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Article

Improving Life Habits through Mindfulness in University Students: A Randomized Controlled Trial

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Abstract: The present study explored the effects of a Second-generation mindfulness-based intervention known as *Flow Meditation* (Meditación-Fluir) in the improvement of life habits. A sample of university students (n = 51) in Spain were randomly assigned to a seven-week mindfulness treatment or a waiting list control group. Results showed that compared to the control group, individuals in the mindfulness group demonstrated significant improvements across all outcome measures, including healthy eating habits (balanced diet, intake rate, snacking between meals, decrease in consumption by emotional states negative, increased consumption by negative emotional states, amount of consumption, meal times, consumption of low-fat products), tobacco, alcohol and cannabis consumption, and resting habits. There were differences between males and females in some of these variables and a better effect of the treatment was evident in the females of the experimental group as compared to males.
The *Flow Meditation* program shows promise for fostering healthy life habits, thus decreasing behaviours related to maladaptive eating, tobacco, alcohol and drug consumption, as well as negative resting habits, in university students. This mindfulness program can significantly contribute in the treatment of eating disorders and addictions, wherein negative emotional states and impulsivity are central features of the condition.

Keywords: life habits; mindfulness; flow meditation; university students; controlled trial

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1. Introduction

University students may be a population at biological and psychosocial risk, often with inadequate health behaviours and life habits. In Spain, these students are distancing themselves from the traditional Mediterranean diet and food patterns [1]. Lifestyle changes of the past few decades have increasingly led to changes in food consumption, such as the reduced consumption of fresh or minimally processed foods and increased consumption of ultra-processed foods [2]. This change in eating habits is associated with an unhealthy diet and various health-related problems, and is especially noticeable in university students [1,3].

With regard to unhealthy life habits, alcohol, tobacco and cannabis consumption among young people are also issues of great concern for their long-term psychological and physical health effects, including sleep disorders [4]. Acute adverse health effects following cannabis use were reported by 40% of the participants in a study conducted by Contreras et al. [5]. According to this study the most common effects were paranoia, increased heart rate, and panic attacks, or anxiety, whereas fewer reported experiencing more severe effects like hallucinations, or loss of consciousness. For its part, tobacco smoking provokes respiratory and cardiovascular diseases and multiple types of cancer. Research has revealed a direct association between having externalizing problems (e.g., aggressive behaviors), and the initiation and continuation of cigarette smoking [6]. So, youths scoring high in externalizing are more likely to initiate cigarette smoking. In this sense, controlling external variables should be a higher priority. Similarly, alcohol consumption among university students is related to decreased academic performance and the appearance of problematic behaviors and violence. Along with unhealthy eating habits, and tobacco and drug abuse, alcohol consumption is also subject to social and environmental factors (e.g., peer pressure), as well as to cognitive factors (e.g., impulsivity, positive expectations and sensation seeking, anxiety sensitivity, hopelessness and low perceived control), among others [7,8].

Maladaptative eating habits, such as eating high-fat and sugar-rich foods, excess calories, and alcohol, tobacco and drugs consumption, have their consequences on sleep [9],. Poor sleep quality is a recurrent feature of student life and affects not only cognitive processes, but also recovery from stress and the elimination of fatigue, increasing the possibility of poor school performance [10]. Moreover, several studies have shown that sleeping problems, including bad resting habits, correlate positively with both uncontrolled and emotional eating in differing populations [9,11,12] By contrast, sleep duration and sleep quality have been associated with healthy diets [13].

The modification of these addictive behaviours and negative habits of students is a potential target for intervention, as well as for improving school success. Likewise,, positive personal and family-domestic habits such as looking for calm and tranquil sensations, and eating as a family with the TV turned off are related to the capacity of controlling repetitive patterns of thoughts and behaviours, and improved well-being and academic performance [14]. Recommended treatments for these unhealthy habits (i.e., negative eating and sleeping habits, addictions such as cannabis, tobacco and alcohol consumption) are psychological and behavioural counselling, different multimodal

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therapeutic programs, psychotropic medication, and stress management techniques, including mindfulness [12, 15, 16].

1.1. Mindfulness-based meditation

The practice of mindfulness-based meditation has been tested as a potential therapeutic intervention for a wide range of clinical problems including eating disorders and other addictions [7,16,17] For these kinds of disorders anxiety and impulsivity are key features [18]. The value of these strategies has been widely recognized for a wide variety of psychological and psychosomatic disorders associated with emotional dysregulation [19,20]. More specifically, different mindfulness-based approaches for unhealthy life habits (i.e,. eating disorders, addictions) have been used, including *Dialectical Behavior Therapy* (DBT; [21,22,23,24]), *Acceptance and Commitment Therapy* (ACT; [25]), *Mindfulness-Based Stress Reduction* (MBSR; [26]); *Mindfulness-Based Cognitive Therapy* (MBCT- [27]), and *Mindfulness-Based Eating Awareness Training* program (MB-EAT; Kristeller, & Wolever, 2014; [17,28]). Mindfulness training should target the specific behavioural impulses that an individual has difficulty controlling and also provide psycho-education. Attitudes regarding healthy eating and unhealthy habits are a key part of most psychological models that aim to foster positive behaviours.

1.2. The present study

There is increasing literature suggesting that university students may be a population at biological and social risk, often with inadequate health behaviours and life habits [29] In fact, at least half of this population presents inadequate health habits [1]. In spite of the large number of studies relating to the variables dealt with in this article, there is a shortage of studies in unhealthy habits carried out with university students, most of them being about eating habits and alcohol consumption, and there are no previous studies analyzing them all simultaneously. To the authors' knowledge, this is the first study to specifically investigate the effects of mindfulness on a wide range of variables related to healthy life habits in university students. This is an important issue given the existing risk that bad habits generate disorders in later adulthood (e.g., eating disorders, alcoholism, drug addiction). Thus, the current study provides an experimental test of the effects of meditation practice in life habits, including healthy eating habits, addictions and resting habits.

Given the role of emotional problems and external factors in life habits, including eating habits, and alcohol and tobacco consumption among youths, and the fact that mindfulness has been shown to improve unhealthy life habits and several disorders in various clinical and non-clinical conditions [30,31,32], the goal of this study was to evaluate the effectiveness of a mindfulness-based intervention known as *Flow Meditation* (Meditación-Fluir- FM; [33] In this study, an empirically well-validated mindfulness intervention program has been used [34,35,36], Specifically, this study evaluates the effects of mindfulness on a range of different life habits and variables, including eating habits (i.e.., number of meal times, balanced diet, intake rate, consumption of low-fat products, snacking between meals, decrease in consumption due to negative emotions, and increase in consumption due to negative emotions.), tobacco, cannabis, alcohol consumption, and

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resting habits, Thus it was hypothesized that compared to a waiting-list control group, students that completed the mindfulness intervention would demonstrate significant improvements in the aforementioned variables. If we could identify the factors that determine leading an active or inactive student lifestyle, we would be able to help improve the quality of life in adulthood.

2. Materials and Methods

A randomized controlled trial was conducted to investigate the effects of mindfulness training on different variables related to life habits in a sample of university students Assessments were taken at pre-test, post-test, and the intervention group was compared with a waiting list control group.

2.1. Participants

All participants were recruited from the University of Almeria (Spain) and were informed that they would be undertaking a program of training in mindfulness. A total of 51 eligible individuals (62.7% women) were recruited into the study and random assignment was employed to allocate participants to the intervention (n=26) or control group (n=25), mean age 20.94, SD = 18.31. More specifically, ballots, concealing the numbers 1 (control group) or 2 (intervention group) were placed in equal number into an urn and each participant extracted one ballot from it. Randomization was conducted by a researcher not participating in the study and participants completed baseline assessments (pre-test) prior to allocation. Due to a logistical constraint, a sample size calculation was not conducted as sample size was governed by the maximum number of eligible participants that were willing to participate in the study at the time of enrolment.

The ANOVA and the Mann-Whitney U test for independent samples did not reveal statistically significant differences in the scores obtained before the treatment (pre-test; p <.05,) by the participants of the control group and the experimental group, which means that the subjects of the two groups were extracted from the same population, so if statistically significant differences are found after the treatment (post-test), these will be due to the intervention. In addition, the Mann Whitney U test for age was performed, comparing the experimental and control groups, since they do not fit a normal distribution (Z = -1.40). There was no difference in age between the experimental and control group (p = 0.160). As for the sex variable, Chi-square p <.05, therefore there was also no difference by sex between both groups.

2.2. Procedure

A mindfulness training program called *Flow Meditation* (*FM*- Franco, 2009) [33] was administered to the intervention group using two-hour weekly group sessions for a period of seven weeks. The training program included (i) mindfulness exercises from Kabat-Zinns´ [37] stress-reduction program, (ii) mindfulness techniques used in acceptance and commitment therapy [38,39,40], and (iii) exposure to and debate on metaphors and exercises used in Zen [41] and Vipassana meditation [42], which promote values such as acceptance, forgiveness and non-identification with mental events. Finally, some exercises that could be placed

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within the framework of logotherapy were also included [43], since their objective was to learn to overcome the existential void that arises from the lack of meaning in what we do and in the life we lead, and to take responsibility in this way for our own life. Logotherapy has demonstrated to be effective in the treatment of different problems, including addictions, depression, anger, anxiety, and for fostering psychological well-being [44,45]

The effectiveness of *Flow meditation* has been tested in various treatment studies with acceptable size effects (Amutio, et al., 2016, 2018; Franco et al., 2016). [34, 35, 36, 46], The program includes existential, ethical and spiritual aspects and values, and thus conforms to Van Gordons´ criteria for *Second Generation Mindfulness-Based Interventions (SG-MBIs)* [47]. The program was facilitated by an instructor with extensive experience in both the practice and teaching of mindfulness meditation techniques.

The main purpose of *Flow meditation* is for participants to learn to allow their thoughts to flow, without trying to modify them or interfere with them. The intervention is not concerned with teaching participants not to think about anything, but seeks to offer an alternative to conditioned automatic ways of reacting to inner and outer experiences. Each weekly session is structured as follows:

1. Discussion and feedback on the mindfulness meditation exercises practiced during the previous week.
2. Ten-minute guided-mindful body-scan.
3. Presentation of the various metaphors and exercises corresponding to each session.
4. Practice of full awareness of breathing for 30 minutes.

Participants were requested to undertake the body-scan and full awareness of breathing exercises on a daily basis at home for 10 minutes and 30 minutes, respectively.

Ethical considerations

All participants provided informed consent and the study was approved by the Bioethics Committee of the University of Almeria, Spain. The registered data for each of the instruments was alphanumerically coded, ensuring confidentiality and anonymity, in order to comply with the Personal Data Protection Act by the Ethics Committee for Research related to Human Beings (CEISH). International guidelines for studies with human subjects described in the Nuremberg Code and in the Declaration of Helsinki were applied. After completion of all assessment phases, the mindfulness training course was offered to control group participants.

2.3. Measures

The following measures were administered pre-and post-intervention:

- *Healthy Lifestyle Questionnaire*. This 12-item measure evaluates the following factors of healthy lifestyle habits: eating habits (balanced diet and respect for meal times), tobacco consumption, and rest habits. In the present study, six more items were introduced with the intention of evaluating also the consumption of cannabis (3 items), and the consumption of alcohol (3 items), using for this purpose the same items that

 doi:10.20944/preprints202006.0265.v1

evaluate tobacco consumption, but changing the word 'tobacco' for 'cannabis' and alcohol, respectively. The questionnaire has been validated in Spanish by Leyton et al. [48]. Cronbach´s alpha for this questionnaire was 0.79.

- *Lifestyles Questionnaire* [49]. This 24-item questionnaire measures the following variables: Externality; Decrease in Food Consumption due to negative emotional states; Increase in Food Consumption due to negative emotional states; Quantity Consumption Pattern; and Intake Rate, valued on a frequency scale of 1 to 7 points. The items "Snacking between meals" (whose frequency has been rated on a 5-point scale) and "Consumption of low-fat meals and / or beverages" (whose frequency has been rated on a 7-point scale) are individually analyzed. Cronbach´s alpha for this questionnaire was 0.84.

2.4. Data analyses

A pre-test/post-test design was used to explore the effectiveness of the intervention in the participants. The results in the applied instruments were considered dependent variables. First descriptive statistics for the studied variables were calculated. A repeated measures ANOVA was performed, when the data distributions were adjusted to a normal one and the homogeneity tests and the Box M test allowed it. When the statistical requirements to use this test were not met, we used the Wilcoxon test for intra-subject differences and the Mann Whitney non-parametric U test for inter-subject differences. As a measure of the effect size, we used the partial *Eta* square for the repeated measures ANOVA and for the non-parametric tests, the Rosenthal *r* recommended by Wasserstein & Lazar [50] and expressed as follows: $r = z / \sqrt{N}$. The results of *r* were compared, applying the Cohen [51]classification that indicates that between 0.2 and 0.5, the effect size will be small, between 0.5 and 0.8, it will be moderate and above 0.8, it will be large. For this partial *Eta* square, around 0.01 little effect was considered, around 0.06 moderate effect, and 0.14 large effect. All statistical analyses were conducted using SPSS version 25.0.

3. Results

3.1. Intervention effects

The mean scores and standard deviations of the variables corresponding to the control and experimental groups in each of the study phases are shown in Table 1.

 doi:10.20944/preprints202006.0265.v1

Table 1. Means and standard deviations for each study variable in the Pre-test and Post-test

Variables	Pre-test				Post-test			
	Control		Experimental		Control		Experimental	
	M	DS	M	SD	M	SD	M	SD
Tobacco use	6.36	3.22	6.50	2.98	6.64	3.39	5.54	2.26
Cannabis consumption	5.08	2.73	5.54	2.73	5.32	3.06	4.92	2.07
Alcohol consumption	6.60	2.59	7.38	3.03	7.00	2.81	6.19	2.11
Meal times	6.80	2.10	6.96	2.30	7.32	1.99	7.92	2.27
Balanced diet	6.48	1.38	6.96	1.48	6.56	1.55	8.15	1.40
Rest habits	6.36	1.57	6.92	1.62	6.80	1.29	8.08	1.32
Externality	31.56	7.73	31.73	7.15	31.32	8.20	27.92	5.78
Decrease in food consumption due to NES	20.92	5.44	21.85	5.45	21.92	5.09	18.35	3.03
Increase in food consumption due to NES	22.68	5.47	21.81	6.19	23.36	5.13	17.62	3.61
Food consumption amount	16.52	4.29	16.27	4.30	17.32	4.17	12.81	2.51
Snacking between meals	3.20	1.04	3.31	1.12	3.36	0.90	2.46	0.51
Consumption of low-fact products	3.36	0.99	3.23	1.21	3.16	0.85	3.38	1.10
Intake rate	6.92	1.89	7.08	1.89	7.36	1.65	6.08	1.06

Note: NES = negative emotional states

Statistically significant differences were obtained between the two groups in the posttest scores on balanced diet and rest habits (Figure 1), as well as in decreasing in food consumption due to negative emotional states, increase in food consumption due to negative emotional states, amount of consumption, snack between meals and intake rate (Table 2).

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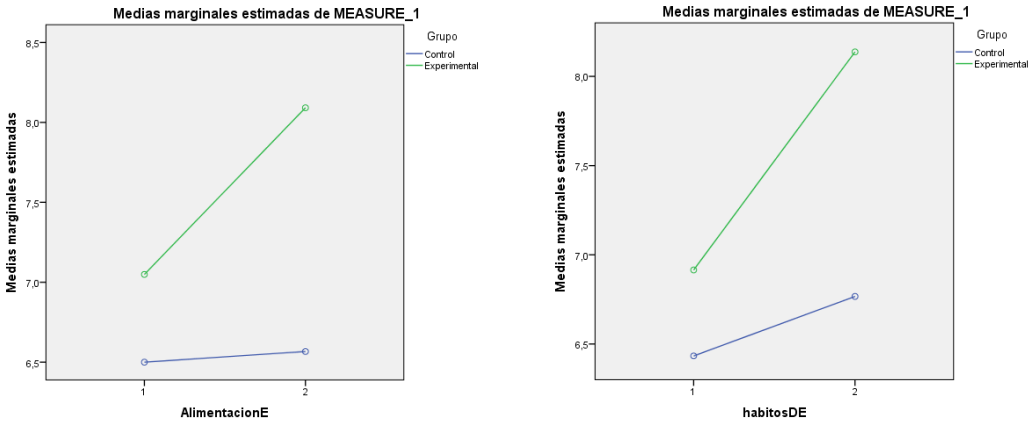

Figure 1. Changes in eating habits and resting habits for the experimental and control groups after the intervention

Table 2. Differences between groups for the Pre-test and Post-test results (ANOVA and Mann Whitney U Test)

Variable	Pre-test		Post-test	
	Z/F	*p*	*Z/F*	*p*
Tobacco use	Z= -.259	.796	Z= -.879	.380
Cannabis consumption	Z= -.926	.355	Z= -.211	.833
Alcohol consumption	Z= -1.09	.273	Z= -1.05	.295
Meal times	F= .068	.795	F= 1.00	.320
Balanced diet	F= 1.43	.237	F= 14.75	.000****
Rest habits	F= 1.57	.215	F= 12.14	.001***
Externality	Z=-.076	.940	Z=-1.45	.146
Decrease in food consumption due to NES	Z=-.541	.589	Z=-2.52	.012*
Increase in food consumption due to NES	Z= -.483	.629	Z= -3.86	.000****
Food consumption amount	Z= -.237	.813	Z= -3.88	.000****
Snacking between meals	Z= -.313	.754	Z= -3.71	.000****
Consumption of low-fat products	F= 173	.679	F= .663	.419
Intake rate	Z= -.317	.751	Z=-2.92	.004**

*p< .05 **p< .01 ***p=.001 ****p< .001

The Wilcoxon test for related samples showed statistically significant differences between the scores of the pretest and the posttest of the experimental group in all the

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variables studied except with respect to meal times and consumption of low-fat products. In the control group, significant differences were also observed in Cannabis Consumption; Decrease in food consumption due to negative emotional states; increase in food consumption due to negative emotional states, quantity of consumption, snacks between meals, consumption of low-fat products and rate intake. However, while in the experimental group the mean scores between the pretest and posttest increase in balanced diet and rest habits, and decrease in most of the remaining variables, thus evidencing the efficacy of the treatment carried out in this group, in the control group differences between mean scores between pretest and posttest indicate a worsening of healthy habits in these subjects (Table 3). In addition, in the experimental group, sizeable effects were obtained on balanced diet and rest habits, whereas moderate effects were observed on alcohol consumption, respect for meal times, externality, decreased consumption due to negative emotional states, increased consumption for negative emotional states, and quantity of consumption.

Table 3. ANOVA and Wilcoxon Test for related samples: Pre-test and post-test intra-group differences in the study variables and Eta Square

Variables	Control			Experimental		
	Z/F	*p*	r/η^2_p	*Z/F*	*p*	r/η^2_p
Tobacco use	Z= -1.94	.520	.271	Z=-3.14	.002**	.439
Cannabis consumption	Z=-2.45	.014*	.343	Z=-3.20	.003**	.448
Alcohol consumption	Z=-1.31	.190	.183	Z=-3.66	.000***	.512
Meal times	F=1.09	.301	.02	F=-1.28	.054	.073
Balanced diet	F= .34	.855	.001	F=7.74	.008**	.14
Rest habits	F=1.39	.243	.028	F=10.05	.003**	.17
Externality	Z=-.259	.795	.362	Z=-4.03	.000***	.564
Decrease in food consumption due to NES	Z=-2.85	.004**	.399	Z=-3.93	.000***	.550
Increase in food consumption due to NES	Z=-2.70	.007**	.378	Z=-4.12	.000***	.577
Food consumption amount	Z=-3.08	.020*	.431	Z=-4.21	.000***	.590
Snacking between meals	Z=-2.00	.046*	.280	Z=-3.17	.002**	.443
Consumption of light products	F=5.22	.027*	.096	F=3.21	.079	.062
Intake rate	Z=-2.31	.021*	.323	Z=-2.96	.003**	.416

*p <.05 **p < .01 ***p = .000

Note: NES = negative emotional states

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3.2. Effects of intervention by gender

Scores for each of the variables in males and females for the control and experimental groups in each of the study phases are shown in Tabla 4.

Table 4. Means and standard deviations for each study variable in the Pre-test and Post-test for males and females in the control and experimental groups

Variable	Pre-test								Post-test							
	Control				Experimental				Control				Experimental			
	Males		Females		Males		Females		Males		Females		Males		Females	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	DS	M	SD
Tobacco use	5	2.5	7.3	3.4	6.7	2.9	6.4	3.1	5.1	2.6	7.7	3.5	6	2.4	5.3	2.2
Cannabis consumption	4.3	2.4	5.6	2.9	5.1	1.6	5.7	3.2	4.5	2.8	5.8	3.2	4.8	1.4	5	2.4
Alcohol consumption	6	2.7	7	2.5	7.3	2.7	7.4	3.3	6.2	2.8	7.5	2.8	6.3	1.9	6.1	2.3
Meal times	6.5	.98	7	2.6	6.1	1.9	7.4	2.4	6.6	1.2	7.8	2.3	6.6	1.7	8.7	2.2
Balanced diet	6.6	1.3	6.4	1.5	7.3	1.3	6.8	1.6	6.6	1.7	6.5	1.5	7.9	1.4	8.3	1.5
Rest habits	6.8	1.2	6.1	1.7	6.9	1.3	6.9	1.8	6.6	1.4	6.9	1.2	8.4	1	7.9	1.5
Externality	32.1	4.9	31.2	9.3	35.4	6.3	29.7	6.9	30.5	7.1	31.8	9.1	30.7	6.1	26.5	5.2
Decrease in food consumption due to NES	21.9	5.6	20.3	5.4	18.8	4	23.5	5.5	22.6	5.4	21.5	5	16.8	2.9	19.2	2.8
Increase in food consumption due to NES	23.4	5	22.2	5.9	22.6	6.1	21.4	6.4	24.2	4.6	22.8	5.5	18	3.3	17.4	3.8
Food consumption amount	15.3	3.8	17.3	4.5	16.6	4.2	16.1	4.5	16.4	3.1	17.9	4.7	12.6	2.3	12.9	2.6
Snacking between meals	3.3	1.2	3.1	1	3.7	1.3	3.1	.9	3.5	1	3.3	.9	2.7	.5	2.3	.5
Consumption of low-fat products	3.6	1.1	3.2	.9	2.7	.9	3.5	1.3	3.3	1	3.1	.8	2.8	.8	3.7	1.1
Intake rate	6.7	1.6	7.1	2.1	6.6	1.2	7.3	2.1	7.3	1.6	7.4	1.7	6.1	1.2	6.1	1

The ANOVA and the Mann-Whitney U test for independent samples did not reveal significant differences between men and women for the pre-test scores in the control and experimental groups. However, statistically significant differences were found in males between the experimental and control groups in the post-test scores in rest habits, decrease

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in consumption due to negative emotional states, increase in consumption due to negative emotional states, amount of consumption and snacking between meals. Significant post-test differences were also found in females between the control and experimental groups in the following variables: balanced diet, rest habits, increased consumption due to negative emotional states, quantity of consumption, snacks between meals, and intake rate, and in tobacco consumption (in the latter a marginally significant difference - p = .058 - was found) (Table 5).

Table 5. Differences between control and experimental groups in the Pre-test and Post-test results for males and females (ANOVA and Mann Whitney U-Test)

Variables	Pre-test				Post-test			
	Males		Females		Males		Females	
	Z/F	*p*	*Z/F*	*p*	*Z/F*	*p*	*Z/F*	*p*
Tobacco use	Z=-1.53	.125	Z=-.673	.501	Z=-1.08	.281	Z=-1.90	.058
Cannabis consumption	Z=-1.48	.138	Z-=.428	.669	Z=-1.30	.194	Z=-.669	.504
Alcohol consumption	Z=-1.20	.229	Z=-.592	.554	Z=-.208	.835	Z=-1.51	.131
Meal times	Z=-.465	.642	Z=-.496	.620	Z=-.128	.898	Z=-.897	.370
Balanced diet	F=1.20	.277	F=.503	.069	F=3.47	.069	F=2.77	.002**
Rest habits	F=.014	.905	F=2.34	.133	F=8.13	.006**	F=4.62	.037*
Externality	Z=-1.23	.218	Z=-.399	.690	Z=-.041	.967	Z=-1.57	.116
Decrease in food consumption due to NES	Z=-1.27	.202	Z=-1.51	.131	Z=-2.34	.019*	Z=-1.23	.218
Increase in food consumption due to NES	Z=-.206	.837	Z=-.417	.676	Z=-2.81	.005**	Z=-2.73	.006**
Food consumption amount	Z=-.615	.539	Z=-.722	.470	Z=-2.34	.019*	Z=-3.07	.002**
Snacking between meals	Z=-.762	.446	Z=-.020	.984	Z=-2.08	.038*	Z=-3.21	.001***
Consumption of low-fat products	F=3.52	.067	F=.738	.395	F=1.44	.236	F=3.63	.063
Intake rate	Z=-.043	.966	Z=-.501	.617	Z=.112	.112	Z=-2.38	.017*

*p< .05 **p < .01 ***p< .001

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The ANOVA and the Wilcoxon test for related samples showed statistically significant differences between the pre-test and post-test scores for males in the experimental group in the following variables: alcohol consumption, rest habits, externality, decrease in consumption due to negative emotional states, increase in consumption due to negative emotional states, and amount of consumption. Similarly, for females of the experimental group, significant differences were observed between pre-test and post-test in all variables except meal times and consumption of low-fat products. A better effect of the treatment is evident in the females of the experimental group than in males.

If we analyze the control group, significant differences are observed in males between the pre-test and post-test in the variables quantity of consumption, consumption of low-fat products, and rate of ingestion, while in women differences in cannabis consumption, decrease in consumption due to negative emotional states, increase in consumption due to negative emotional states and quantity of consumption are observed. However, whereas in the experimental group the differences were due to the increase in good healthy habits, in the control group healthy habits decreased in the intervention period.

In relation to gender differences in the intervention group, males in the experimental group obtained large-size effects in rest habits and moderate-size effects were observed in externality, decreased consumption due to negative emotional states, increased consumption due to negative emotional states and quantity of consumption. In females of the experimental group, large effects were obtained in balanced diet and moderate effects were observed in tobacco consumption, alcohol consumption, rest habits, externality, decrease in consumption due to negative emotional states, increase in consumption by states, negative emotions, amount of consumption and consumption of low-fat products (Table 6).

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Table 6. ANOVAS and Wilcoxon Test for related samples. Intra-group differences for pre-test and post-test in the study variables for males and females, and effect sizes

Variables	Control				Experimental					
	Male		Female		Male			Female		
	Z/F	*p*	*Z/F*	*p*	*Z/F*	*p*	*r/* η^2_p	*Z/F*	*p*	*r/* η^2_p
Tobacco use	Z=-1.00	.317	Z=-1.73	.083	Z=-1.38	.165	.317	Z=-2.85	.004**	.504
Cannabis consumption	Z=-141	.157	Z=-2.00	.046*	Z=-1.73	.083	.398	Z=-2.60	.009**	.460
Alcohol consumption	Z=-1.00	.317	Z=-.962	.336	Z=-2.12	.034*	.487	Z=-3.02	.003**	.535
Meal times	Z=-.447	.655	Z=-1.15	.251	Z=-.341	.733	.078	Z=-1.32	.184	.234
Balanced diet	F=.000	1.00	F=.055	.816	F=.57	.453	.012	F=8.2	.006**	.148
Rest habits	F=.116	.735	F=3.28	.077	F=5.4	.024*	0.11	F=4.9	.031*	.095
Externality	Z=-.359	.719	Z=.000	1.00	Z=-2.68	.007**	.616	Z=-3.1	.002**	.549
Decrease in food consumption due to NES	Z=-1.55	.121	Z=-2.33	.020*	Z=-2.21	.027*	.508	Z=-3.31	.001***	.586
Increase in food consumption due to NES	Z=-1.83	.068	Z=-2.07	.038*	Z=-2.37	.018*	.545	Z=-3.42	.001***	.606
Food consumption amount	Z=-2.41	.016*	Z=-2.01	.045*	Z=-2.53	.012*	.582	Z=-3.43	.001***	.607
Snacking between meals	Z=-1.41	.157	Z=-1.41	.157	Z=-1.89	.059	.434	Z=-2.60	.009**	.460
Consumption of low-fat products	F=4.6	.037*	F=1.36	.249	F=.57	.455	.012	F=2.7	.107	.054
Intake rate	Z=-2.12	.034*	Z=-1.31	.187	Z=-.966	.334	.222	Z=-2.80	.005**	.496

*p<.05 **p<.01 ***p< .001

Note: NES = negative emotional states

4. Discussion

The current study compared a Second-Generation Mindfulness-Based Intervention (SG-MBI; Van Gordon et al.,[47,52]) known as *Flow Meditation (FM - Meditación-Fluir)* with a waiting list control group to investigate the effects of mindfulness on life habits in a sample of university students. Compared to first-generation mindfulness-based interventions, SG-MBIs employ a slightly different model of mindfulness that emphasizes the importance of non-attachment to self, as well as to psychological and somatic symptoms. Results showed that the mindfulness intervention was effective in reducing maladaptive life habits, especially for eating (balanced diet, food intake), alcohol and drug consumption, and maladaptive resting habits, in a sample of young university students. Gender differences were found in the efficacy of the intervention, where females experienced significant changes in eating habits, as compared to males. This is an important finding if we take into account that eating disorders are more frequent in women and the fact that the social pressure to conform to a normative body image is higher for females. Therefore, the females of this sample may have been more sensitive to change their eating habits.

Maladaptive eating, including eating disorders, frequently persist in adulthood even in the face of significant deterioration in psychological and physiological wellness and overall quality of life [9, 53]. They have a strong negative impact on family and social engagement and impose substantial health-care and social services costs [54], and also non-health-care costs associated with obesity, such as job/ school absenteeism, with its negative consequences on work and academic performance [55]. More specifically, there is a high prevalence in the students population of mental health issues such as anxiety and depression, significantly increasing the risk of mental health and disordered eating development in the future [55,56]. Fortunately, mindful eating programs have proven to be effective in improving body image, reducing eating disorder symptomatology, and preventing weight gain [57, 58].

Our findings concerning enhancements in resting habits are also consistent with studies showing improvements in the number of hours of sleep and sleep quality after eight weeks of mindfulness training, including flow meditation [35,59] This is a relevant finding since insufficient rest due to bad sleeping habits is related to poor academic performance [13].

Significant differences were also found in the studied variables in the control group, but these were due to a worsening of the habits (e-g., substance consumption). It would be interesting to know if this worsening of health habits was due to the proximity of the exams.

In terms of possible mechanisms of action, in the present study, in addition to decreased hyperarousal of the sympathetic nervous system and increases in parasympathetic activation through relaxation, mindfulness may have improved life habits via the cultivation of new metacognitive resources (e.g., detachment from self-referential processing and acceptance) that increase perceptual distance from internal and external stimuli [46,47,52] This is consistent with previous studies of *Flow Meditation* in which mindfulness was shown to be effective in adolescents with high levels of aggressiveness and lack of impulse control

[34]. In addition, mindfulness approaches can intervene by improving regulation of emotions [17, 30] and increasing the experience of positive emotional states [20, 60].

The findings of the present study should be considered in light of their limitations that include (i) a small sample size, (ii) the absence of an active control condition, (iii) reliance on self-report measures, (iv) lack of follow-up assessment. It would be useful to investigate maintenance effects over a longer period of time.

The current study showed that *flow meditation* was effective for reducing unhealthy habits, including maladaptive eating disorders, addictive behaviours, and bad resting habits. Further research is warranted to replicate the findings of this study, as well as to understand the mechanisms that lead to improvements in health habits following participation in mindfulness training. The potential effects of mindfulness go beyond simply inducing a state of relaxation [18, 20]. An additional mechanism of action would be through attitude change [53]. In this sense, and over the past decade mindfulness has increasingly been linked to sustainable consumption linked to changes in attitudes and intentions, and the ability to use inner states and processes to change consumption behaviours [53, 61] Schools, universities and community public health practitioners should provide prevention and intervention efforts among the target population [62]. Given their increasing prevalence of maladaptive health habits among this population, and the associated health-related risks and concurrent psychopathology, greater attention is warranted to improve the efficacy of existing treatments. University and college arenas represent an important opportunity for health and nutritional education.

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Compliance with Ethical Standards

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Informed consent: Informed and written consent was obtained from all individual participants included in the study.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Bioethics Committee of the University of Almería (Spain).

References

1. Navarro-Prado, S.; González-Jiménez, E.; Perona, J. S.; Montero-Alonso, M. A.; López-Bueno, M.; Schmidt-RioValle, J. Need of improvement of diet and life habits among university student regardless of religion professed. *Appetite*. **2017**, 114, 6-14.
2. Da Silva, R.; Barbosa, M. L.; Rodrigues, B.; Da Silva, C. C. N.; Moura, A.A. Association between the Degree of Processing of Consumed Foods and Sleep Quality in Adolescents. *Nutrients*. **2020**, 12(2), 462.
3. Fardet, A. Characterization of the Degree of Food Processing in Relation with Its Health Potential and Effects. *Adv. Food Nutr. Res*. **2018**, 85, 79–129.
4. Kwon, M.; Seo, Y. S.; Park, E.; Chang, Y. P. Association between substance use and insufficient sleep in US high school students. *The Journal of School Nursing*, **2020**. doi: 10.1177/1059840519901161
5. Contreras, A. E.; Hall, K. E.; Vigil, D. I.; Rosenthal, A.; Azofeifa, A.; Van Dyke, M. Results from the Colorado Cannabis Users Survey on Health (CUSH), 2016. *International Journal of Mental Health and Addiction*. **2020**, 18(1), 1-13.
6. Buu, A.; Hu, Y. H.; Wong, S. W.; Lin, H. C. Internalizing and Externalizing Problems as Risk Factors for Initiation and Progression of E-cigarette and Combustible Cigarette Use in the US Youth Population. *International Journal of Mental Health and Addiction*. **2020**, 1-13. DOI: 10.1007/s11469-020-00261-9
7. Pérez-Fuentes, M. D. C.; Molero Jurado, M. D. M.; Gázquez Linares, J. J.; Martos Martínez, Á.; Mercader Rubio, I.; Saracostti, M. Individual variables involved in perceived pressure for adolescent drinking. *International journal of environmental research and public health*. **2020**, 17(6), 2012.
8. Whitaker, M. D.; Brown, S. Is Mobile Addiction a Unique Addiction: Findings from an International Sample of University Students. *International Journal of Mental Health and Addiction*. **2019**. doi.org/10.1007/s11469-019-00155-5
9. Litsfeldt, S.; Ward, T. M.; Hagell, P.; Garmy, P. Association between sleep duration, obesity, and school failure among adolescents. *The Journal of School Nursing*. **2020**. doi: 10.1177/1059840520901335
10. Wang, Y.; Xiao, H.; Zhang, X.; Wang, L. The Role of Active Coping in the Relationship Between Learning Burnout and Sleep Quality Among College Students in China. *Frontiers in Psychology*. **2020**, 11, 647.
11. Blumfield, M.L.; Bei, B.; Zimberg, I.Z.; Cain, S.W. Dietary disinhibition mediates the relationship between poor sleep quality and body weight. *Appetite*. **2018**, *120*, 602–608.
12. Gázquez Linares, J. J.; Pérez-Fuentes, M. D. C.; Molero Jurado, M. D. M.; Oropesa Ruiz, N. F.; Márquez, S.; del Mar, M.; Saracostti, M. Sleep Quality and the Mediating Role of Stress Management on Eating by Nursing Personnel. *Nutrients*. **2019**, 11(8), 1731.

13. Da Silva, R. D. S., Barbosa, M. L., Rodrigues de Oliveira, B., Da Silva Coelho, C. C., & Moura da Silva, A. .. Association between the Degree of Processing of Consumed Foods and Sleep Quality in Adolescents. *Nutrients*. **2020**, 12(2), 462. doi:10.3390/nu12020462
14. López-González, L.; Amutio, A.; Oriol, X.; Bisquerra, R. Hábitos relacionados con la relajación y la atención plena (mindfulness) en estudiantes de secundaria: influencia en el clima de aula y el rendimiento académico. *Revista de Psicodidáctica*. **2016**, 21(1), 121-138.
15. Currie, A. Sport and Eating Disorders—Understanding and Managing the Risks. Asian *J. Sports Med*. **2010**, 1, 63–68.
16. Villanueva, V. J.; Puig-Perez, S.; Becoña, E. Efficacy of the "Sé tú Mismo"(Be Yourself) Program in Prevention of Cannabis Use in Adolescents. *International Journal of Mental Health and Addiction*. **2020**, 1-13. https://doi.org/10.1007/s11469-019-00219-6
17. Kristeller, J. L.; Wolever, R. Mindfulness-Based Eating Awareness Training: Treatment of overeating and obesity. In *Mindfulness-Based Treatment Approaches* (2nd Edn); R. A. Baer Ed.; Elsevier: San Diego, CA, USA, 2014.
18. Shead, N.W.; Champod, A.S.; MacDonald, A. Effect of a Brief Meditation Intervention on Gambling Cravings and Rates of Delay Discounting. *Int J Ment Health Addiction*. **2019**. https://doi.org/10.1007/s11469-019-00133-x
19. Goyal, M.; Singh, S.; Sibinga, E. M.; Gould, N. F.; Rowland-Seymour, A.; Sharma, R., et al. Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA Internal Medicine*. **2014**, 174, 357–368.
20. Smith, J.C. *Third-Generation Mindfulness & The Universe of Relaxation* (Professional Version). Kendall Hunt: Iowa, USA, 2019.
21. Linehan, M. M. *Cognitive-behavioral treatment of borderline personality disorder*. The Guilford Press: New York, USA, 1993a.
22. Linehan, M. M. *Skills training manual for treating borderline personality disorder*. The Guilford Press: New York, USA, 1993b.
23. Sayrs, J. H. R.; Linehan, M. M. *DBT Teams: Development and Practice*. The Guilford Press: New York, USA, 2019.
24. Telch, C. F.; Agras, W. S.; Linehan, M. M. Dialectical behavior therapy for binge eating disorder. *Journal of Consulting and Clinical Psychology*. **2001**, 69, 1061–1065.
25. Hayes, S. C.; Strosahl, K. D.; Wilson, K. G. *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.); Guilford Press: New York, USA, 2012.
26. Kabat-Zinn, J. *Wherever you go, there you are: Mindfulness meditation in everyday life*; Hyperion: New York, USA, 2009.
27. Segal, Z. V.; Williams, J. M. G.; Teasdale, J. D. *Mindfulness-based cognitive therapy for depression* (2nd ed.). The Guilford Press: New York, USA, 2013.
28. Oraki, M.; Ghorbani, M. The effectiveness of mindfulness-based eating awareness training (MB-EAT) on perceived stress and body mass index in overweight women. *International Journal of Applied Behavioral Sciences*. **2019**, 6(3), 1-8.

29. Freire, C.; Ferradas, MdM.; Regueiro B.; Rodríguez, S.; Valle, A.; Núñez, J.C. Coping Strategies and Self-Efficacy in University Students: A Person-Centered Approach. *Frontiers in Psychology.* **2020**, 11, 841.
30. Britton, W.B.; Haynes, P.L.; Fridel, K.W.; Bootzin, R.R. Mindfulness-based cognitive therapy improves polysomnographic and subjective sleep profiles in antidepressant users with sleep complaints. *Psychotherapy and Psychosomatics*. **2012**, 81(5), 296-304.
31. Hülsheger, U. R.; Feinholdt, A.; Nübold, A. A low-dose mindfulness intervention and recovery from work: Effects on psychological detachment, sleep quality, and sleep duration. *Journal of Occupational and Organizational Psychology*. **2015**, 88(3), 464-489.
32. Wheeler, M. S.; Arnkoff, D. B.; Glass, C. R. The Neuroscience of Mindfulness: How Mindfulness Alters the Brain and Facilitates Emotion Regulation. *Mindfulness*. **2017**, 8, 1471-1487.
33. Franco, C. *Meditación Fluir para serenar el cuerpo y la mente;* Bubok: Madrid, Spain, 2009.
34. Franco, C.; Amutio, A.; López-González, L.; Oriol, X.; Martínez-Taboada, C. Effect of a mindfulness training program on the impulsivity and aggression levels of adolescents with behavioral problems in the classroom *Frontiers in Psychology*. **2016**, 7, 1385.
35. Amutio, A.; Franco, C.; Sánchez, L.C.; Pérez-Fuentes, M.C.; Gázquez-Linares, J.J.; Van Gordon, W.; Molero-Jurado, M.M. Effects of Mindfulness training on sleep problems in patients with fybromialgia. *Frontiers in Psychology (section: Clinical and Health Psychology).* **2018**, 9, 1365.
36. Franco, C.; Amutio, A.; Mañas, I.; Sánchez, L.C.; Mateos, E. Improving psychosocial functioning in mastectomized women through a mindfulness-based program: Flow Meditation. *International Journal of Stress Management*. **2020**. 27(1), 74–81.
37. Kabat-Zinn, J. *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness;* Delacorte: New York, USA,1990.
38. Carrascoso, F.J. Terapia de aceptación y compromiso: características, técnicas clínicas básicas y hallazgos empíricos. *Psicología Conductual.* **2006**, *14*(3), 361-386
39. Hayes, S.C., Stroshal, K.D., and Wilson, K.G. *Acceptance and Commitment Therapy*. New York: The Guilford Press, 1999.
40. Wilson, K.G.; Luciano, M.C. *Terapia de aceptación y compromiso. Un tratamiento conductual orientado a los valores*. Pirámide: Madrid, Spain, 2002.
41. Deshimaru, T. *La práctica del zen.* RBA: Barcelona, 2006.
42. Hart, W. *La Vippasana. El arte de la meditación.* Luz de Oriente: Madrid,1994.
43. Frankl, V. E. *The will to meaning: Foundations and applications of logotherapy*
44. Costello, S. J. *Applied Logotherapy: Viktor Frankl's Philosophical Psychology*; Cambridge Scholars Publishing: Newcastle, UK, 2019.
45. Esalati, P.; Arab, A.; Mehdinezhad, V. Effectiveness of Frankl's Logotherapy on Health (Decreasing Addiction Potential and Increasing Psychological Well-being) of Students with Depression. *Iranian Journal of Health Education and Health Promotion.* **2019**, 7(1), 84-92.

46. Amutio, A.; Franco, C.; Mercader, I.; Pérez-Fuentes, M.C.; Gázquez, JJ. Mindfulness training for reducing anger, anxiety and depression in fibromyalgia patients. *Frontiers in Psychology (Psychology for Clinical Settings)*. **2015**, 5, 1572.
47. Van Gordon, W.; Shonin, E.; Sumich, A.; Sundin, E. C.; Griffiths, M. D. Meditation awareness training (MAT) for psychological well-being in a sub-clinical sample of university students: a controlled pilot study. *Mindfulness*. **2014**, *5*(4), 381-391.
48. Leyton, M.; Lobato, S.; Batista, M.; Aspano, M. I.; Jiménez, R. Validación del cuestionario de estilo de vida saludable (EVS) en una población española. *Revista Iberoamericana de Psicología del Ejercicio y el Deporte*. **2018**, 13(1), 23-31.
49. Sánchez-Carracedo, D. S.; Saldaña, C. Evaluación de los hábitos alimentarios en adolescentes con diferentes índices de masa corporal. *Psicothema*. **1998**, 10(2), 281-292.
50. Wasserstein, R.L.; Lazar, N. A. The ASA's statement on p-values: context, process, and purpose, *The American Statistician.* **2016**, 70 (2), 129-133.
51. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences* (2nd ed); Lawrence Erlbaum: Hillsdale, MI, USA, 1988.
52. Van Gordon, W.; Shonin, E.; Griffiths, M.D. Towards a second generation of mindfulness-based interventions. *Australian and New Zealand Journal of Psychiatry*. **2015**, 49(7), 591-592.
53. Requero, B.; Briñol, P.; Moreno, L.; Paredes, B.; Gandarillas, B. Promoting healthy eating by enhancing the correspondence between attitudes and behavioral intentions. *Psicothema*. **2020,** 32(1), 60-66.
54. Lee, J.; Kubik, M. Y.; Fulkerson, J. A. Missed Work Among Caregivers of Children with a High Body Mass Index: Child, Parent, and Household Characteristics. *The Journal of School Nursing*. **2019**. DOI: 10.1177/1059840519875506
55. Giannopoulou, I.; Kotopoulea-Nikolaidi, M.; Daskou, S.; Martyn, K.; Patel, A. Mindfulness in eating is inversely related to binge eating and mood disturbances in university students in health-related disciplines. *Nutrients*. **2020**, 12(2), 396.
56. Bourdier, L.; Orri, M.; Carre, A.; Gearhardt, A. N.; Romo, L.; Dantzer, C.; Berthoz, S. Are emotionally driven and addictive-like eating behaviors the missing links between psychological distress and greater body weight? *Appetite*. **2018**, 120, 536-546.
57. Katterman, S. N.; Kleinman, B. M.; Hood, M. M.; Nackers, L. M.; Corsica, J. A. Mindfulness meditation as an intervention for binge eating, emotional eating, and weight loss: a systematic review. *Eating Behaviors*. **2014**, *15*(2), 197-204
58. Taylor, M. B.; Daiss, S.; Krietsch, K. Associations among self-compassion, mindful eating, eating disorder symptomatology, and body mass index in college students. *Translational Issues in Psychological Science*, **2015**, 1(3), 229-238.
59. Kanen, J.W.; Nazir, R.; Sedky, K.; Pradhan, B. K. The effects of mindfulness-based interventions on sleep disturbance: A meta-analysis. *Adolescent Psychiatry*. **2015**, *5*(2), 105-115.
60. Amutio, A.; Franco, C.; Gázquez, J.J.; Mañas, I. Aprendizaje y práctica de la conciencia plena en estudiantes de bachillerato para potenciar la relajación y la autoeficacia en el rendimiento escolar. *Universitas Psychologica.* **2015**, 14(2), *15-25*.

 doi:10.20944/preprints202006.0265.v1

61. Frank, P.; Fischer, D.; Wamsler, C. Mindfulness, Education, and the Sustainable Development Goals. In *Quality Education, Encyclopedia of the UN Sustainable Development Goals*; Leal Filho, W.; Azul, L.; Brandli, P.; Özuyar, G.; Wall. T. Eds. Springer: Cham, Germany, 2019; Volume 10, pp. 1-11, ISBN 978-3-319-69902-8
62. Li, C.; Kee, Y. H.; Lam, L. S. Effect of brief mindfulness induction on university athletes' sleep quality following night training. *Frontiers in Psychology*. **2018**, 9, 508.