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Running head: EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

The Acute Effects of Yoga on Mindfulness and Smoking Urges

Elizabeth Crain

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EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Abstract

Although smoking rates in the United States have decreased in the last several years, smoking is still the leading cause of preventable death in the United States. Smoking cessation is associated with significant health improvements—some as immediately as thirty minutes from the last cigarette smoked. The most common smoking cessation technique today involves teaching smokers to suppress their cravings. However, actively suppressing cravings could have a rebound effect. Mindfulness—essentially the opposite of suppression—is a tool that is presently being used to help smokers in the cessation process. In terms of smoking cessation, mindfulness is described as a process in which the smoker allows a craving to surface without acting on the craving or judging it. Rather, the smoker is encouraged to stay in the present moment and allow their thoughts and feelings to arise without judgment or action. As such, the use of mindfulness as a cessation strategy is said to help smokers develop a tolerance for their cravings, and that this tolerance greatly aids the cessation process. Mindfulness can be facilitated via the practice of yoga, which comprises exercise, meditation, and breathing exercises. Each of these three components have independently been shown to decrease smoking urges. In the present study, 29 smokers were randomly assigned to participate in a yoga session, a meditation session, a breathing exercise session, a treadmill exercise session, or a control condition in order to determine whether or not yoga decreased smoking urges, and whether this process was mediated by mindfulness. Contrary to prediction, there were no significant differences among the five groups in smoking urges or mindfulness measures. Due to the small sample size in the experimental and other conditions, it is difficult to draw meaningful conclusions about the effects of each manipulation on mindfulness and whether mindfulness mediated the relationship between yoga and smoking urges.

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

The Acute Effects of Yoga on Mindfulness and Smoking Urges

According to the Center for Disease Control and Prevention (2011), smoking is the cause of many cancers including lung, bladder, kidney, and stomach cancer. It also causes a myriad of other health issues such as stroke, aneurysm, and cardiovascular disease. It is thought to shorten lives by more than a decade. Although the rates of smoking have steadily decreased in the last several decades, smoking is still the leading cause of preventable deaths in the United States (CDC website). In a survey conducted by the CDC in 2012, 18.1% of Americans still identified themselves as smokers. Smokers often cite stress as a reason to continue smoking behavior, although research shows that smoking does not truly help people cope with stress and even increases negative affect (Hajek, 2010).

The traditional method to help people quit smoking involves instructing them to suppress cravings, avoid things that trigger cravings, reduce stress, and find alternatives to smoking. Suppression has been shown to be effective in the short term, but could have a rebound effect. When people push cravings out of awareness, they could come back even stronger than before (Rogojanski, Vettese, & Antony, 2011b).

Another strategy that is being used in smoking cessation is mindfulness. Mindfulness can be defined as a non-judgmental awareness of what is happening in the present moment. Mindfulness is essentially the opposite of suppression. In terms of smoking cessation, mindfulness involves allowing a craving to surface without acting on it or judging it. A person is encouraged to stay in the present moment and allow their thoughts and feelings to arise without judgment or action. This method of cessation is said to help people develop a tolerance for their cravings (Rogojanski et al., 2011b). In 2011, Rogojanski et al. (2011a) conducted a study using mindfulness and suppression for smoking cessation and the groups did not show significantly

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

different craving levels, but the mindfulness group was able to better cope with cravings and ultimately had a greater success in abstaining from smoking. They also had a more positive outlook and felt like they would continue to abstain from smoking. A pilot study by Shelov, Suchday, and Friedberg (2009) showed preliminary evidence that yoga significantly increased mindfulness in participants. The three areas of mindfulness that were increased the most were: attention to the present moment, accepting and open attitudes toward experience, and insightful understanding. Those 3 facets of mindfulness could be useful in combating smoking urges by allowing a person to experience an urge to smoke, but not act on that urge or attach themselves to the discomfort and realize that it is only temporary.

Traditional Yoga has 8 parts, but western yoga focuses mainly on 3: exercise, meditation, and controlled breathing. These 3 things are linked together in a yoga session (Carim-Todd, Mitchell, & Oken, 2013). Exercise in itself has been shown to significantly reduce smoking urges. Elibero, Rensburg, and Drobles found that one 30 minute exercise session reduced smoking urges, and participants reported that they anticipated smoking to be less desirable after the exercise session (2011). Taylor and Katomeri found that a brisk 15 minute walk reduced smoking urges and symptoms of withdrawal (2007). Daniel, Cropley, and Fife-Schaw conducted a study that compared 10 minutes of exercise on a stationary bike and a cognitive distraction task to determine if it was the exercise that reduced cravings or if it was simply the distraction. The participants who did 10 minutes of exercise had a significantly larger reduction in nicotine craving and withdrawal symptoms than those who did the cognitive distraction task (2006). Meditation has also been shown to reduce smoking urges. One study compared 2 weeks of meditation training and 2 weeks of relaxation training and found that 60% of the participants in the meditation condition smoked less cigarettes by the end of the 2 weeks. The participants in the

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

relaxation condition smoked the same amount of cigarettes as before. Researchers attributed the reduction in craving in the meditation group to an increase in mindfulness (Y. Tang, R. Tang, & Posner, 2013). Finally, controlled breathing has also been studied in terms of its efficacy for smoking cessation. In 2012, Shahab conducted a study that used yogic breathing exercises for smokers. Yogic breathing was shown to reduce cravings and increase relaxation.

The present study tested if yoga increased mindfulness and decreased smoking urges. We conducted a 5 group design. We predicted that the participants in the exercise condition would show no difference in mindfulness and a decrease in smoking urges based on the previous literature. We predicted that the participants in the meditation condition and the breathing exercises condition would show an increase in mindfulness and a decrease in smoking urges, and we predicted that the participants in the yoga condition would show the most pronounced increase in mindfulness and decrease in smoking urges as a result of linking together exercise, breath, and meditation.

Method

Power Analysis

A power analysis was conducted to determine the necessary sample size to achieve statistical power to detect differences between groups. In order to detect a medium effect size of Cohen's d , with alpha set at .05 and power at .80, 25 participants needed to be recruited for each of the 5 groups for a total of 125 participants. Due to recruitment difficulties, only 29 participants were recruited and completed the study.

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Participants

We recruited 29 participants (19 women and 10 men; ages 18-23; mean age=20; SD=1.5) who identified themselves as smokers online through the SONA experiment system at Louisiana State University (LSU). For the purposes of this experiment, smokers were operationally defined as individuals who endorse cigarette or e-cigarette smoking in the prior 30 days. Self-reported smoking status was biochemically verified by carbon monoxide (CO) breath analysis with a Vitalograph BreathCo monitor when participants attended the experimental session. Participants were randomly assigned to one of the five conditions. Students received course credit for participating.

Apparatus and Materials

Demographic Questionnaire (developed by the experimenter). This questionnaire collected information on gender, ethnicity, race, and age.

Minnesota Nicotine Withdrawal Scale (MNWS; Hughes & Hatsukami, 1986; see Appendix A). This measure was given to assess the participants' current level of nicotine withdrawal. The Minnesota Nicotine Withdrawal Scale is an 8-item scale that measures self-reported withdrawal symptoms such as: anxiety, difficulty concentrating, restlessness, and depressed or sad mood. Each item is rated on a 4-point scale (0 = symptom not present; 3 = severe symptom intensity). The MNWS has been shown to have good reliability and high sensitivity to nicotine abstinence (West, Ussher, Evans, & Rashid, 2006).

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006; see Appendix B). This questionnaire was given to assess mindfulness in participants. The five categories of mindfulness being measured in the FFMQ are: observing, describing, acting with awareness,

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

non-judging of inner experience, and non-reactivity to inner experience. Example statements for each category are as follows: observing: “I notice how food and drinks affect my thoughts, bodily sensations, and emotions”; describing: “I am good at finding words to describe my feelings”; acting with awareness: “I don’t pay attention to what I’m doing because I’m daydreaming, worrying, or otherwise distracted”; non-judging of inner experience: “I tell myself I shouldn’t be feeling the way I’m feeling”; and non-reactivity to inner experience: “I perceive my feelings and emotions without having to react to them.” The FFMQ consists of 39 statements that participants rate on a 5-point scale (1 = never or very rarely true; 5 = very often or always true). Participants receive a separate score for each of the 5 categories. The FFMQ contains several reverse-scored items to increase validity.

Yoga Video This 30 minute video shows a gentle yoga sequence created and led by a hatha yoga certified instructor. Viewers are led through several gentle yoga poses and asked to link their breath with their movements. In the last seven minutes of the video, the viewer is instructed to lie down and relax for “corpse pose,” which is the relaxation pose that ends almost all yoga classes. This video was created for the Moffit Cancer Center and has been used in studies in the Health Outcomes and Behaviors department at the University of South Florida.

Meditation Audio This 30 minute YouTube audio clip guides listeners through a seated meditation. It encourages listeners to relax and focus on the breath, but not to control or change it. The audio clip includes periods of silence. After these short periods of silence (one or two minutes), the voice prompts listeners to let go of any thoughts they might be having without judging themselves for having thoughts. The voice also instructs the listener to refocus on their breath. The following is a link to the meditation audio:

<https://www.youtube.com/watch?v=sNumcjOvHHw>

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Breathing Exercises Video This 30 minute YouTube video instructs listeners in a series of yogic breathing techniques. The video begins by asking the viewer to just notice the movement of their breath without changing it. It then asks viewers to deepen their breath for a period of time and try to match the length of the inhale to the length of the exhale. The instructor then leads the participants in a series of breathing exercises including: rapid breathing, alternate nostril breathing, and abdominal breathing. The following is a link to the breathing exercises video: <https://www.youtube.com/watch?v=PYZZKgd8ND8>

Treadmill The treadmill used in the study was a manual treadmill, and participants were asked to walk at their own pace for 30 minutes.

Procedure

When participants came in for the study, they read and signed a consent form. They were asked how many cigarettes they smoked monthly and how many years they had been smoking. Participants then completed the demographic form, the MNWS, and the FFMQ. They were also asked to rate their desire to smoke a cigarette from 1(no desire to smoke)-10(a strong desire to smoke). Participant smoking status was verified by a CO monitor reading. Participants in the yoga condition were provided with a yoga mat and shown a 30 minute yoga video that they were asked to follow along with. Participants in the mediation condition were led through a 30 minute guided meditation session on YouTube. Participants in the breathing exercises condition were shown a 30 minute breathing exercise training on YouTube that they were asked to follow along with. Participants in the exercise condition were asked to walk on a manual treadmill at their own pace for 30 minutes. Participants in the control condition watched a 30 minute informational video about the health benefits of yoga. All participants then completed the FFMQ again and

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

rated their desire to smoke a cigarette from 1-10 again to assess changes in nicotine craving, and mindfulness.

Results

Participant Characteristics

Participants (N = 29) were randomly assigned to the five conditions, resulting in the following number of participants per condition: Yoga Group: n=5, Meditation Group: n=6, Breathing Exercise Group: n=5, Exercise Group: n=4, Control Group: n=9. At baseline, overall participant age was 20. See Table 1 for overall participant characteristics and for baseline characteristics by condition.

Smoking Urge Ratings

We conducted a one-way analysis of covariance (ANCOVA) with experimental condition as the factor, smoking urge ratings at post-manipulation as the dependent variable, and pre-manipulation smoking urge ratings as the covariate. There were no significant differences among the five groups in post-manipulation smoking urge. See Figure 1 for pre- and post-manipulation urges in the five conditions/groups.

FFMQ

We conducted a one-way multivariate analysis of covariance (MANCOVA) with experimental condition as the factor, the five subscales of the FFMQ at post-manipulation as factors, and the pre-manipulation five subscales of the FFMQ as covariates. There were no significant differences among the five groups for the five facets of the FFMQ at post-

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

manipulation. See Figures 2-7 for pre- to post-manipulation scores among the five conditions/groups.

Discussion

We did not find any significant differences among the five groups in smoking urges or mindfulness measures. This was most likely due to recruitment difficulties. In order to achieve statistical power, we would have had to recruit 125 participants, 25 for each group. We were only able to recruit 29. There are very few daily college student smokers at LSU. This is why we included anyone who reported having smoked a cigarette or used an e-cigarette in the last month. Most of the participants were not daily smokers, and thus rated their pretest smoking urge very low. Future researchers should operationally define a smoker as anyone who has smoked at least one cigarette or uses an e-cigarette daily to increase the pretest smoking urge score, in order to compare it to the posttest smoking urge score.

Another limitation of our study is that the Carbon Monoxide (CO) machine was not working properly throughout the study. This is why the yoga condition does not have a CO reading in figure 1.

This was to our knowledge, the first study to investigate the effects of yoga on smoking urges and to dissect yoga into its three separate components which have all been individually shown to decrease smoking urges (Elibero, Rensburg, & Drobles, 2011; Y. Tang, R. Tang, & Posner, 2013; Shahab, 2012). We did not find any significant differences in smoking urges among the groups. One explanation of our findings is that although yoga has been shown to increase mindfulness (Shelov, Suchday, & Friedberg, 2009), it did not necessarily decrease smoking urges in previous studies (Rogojanski et al., 2011b). Rogojanski et al. found no

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

difference between smoking urges in mindfulness participants and suppression participants, but the mindfulness participants actually smoked less (2011b). Future research could replicate this study and assess nicotine craving, number of cigarettes smoked, and mindfulness measures a week after completion to determine if participants are smoking less and if there is a relationship between mindfulness and number of cigarettes smoked.

Acknowledgements

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EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

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EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Table 1. Participant Characteristics for each group.

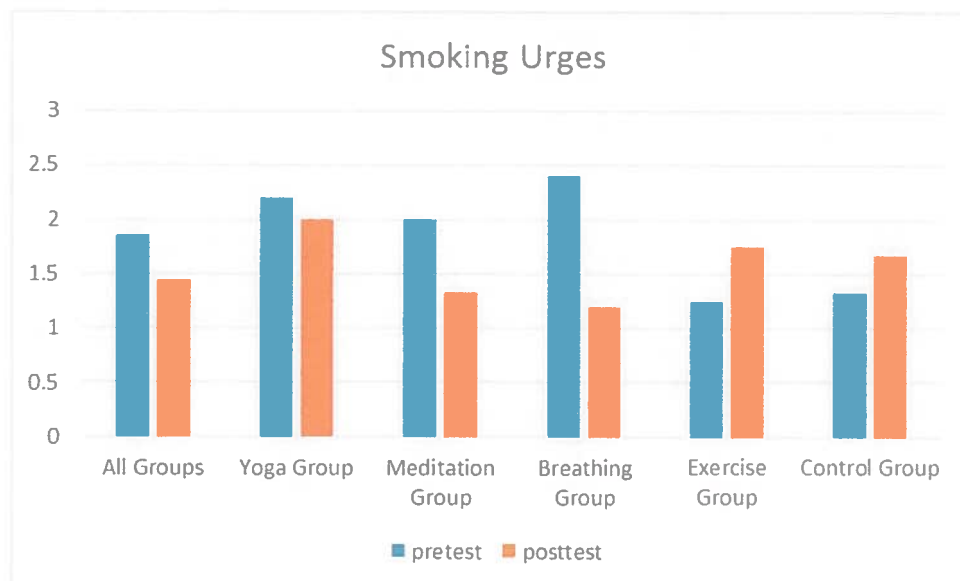
	All (n=29)	Yoga group (n=5)	Meditation group (n=6)	Breathing group (n=5)	Exercise group (n=4)	Control group (n=9)
Age (years)	Mean: 20 (SD=2.3)	Mean: 21 (SD=1.2)	Mean: 20 (SD=1.5)	Mean: 19 (SD=0.7)	Mean: 20 (SD=2.4)	Mean: 19 (SD=1.3)
Gender	10 males 19 females	1 male 4 females	3 males 6 females	3 males 2 females	1 male 3 females	2 males 4 females
CO level	Mean: 0.002ppm	Mean:	Mean: 0.003ppm	Mean: 0.003ppm	Mean: 0ppm	Mean: 0.001ppm
Number of cigarettes per month	Mean: 22.9 (SD=57.3)	Mean: 4 (SD=2.6)	Mean: 66.3 (SD=103)	Mean: 11 (SD=13)	Mean: 4.7 (SD=1.2)	Mean: 3.3 (SD=1.5)
Years participant has been smoking	Mean: 0.4 (SD=0.9)	Mean: 0.6 (SD=1.3)	Mean: 0.3 (SD=0.6)	Mean: 0.6 (SD=1.3)	Mean: 0.2 (SD=0.3)	Mean: 0.3 (SD=0.6)
Baseline MNWS score	Mean: 13.6 (SD=8.9)	Mean: 12.4 (SD=8.6)	Mean: 12.3 (SD=6.9)	Mean: 16.8 (SD=13.1)	Mean: 15.5 (SD=10.9)	Mean: 12.5 (SD=9.2)
Baseline smoking urge rating	Mean: 2 (SD=1.6)	Mean: 2 (SD=2.2)	Mean: 2 (SD=1.5)	Mean: 2 (SD=2.6)	Mean: 1 (SD=0.5)	Mean: 1 (SD=0.8)

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Table 2. Participant baseline FFMQ subscale scores for each group.

FFMQ subscale	All (n=29)	Yoga group (n=5)	Meditation group (n=6)	Breathing group (n=5)	Exercise group (n=4)	Control group (n=9)
Observing	Mean: 26.6 (SD=4.9)	Mean: 25.7 (SD=3.8)	Mean: 26.8 (SD=6.8)	Mean: 28.2 (SD=4.5)	Mean: 26.8 (SD=4.4)	Mean: 25.4 (SD=4)
Describing	Mean: 26.5 (SD=6.4)	Mean: 19.7 (SD=4.9)	Mean: 25.6 (SD=6.9)	Mean: 30.6 (SD=4.7)	Mean: 31 (SD=4.8)	Mean: 24 (SD=4.8)
Awareness	Mean: 26.9 (SD=5.6)	Mean: 22.7 (SD=6.8)	Mean: 29.1 (SD=5.4)	Mean: 26.2 (SD=6.1)	Mean: 26.5 (SD=7)	Mean: 27 (SD=3.4)
Non-judgement	Mean: 27.1 (SD=7)	Mean: 26 (SD=5)	Mean: 30.1 (SD=6.1)	Mean: 28.6 (SD=10.1)	Mean: 20.2 (SD=5.6)	Mean: 25.6 (SD=3.4)
Non-reactivity	Mean: 19.9 (SD=5)	Mean: 19.3 (SD=3.2)	Mean: 21.2 (SD=5.3)	Mean: 19.6 (SD=4.2)	Mean: 15.8 (SD=3.6)	Mean: 20.8 (SD=6.5)

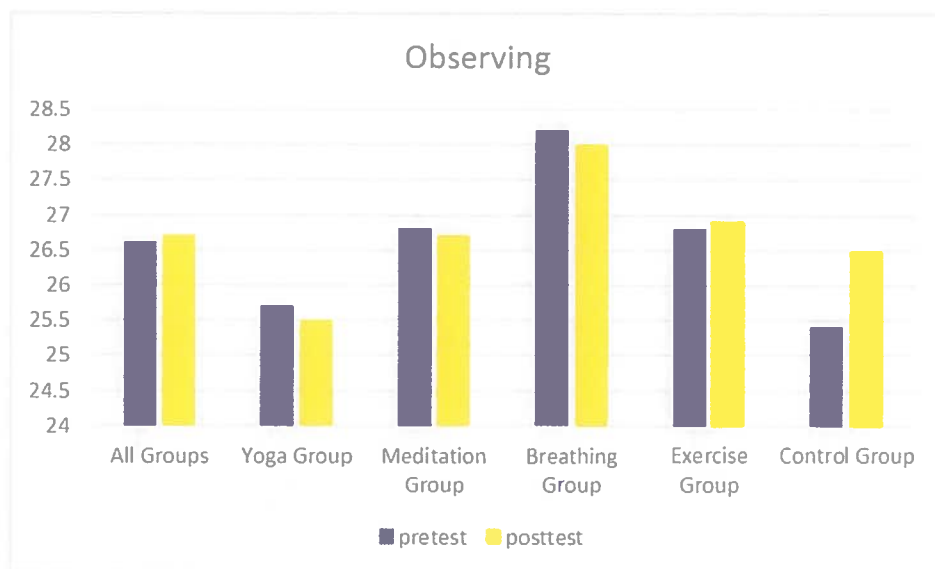
Fig. 1. Pretest and Posttest self-rating for participant's urge to smoke from 1-10.



EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

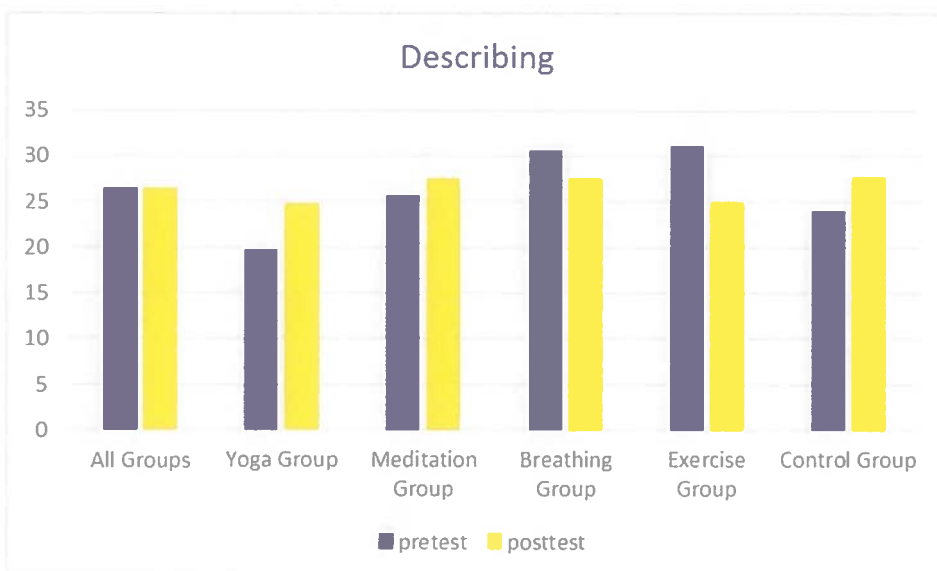
Observing Facet of Mindfulness

Fig 2. Pretest and Posttest scores for the “observing” facet of mindfulness. Scores range from 1-40. Higher scores indicate a higher level of the observing facet of mindfulness.



Describing Facet of Mindfulness

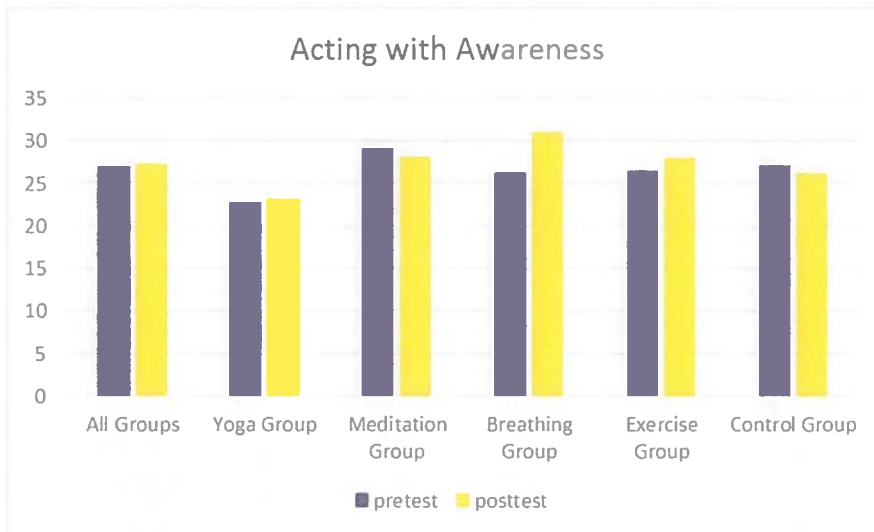
Fig 3. Pretest and Posttest scores for the “describing” facet of mindfulness. Scores range from 1-40. Higher scores indicate a higher level of the describing facet of mindfulness.



EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

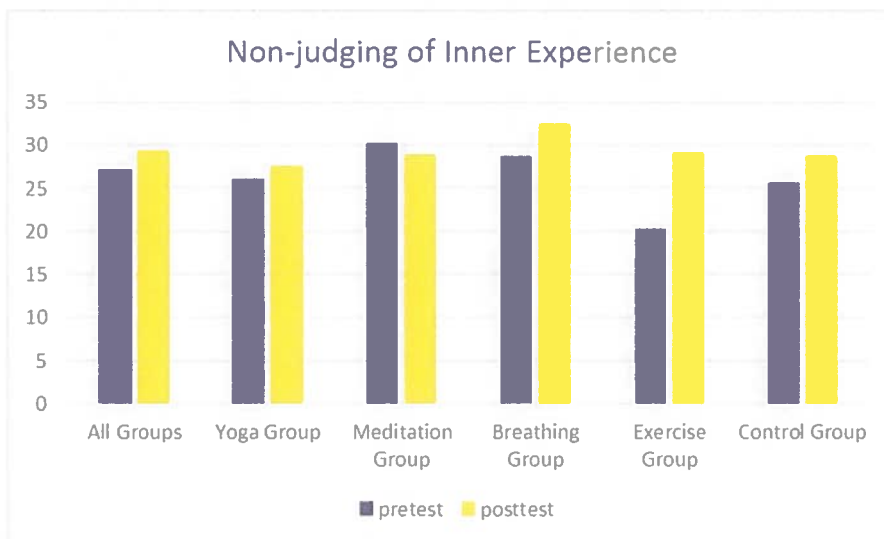
Acting with Awareness Facet of Mindfulness

Fig 4. Pretest and Posttest scores for the “acting with awareness” facet of mindfulness. Scores range from 1-40. Higher scores indicate a higher level of the “awareness” facet of mindfulness.



Non-judging of Inner Experience Facet of Mindfulness

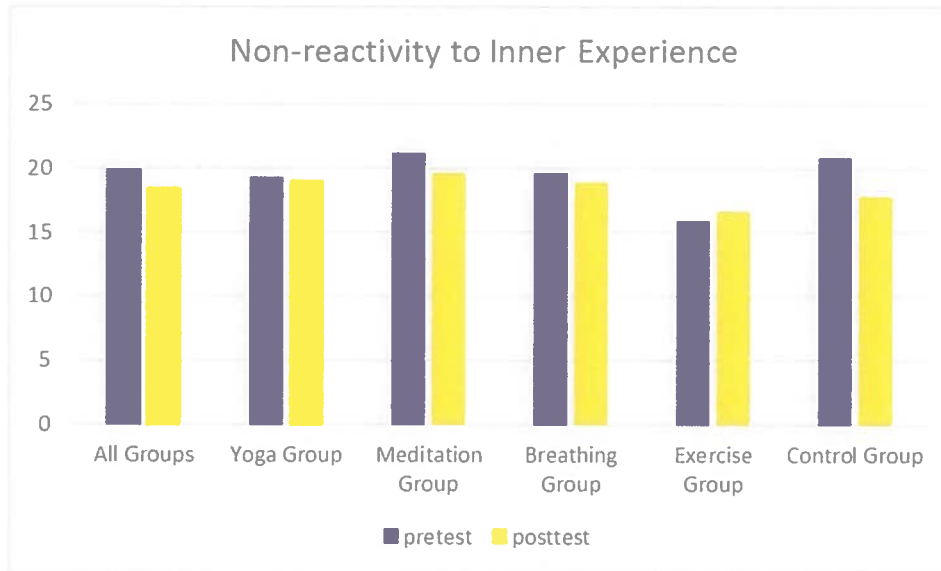
Fig 5. Pretest and Posttest scores for the “non-judging of inner experience” facet of mindfulness. Scores range from 1-40. Higher scores indicate a higher level of the “non-judging” facet of mindfulness.



EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Non-reactivity to Inner Experience Facet of Mindfulness

Fig 6. Pretest and Posttest scores for the “non-reactivity to inner experience” facet of mindfulness. Scores range from 1-35. Higher scores indicate a higher level of the “non-reactivity” facet of mindfulness.



EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Appendix A

Minnesota Nicotine Withdrawal Scale

Please rate yourself for the last 24 hours.

0 = none, 1 = slight, 2 = mild, 3 = moderate, 4 = severe

1. Desire or craving to smoke
2. Irritability, frustration, or anger
3. Anxiety
4. Difficulty concentrating
5. Restlessness
6. Increased appetite or weight gain
7. Depressed or sad mood
8. Insomnia or sleep problems

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

Appendix B

Five Facet Mindfulness Questionnaire

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

- _____ 1. When I'm walking, I deliberately notice the sensations of my body moving.
- _____ 2. I'm good at finding words to describe my feelings.
- _____ 3. I criticize myself for having irrational or inappropriate emotions.
- _____ 4. I perceive my feelings and emotions without having to react to them.
- _____ 5. When I do things, my mind wanders off and I'm easily distracted.
- _____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.
- _____ 7. I can easily put my beliefs, opinions, and expectations into words.
- _____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- _____ 9. I watch my feelings without getting lost in them.
- _____ 10. I tell myself I shouldn't be feeling the way I'm feeling.
- _____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- _____ 12. It's hard for me to find the words to describe what I'm thinking.
- _____ 13. I am easily distracted.
- _____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
- _____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
- _____ 16. I have trouble thinking of the right words to express how I feel about things
- _____ 17. I make judgments about whether my thoughts are good or bad.
- _____ 18. I find it difficult to stay focused on what's happening in the present.
- _____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
- _____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- _____ 21. In difficult situations, I can pause without immediately reacting.
- _____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
- _____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.
- _____ 24. When I have distressing thoughts or images, I feel calm soon after.
- _____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.
- _____ 26. I notice the smells and aromas of things.
- _____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.
- _____ 28. I rush through activities without being really attentive to them.
- _____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.
- _____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
- _____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- _____ 32. My natural tendency is to put my experiences into words.
- _____ 33. When I have distressing thoughts or images, I just notice them and let them go.

EFFECTS OF YOGA ON MINDFULNESS & SMOKING URGES

- _____ 34. I do jobs or tasks automatically without being aware of what I'm doing.
- _____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
- _____ 36. I pay attention to how my emotions affect my thoughts and behavior.
- _____ 37. I can usually describe how I feel at the moment in considerable detail.
- _____ 38. I find myself doing things without paying attention.
- _____ 39. I disapprove of myself when I have irrational ideas.