.

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[DOI: 10.61838/kman.ijes.7.1.2]

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460