



# The Impact of Cognitive and Metacognitive Strategy Training on Academic Self-Efficacy and Procrastination among Female Students with Social Media Addiction

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## Abstract

**Background:** Social media addiction has become prevalent among young people, negatively impacting their academic performance. The present study aimed to investigate the effectiveness of cognitive and metacognitive strategy training on self-efficacy and procrastination among female students with social media addiction.

**Methods:** A quasi-experimental pre-test, post-test, and follow-up design with a control group was used in this study. The target population comprised all female high school students exhibiting social media addiction in Dezful, Iran, during 2023. A convenience sample of 30 participants was randomly assigned to either an experimental group (n=15) or a control group (n=15). The experimental group underwent 10 weekly, 60-minute sessions of cognitive and metacognitive training, while the control group received no intervention. Pre-, post-, and follow-up assessments were conducted using the Academic Self-Efficacy Questionnaire (ASEQ) and the Academic Procrastination Questionnaire (APO). Repeated measures ANOVA was employed to analyze the data collected using SPSS version 22.

**Results:** The study results revealed significant differences between the groups in academic self-efficacy and procrastination ( $P < 0.001$ ). The experimental group demonstrated a significant increase in academic self-efficacy from a mean of  $67.20 \pm 4.67$  to  $84.27 \pm 5.66$  and a significant decrease in procrastination from a mean of  $35.13 \pm 5.96$  to  $20.40 \pm 6.57$  ( $P < 0.001$ ). In contrast, the control group showed no significant changes in these variables.

**Conclusion:** This study indicated that cognitive and metacognitive strategy training is effective in reducing the adverse effects of social media addiction on academic self-efficacy and procrastination among female high school students. These results suggested that equipping high school students with cognitive and metacognitive strategies can empower them to manage their social media usage more effectively, leading to improved academic outcomes.

**Keywords:** Cognitive, Self-efficacy, Procrastination, Internet addiction disorder, Students

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## 1. Introduction

Nowadays, Internet addiction is prevalent, affecting many societies (1). Over the past two decades, children and adolescents have exhibited high levels of Internet addiction. A meta-analysis revealed global pooled prevalence rates of 26.99% for smartphone addiction, 17.42% for social media addiction, and 14.22% for Internet addiction (2). In Iran, Modara and colleagues (3) estimated an overall Internet addiction prevalence of 20.00%. Internet addiction, characterized by excessive, uncontrollable, and compulsive internet use, is linked to negative outcomes such as poor academic performance, interpersonal difficulties, and decreased life satisfaction (4). Research also

demonstrated a significant negative correlation between Internet addiction and academic motivation, suggesting that it contributes to a decline in academic motivation (5).

Among the numerous behaviors influenced by the Internet age during adolescence, procrastination, a psychological trait characterized by the delaying or avoidance of tasks, is particularly prevalent in educational settings (6). It refers to a psychological characteristic where individuals postpone tasks or responsibilities due to their perceived unpleasantness or boredom, often leading to dissatisfaction with performance (7). Despite its negative consequences, procrastination is a common behavior in educational environments

and is associated with detrimental outcomes such as low grades, dropout rates, impaired physical and mental health, and interpersonal problems (8). Suarez-Perdomo and co-workers (9) demonstrated that students with the highest levels of academic procrastination tend to spend more time on social media. Furthermore, the findings of Nadarajan and colleagues (10) confirmed that daily Internet use for leisure purposes can lead to various problems for adolescents, and there is a significant positive correlation between problematic mobile phone use and academic procrastination. Given these findings, understanding and preventing procrastination is crucial for supporting students and improving educational systems.

Previous studies consistently linked academic self-efficacy to academic procrastination, with higher self-efficacy often associated with lower levels of procrastination (11). Self-efficacy, a cognitive construct, influences individuals' belief in their ability to achieve goals (12). Individuals with high self-efficacy tend to persevere through challenges and effectively manage emotions (13). Moreover, self-efficacy has been shown to mediate the relationship between adversity and psychological well-being, with higher self-efficacy linked to a more positive outlook and resilience (14). Furthermore, Hayat and colleagues (15) reported that academic self-efficacy is a strong predictor of academic success.

Over the years, various methods have been employed to address students' academic, motivational, behavioral, cognitive, and psychological challenges. One such method is the teaching cognitive and metacognitive strategies (16, 17). Perry and colleagues (18) defined metacognitive skills as an individual's capacity to reflect upon, comprehend, and regulate their own learning. This ability encompasses both knowledge about effective strategies (metacognitive knowledge) and the application of these strategies (metacognitive regulation). Metacognition refers to an individual's ability to think about their own thinking and learning processes (19). Metacognitive strategies, such as planning, monitoring, and organizing, are deeper processing techniques that enable students to control, regulate, and guide their cognition, thereby fostering meaningful learning and sustained attention (20).

Metacognition is a complex process encompassing knowledge of cognition and regulation of

cognition, divided into declarative, procedural, and conditional knowledge. It involves a set of strategic activities, including planning, monitoring, control, and evaluation (21). Planning entails setting goals, while regulation involves monitoring, controlling, and predicting. Control includes checking for errors and ensuring the success of the process. Both components are essential for effective metacognition and personal growth (22). Cognitive strategies, by increasing the speed of information processing, can enhance attention, focus, and working memory capacity. On the other hand, metacognitive strategies, by increasing the ability to plan, develop strategies, monitor strategies, or evaluate effectiveness, can also enhance attention, focus, and working memory capacity (23). Moreover, the combination of cognitive and metacognitive strategies is a powerful tool for revealing how learning processes develop, leading to increased self-learning skills, enhanced independence, and facilitated learning ability (24).

Metacognitive strategies are significant predictors of learners' success in educational settings. A lack of metacognitive skills, coupled with unfavorable motivational tendencies, has been identified as a potential risk factor for negative outcomes in school, such as limited knowledge of learning, behavioral problems, low self-concept, and often a negative attitude towards learning and school (25). Research showed that cognitive and metacognitive strategies can improve working memory, response inhibition, goal orientation, academic motivation, and vitality (26-28).

While previous research highlighted the importance of cognitive and metacognitive skills in promoting self-regulation and self-awareness among students (26, 27), there is a lack of research specifically investigating their impact on female students with social media addiction. Given the negative consequences of social media addiction on academic performance, it is imperative to explore interventions that can mitigate these effects. This study contributes to the existing body of knowledge by providing evidence-based recommendations for educational planners and policymakers. By equipping students with cognitive and metacognitive strategies, educational institutions can empower them to manage their social media usage more effectively and improve their academic outcomes. This study sought to evaluate

the effectiveness of cognitive and metacognitive strategy training in enhancing academic self-efficacy and reducing procrastination among female students with social media addiction.

## 2. Methods

A semi-experimental design with a pre-test, post-test, and follow-up was used in this study. The study population consisted of female high school students in Dezful City, Iran, during the 2022-2023 academic year, who were identified as having a tendency towards social media addiction based on the Addiction to Mobile Questionnaire (AMQ). A convenience sample of 30 students was randomly assigned to either an experimental or a control group (n=15) using a simple randomization technique (Figure 1). A table of random numbers was employed to assign participants to groups, ensuring that each student had an equal probability of being allocated to either condition. A G\*Power analysis was performed to find the sample size needed for 0.05 Types I error rate and 0.90 power. After the intervention, the experimental group,

which received cognitive and metacognitive strategy training, demonstrated significantly higher mean academic self-efficacy scores ( $M=84.27$ ,  $SD=5.66$ ) compared with the control group ( $M=70.07$ ,  $SD=6.63$ ) on the post-test. The inclusion criteria were: 15 -18 years of age, a score above 69 on the AMQ, no prior participation in relevant educational interventions, and informed consent from both parents and students. Participants were excluded if they missed more than two intervention sessions or did not complete all questionnaires.

### 2.1. Procedure

Prior to commencing the study, students who met the inclusion criteria were administered a pre-test to assess their academic self-efficacy and procrastination levels. Following group assignment, the experimental group participated in a ten-week training program consisting of ten 60-minute sessions (29). These sessions, facilitated by the researcher at the educational counseling center, focused on cognitive and metacognitive strategies. The control group received no intervention during

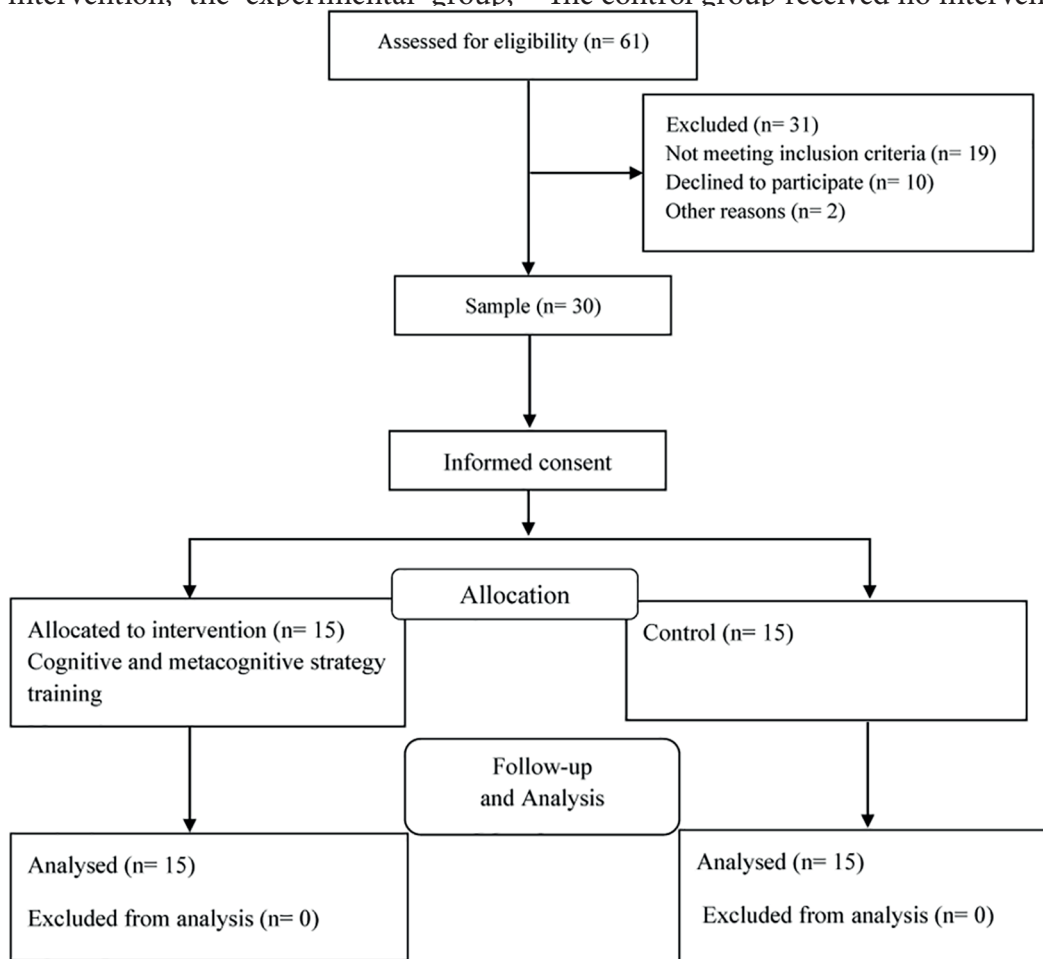


Figure 1: The figure shows the CONSORT flow diagram of the study.

this period. A detailed outline of the training sessions is provided in Table 1. After the training, both groups completed post-tests to assess their academic self-efficacy and procrastination levels. A follow-up evaluation was conducted one month later. To maintain ethical standards, the control group was subsequently provided with the treatment that the experimental group had received. All participant information was treated with utmost confidentiality.

## 2.2. Instruments

**2.2.1. The Addiction to Mobile Questionnaire (AMQ):** To assess tendency towards social media addiction, AMQ developed by Khajehmadi and colleagues in 2016 (30) was administered. This 23-item questionnaire measures addiction to mobile-based social media across four subscales: individual functioning, self-control, time management, and social relationships. Participants rated items on a 5-point scale from “strongly disagree” (1) to “strongly agree” (5). A higher score indicates a greater level of social media addiction. Individuals with a total AMQ score (cut-point) of 69 or higher were classified as having a tendency toward social media addiction. Internal consistency, as measured by Cronbach’s alpha, was found to be 0.92 (30). Khajehmadi and colleagues (30) reported that AMQ demonstrated strong content validity, as evidenced by a Content Validity Ratio (CVR) of

0.95 and a Content Validity Index (CVI) of 0.86. The study assessed the reliability of the questionnaire with a Cronbach’s alpha of 0.82.

**2.2.2. The Academic Self-Efficacy Questionnaire (ASEQ):** ASEQ, developed by Jinks and Morgan (31), is a 30-item measure assessing students’ beliefs in their academic abilities. It consists of three subscales: talent, effort, and texture. Respondents rate their agreement with each item on a 4-point Likert scale. The highest and lowest possible scores on ASEQ are 30 and 120, respectively. Previous research confirmed the reliability of ASEQ (32). Additionally, ASEQ demonstrated robust content validity, supported by a Content Validity Ratio (CVR) of 0.97 and a Content Validity Index (CVI) of 0.94 (32). In the present study, the Cronbach’s alpha for ASEQ was 0.79, confirming its internal consistency.

**2.2.3. The Academic Procrastination Questionnaire (APQ):** To assess academic procrastination, Sevari’s Academic Procrastination Questionnaire (33) was employed in this study. This questionnaire consists of 12 items and measures three factors: intentional procrastination, procrastination due to physical and mental fatigue, and procrastination due to a lack of planning. Respondents rated their agreement on a 5-point Likert scale from ‘never’ (0) to ‘always’ (4), yielding total scores from 0 to 48, where higher scores indicate more procrastination.

**Table 1:** A summary of the cognitive and metacognitive training sessions

Sessions	Content
1	After introductions and motivation, students were introduced to the concept of learning, memory structure, and the causes of forgetting. Subsequently, basic rehearsal strategies as a cognitive strategy were introduced using student-provided examples.
2	Strategies for rehearsing complex information, such as identifying key points and highlighting important content, were presented to students. They were asked to provide examples from their own experiences.
3 & 4	After reviewing previous material and assigning related homework, strategies for elaborating on simple information, such as mental imagery, keywords, and acronyms, were introduced along with examples. Homework was assigned for the following session.
5	In this session, strategies for elaborating on complex information, such as note-taking and analogical reasoning (learning based on similarities between different things and organizing information), were presented.
6 & 7	These sessions focused on organizational strategies, a subset of metacognitive strategies. Topics included categorizing information based on familiar categories, creating lists of headings, drawing tree diagrams, creating charts, concept maps, and concept models, all accompanied by examples.
8	This session focused on planning strategies, a subset of metacognitive strategies. Students were taught to set goals for their study sessions and to allocate time based on their individual learning rates. They were also asked to reflect on and discuss the cognitive and metacognitive strategies they had used prior to the training program.
9	The focus of this session was on monitoring and control strategies, another subset of metacognitive strategies. Students were taught to engage in self-assessment to track their progress. They were encouraged to monitor their attention levels while reading and to ask themselves questions about the text during study sessions.
10	The final session introduced the last metacognitive strategy: regulation. Students were taught how to be flexible in their study approaches, adapting their study style and pace based on the subject matter and their specific circumstances. The session concluded with a review of all the training material, with students providing examples.

Sevari (33) found a Cronbach's alpha of 0.85 for APQ, indicating strong internal consistency, with a CVR of 0.90 and a CVI of 0.89 confirming content validity. This Cronbach's alpha in this study is 0.82, showing the reliability of the questionnaire.

### 2.3. Statistical Analyses

Descriptive statistics, including means and standard deviations (SD), were calculated. Repeated measures analysis of variance was used to determine significant differences between groups. The normality of the data was assessed using the Kolmogorov-Smirnov test. Levene's test was employed to verify the assumption of homogeneity of variances between groups at the pre-test stage. All statistical analyses were performed using SPSS version 22, with a significance level of 0.05.

### 3. Results

A total of 30 female high school students, with an average age of 16.39 years ( $SD=2.60$ ), participated in the study. The mean age of participants in the experimental group was 15.90 ( $SD=2.36$ ) years, compared with 16.88 ( $SD=2.84$ ) years in the control group ( $P=0.313$ ). In the experimental group, 6 (40.00%) participants were in the 10<sup>th</sup> grade, 4 (26.67%) were in the 11<sup>th</sup> grade, and 5 (33.33%) were in the 12<sup>th</sup> grade. In the control group, 4 (26.67%) participants were in the 10<sup>th</sup> grade, 4 (26.67%) were in the 11<sup>th</sup> grade, and 7 (46.66%) were in the 12<sup>th</sup> grade ( $P=0.553$ ). No significant differences were found in demographic variables between experimental and control groups.

Table 2 shows the mean and standard deviations of academic self-efficacy and procrastination for the pre-test, post-test, and follow-up. The experimental group had significantly higher self-efficacy and lower procrastination than the control

group in all phases of the study. Specifically, mean academic self-efficacy scores in the experimental group increased from 67.20 ( $\pm 4.67$ ) at the pre-test to 84.27 ( $\pm 5.66$ ) at the post-test and remained relatively high at the follow-up 83.67 ( $\pm 5.83$ ). In contrast, academic self-efficacy scores in the control group showed minimal changes, with mean scores ranging from 69.33 ( $\pm 6.64$ ) to 70.27 ( $\pm 6.92$ ). Similarly, the experimental group demonstrated a significant decrease in procrastination, with mean scores dropping from 35.13 ( $\pm 5.96$ ) at the pre-test to 20.40 ( $\pm 6.57$ ) at the post-test and remaining low at the follow-up (20.33 $\pm 6.51$ ). The procrastination levels in the control group remained relatively stable throughout the study, with mean scores ranging from 36.27 ( $\pm 5.35$ ) to 35.07 ( $\pm 5.54$ ).

The Kolmogorov-Smirnov test confirmed that the data for all variables were normally distributed. Levene's test indicated that the variances were homogeneous. However, Mauchly's test revealed a violation of the sphericity assumption for academic self-efficacy and procrastination. To address this, the Greenhouse-Geisser correction was applied.

Repeated measures ANOVA indicated significant longitudinal changes in academic self-efficacy and procrastination ( $P<0.001$ ). These findings highlighted substantial differences in these dependent variables across the pre-test, post-test, and follow-up stages. Furthermore, a significant interaction effect between group and time was observed for both academic self-efficacy and procrastination ( $P<0.001$ ). This suggests that the intervention's impact varied over time for the two groups. Additionally, significant differences emerged between the cognitive and metacognitive training group and the control group in terms of academic self-efficacy and procrastination ( $P<0.001$ ). These findings emphasized the superior efficacy of cognitive and metacognitive training

**Table 2:** Means and standard deviations (SD) of self-efficacy and procrastination

Variable	Phase	Experimental group	Control group	P (between group)
		Mean $\pm$ SD	Mean $\pm$ SD	
Academic self-efficacy	Pre-test	67.20 $\pm$ 4.67	69.33 $\pm$ 6.64	0.318
	Post-test	84.27 $\pm$ 5.66	70.07 $\pm$ 6.63	0.001
	Follow-up	83.67 $\pm$ 5.83	70.27 $\pm$ 6.92	0.001
	P (within group)	0.001	0.707	-
Procrastination	Pre-test	35.13 $\pm$ 5.96	36.27 $\pm$ 5.35	0.586
	Post-test	20.40 $\pm$ 6.57	35.33 $\pm$ 5.70	0.001
	Follow-up	20.33 $\pm$ 6.51	35.07 $\pm$ 5.54	0.001
	P (within group)	0.001	0.551	-

SD: Standard Deviation

**Table 3:** Bonferroni post-hoc test for comparing academic self-efficacy and procrastination over time

Groups	Variables	Phase A	Phase B	Mean difference (A-B)	SE	P
Experimental group	Academic self-efficacy	Pre-test	Post-test	17.06	1.90	0.001
			Follow-up	16.46	1.93	0.001
		Post-test	Follow-up	0.60	2.10	0.620
	Procrastination	Pre-test	Post-test	14.73	2.29	0.001
			Follow-up	14.80	2.28	0.001
		Post-test	Follow-up	0.07	2.39	0.977
Control group	Academic self-efficacy	Pre-test	Post-test	0.74	2.42	0.762
			Follow-up	0.94	2.48	0.707
		Post-test	Follow-up	0.20	2.47	0.936
	Procrastination	Pre-test	Post-test	-0.94	2.02	0.645
			Follow-up	-1.20	1.99	0.551
		Post-test	Follow-up	-0.26	2.05	0.900

SE: Standard Error

in enhancing academic self-efficacy and reducing procrastination compared with the control group.

Bonferroni post-hoc comparisons were conducted to examine differences among the three time points (pre-test, post-test, and follow-up) within the experimental group. Significant differences in academic self-efficacy and procrastination were observed between the post-test and pre-test, as well as between the follow-up and pre-test ( $P < 0.001$ ), within the cognitive and metacognitive training group. However, no significant differences were found in either academic self-efficacy or procrastination between the post-test and follow-up stages within this group. Moreover, the control group exhibited no significant differences in academic self-efficacy or procrastination at different time points (Table 3).

#### 4. Discussion

The study investigated the efficacy of cognitive and metacognitive strategy training in enhancing academic self-efficacy and mitigating procrastination among female students exhibiting social media addiction. The results demonstrated that cognitive and metacognitive strategy training was effective in enhancing academic self-efficacy among students with social media addiction. This finding aligned with the research conducted by Saeedpoor and colleagues (34), who also observed the positive effects of such training on academic self-efficacy in students. They implemented a similar intervention and found that participants in the training group exhibited significant improvements in academic self-efficacy compared to a control group. Their study further emphasized the importance of cognitive and metacognitive strategies in fostering

academic success. Zolfy and co-workers (27) reported that cognitive-metacognitive strategy training enhanced working memory scores and response inhibition among students with learning disabilities. The aim of metacognitive training is to cultivate independent learners, systematize study habits, and emphasize the management of various cognitive resources. These objectives are among the higher-order cognitive goals linked to advanced mental processes. Metacognitive training empowers individuals to maximize the use of available internal and external resources, effectively increasing cognitive efficiency (27).

Metacognitive strategies are derived from a constructivist perspective, which underscores the active role of learners in studying and learning. To perform optimally, students must not only be aware of multiple strategies but also understand when and how to use them. When students receive metacognitive strategy training, over time, it enables them to engage in deeper, divergent thinking when solving scientific and intellectual problems (34). Furthermore, reviewing study habits and learning conditions compels learners to adapt. Individuals with high metacognition, being aware of their learning processes, recognize this and, if they do not achieve desired outcomes or academic success in any given situation, seek to change themselves, their circumstances, and other related factors, embracing whatever enhances their self-efficacy (25).

Cognitive and metacognitive strategy training, by fostering self-awareness in students, helped them to recognize their strengths and weaknesses. When individuals have a sufficient understanding of their abilities and accurately assess their

situations, they are better able to enhance their motivation for success and identify contexts that foster increased motivation for continued learning (28). Adolescents with self-awareness skills have a greater capacity to understand the needs of others and effectively perceive peer pressure (35). Acquiring these skills leads to significant changes in students' intrapersonal and interpersonal indices, enabling them to develop a realistic perception of themselves and the world around them, and empowering them to control their emotions and behaviors (34). Moreover, they become more successful in establishing meaningful, deep, and authentic relationships with others. Additionally, improved self-awareness accelerates cognitive functions such as attention, focus, reasoning, and learning, ultimately leading to increased academic self-efficacy. Furthermore, cognitive and metacognitive strategy training emphasized strategies such as monitoring one's ability and speed in solving problems, as well as regulating effort and study habits, which gradually enables students to enhance their academic self-efficacy (22).

Furthermore, the results demonstrated that cognitive and metacognitive strategy training was effective in reducing procrastination among students with social media addiction. This finding aligned with the results of Ghadampour and Beiranvand (36). To explain this finding, Ghadampour and Beiranvand argued that the primary goal of metacognitive skills is self-regulation and self-directed learning, enabling learners to become independent learners capable of guiding, monitoring, and modifying their cognitive and learning processes toward their defined goals (36). Therefore, learners need to be trained in skills such as organization, self-monitoring, planning, and goal setting to establish a foundation for new learning. Otherwise, solving novel tasks that they have not encountered before becomes difficult, leading to increased anxiety and procrastination.

On the other hand, during group-based metacognitive strategy training, as interaction among students increases, so too does discussion of academic challenges. When students engage in more dialogue, overcoming academic difficulties becomes easier due to increased collaboration (34). Consequently, this facilitated overcoming of challenges, coupled with empathy and dialogue among students, contributes to a decrease in

procrastination. In summary, it can be said that through metacognitive strategy training, students learn operational and behavioral guidelines that include planning, monitoring, and organizing (27). During this learning process, they develop positive feelings and attitudes toward studying, which increases their motivation and interest in learning, thereby significantly contributing to a reduction in academic procrastination (34).

#### 4.1. Limitations

This study had certain limitations including the small sample size, which may limit the generalizability of the findings. Additionally, the use of a convenience sample could introduce selection bias. Furthermore, conducting the study in a single location restricts the generalizability of the results to other regions. The follow-up period of one month was relatively short, limiting insights into long-term effects. Moreover, the reliance on self-reported measures may be subject to response biases. Finally, while random assignment was employed to mitigate confounding variables, other factors may have influenced the outcomes.

## 5. Conclusions

The study results showed that cognitive and metacognitive strategy training effectively reduces the negative impact of social media addiction on academic self-efficacy and procrastination in female students. The experimental group had higher academic self-efficacy and lower procrastination than the control group. These findings suggested that equipping students with cognitive and metacognitive strategies can empower them to manage their social media usage more effectively, leading to improved academic outcomes. In terms of educational interventions, the study highlighted the importance of incorporating cognitive and metacognitive strategy training into educational programs to address the challenges faced by students with social media addiction. Additionally, schools and counseling services can benefit from implementing interventions that target both academic skills and emotional well-being to support students struggling with social media-related issues. Future studies could explore the long-term effects of cognitive and metacognitive training on academic performance and mental health outcomes among students with social media addiction. Furthermore, investigating the

effectiveness of these strategies for different age groups and cultural contexts could provide valuable insights for developing tailored interventions.

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### Authors' Contribution

Samira Zeynali: Contributed substantially to the conception and design of the study and the interpretation of data, drafted the manuscript and critically reviewed it for important intellectual content. Marzieh Talebzadeh Shoushtari: Contributed substantially to the methodology development and data analysis, critically reviewed the manuscript for important intellectual content. Rezvan Homaei: Contributed substantially to data collection, management, and analysis, with substantial input on the statistical analysis, critically reviewed the manuscript. Sasan Bavi: Contributed substantially to data collection, provided substantial clinical insight and expertise during the design of the study and contributed substantially to the interpretation of data and the discussion section, critically reviewed and edited the manuscript for clarity and coherence. Fatemeh Sadat Marashian: Contributed substantially to data collection, contributed substantially to data collection, provided substantial clinical insight and expertise during the design of the study and contributed substantially to the interpretation of data and the discussion section, critically reviewed and edited the manuscript for clarity and coherence. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such that the questions related to the accuracy or integrity of any part of the work.

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### Ethical Approval

The study was approved by the Ethics Committee of Islamic Azad University, Ahvaz Branch, Iran

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