

Mindfulness-based on Eating Improving Dietetic Measure Outcomes: Systematic Review

Sylvi Harmiardillah¹, Kusnanto², Ilya Krisnana³

¹Master of Nursing Student, ²Laboratory Human Basic Need, ³Laboratory Nursing Child and Maternity
Faculty of Nursing, Airlangga University Campus C Mulyorejo Surabaya 60115
Tel/Fax: (031) 5913754, E-mail: sylviharmiardillah@gmail.com

Keyword : *mindfulness, eating, diet.*

Abstrak: The use of mindfulness skill is increasing, its popularity and interest as an intervention appears to be growing. One of them as an intervention in weight management and eating through mindfulness-based on eating. Various literature explores the effect of mindfulness in general with emotional output and well being. This systematic review will examine the effects of mindfulness-based on eating as a major therapy with output related to diet from various aspects of physical, biochemical, and behavioral result. We identified articles through databases searching: Science Direct, Sage, Proquest, Springerlink, EbscoHost, and Google Scholar published between (2010-2018). Nine articles were analyzed and selected from 843 journal articles found for this systematic review. Most of the studies show that mindfulness-based on eating are recommended for the management of diet programs including improving eating related behavior, and affecting the biochemical and physical bodies. However, many of these studies have a disadvantage in term of method and sample size, we suggest to do further research with good preparation in all aspect to determine effectiveness the intervention.

1 INTRODUCTION

Some literature says clinical interventions based on mindfulness skills are increasingly clarified with increasing frequency and interest in health scopes for the use of attention techniques seems to be growing rapidly (Baer, 2003; Goodwin et al., 2017). Mindfulness can be interpreted as being fully present from moment to moment with full awareness of one's emotional state, physical condition and environment. The practice of mindfulness in evidence is also increasingly applied to the treatment of chronic diseases (Fung et al., 2016). Several training programs based on mindfulness have shown positive in eating habits and emotional well-being through various research studies (Pintado-Cucarella & Rodríguez-Salgado, 2016).

Mindfulness exercise during feeding activities enhances the body's physiological alert response during hunger and satiety and increases self-awareness through internal dialogue that contributes to the re-patterning of behavioral behaviors (Re-patterning behavior) (Tak et al., 2015). In dietetics, mindful eating strategies have been utilized primarily in the management of obesity and eating disorders (Fung et al., 2016). Attention to the

sensations, thoughts, and feelings during mealtime is related to regulation, emotion, and self-acceptance so as to reduce the problematic eating behavior so that one is able to make their own decisions about what, when, and how much food to consume (Alberts et al., 2012).

Food consumption directly affects the supply of nutrients and energy needed to sustain life (Cruwys et al., 2015). It is widely recognized that healthy nutritious foods are essential for human health and well-being. Poor dietary eating patterns and poor diet can contribute to poor health and become a risk factor for the development of non-communicable diseases that are the current trends, leading to the cause of death globally (Leech et al., 2015).

In addition to physical activity, Adjustment to the right diet program is considered a vital component in managing weight and chronic illness accompanied by optimizing nutritional status and health (Kristensen & Køster, 2014). Health outcome measures should be valid, reliable and measurable within a certain timeframe. An outcome generated by a dietary intervention intends for the client to have and be able to achieve the goal of a treatment plan for a diet program and the achievement of nutritional wellbeing. Measurement of dietary

outcomes is a component of monitoring and evaluation of a nutritional model and dietetic treatment. British Dietetic Association (BDA) divide diet outcomes to different parts of the domain including physical domains associated with anthropometry and body, biochemical domain associated with biochemical indicators and chemical performance of the body, and behavioral change domains related to trust, behavior, attitude, motivation and compliance such as restrictive eating, increased consumption of health food (fruit, vegetables or rich nutrient food) (BDA, 2011).

2 METHOD

We identified articles through databases searching: Science Direct, Sage, Proquest, Springerlink, EbscoHost, and Google Scholar published between (2010-2018), search terms include using keyword “Mindfulness”, “Eating”, and “Diet”. Nine articles were found that suitable with inclusion criteria. Experimental research articles that examine mindfulness-based on eating or mindful eating interventions as the main therapies in the health sciences of adolescents or adults who impact on diets and articles that include English in the inclusion criteria. We exclude the articles if the target population is focused on children, mindfulness therapy in general and is a combination therapy.

3 RESULT

Searching through the database obtained 843 research articles. We selected articles based on inclusion criteria and excluded articles that did not meet inclusion criteria.

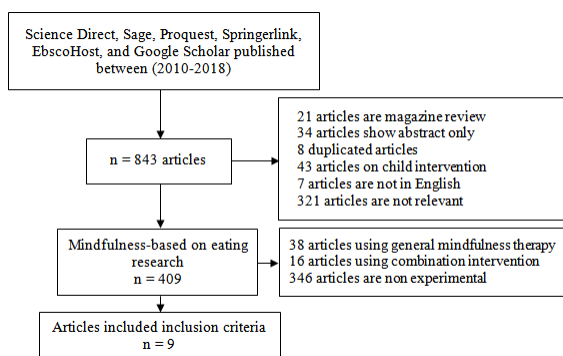


Figure 1: Flowchart articles retrieval process.

The data retrieval process is shown in figure 1. Nine journals that have been founded, collected and analyzed obtained the following results (table 1). Four articles of RCT design (Kristeller & Wolever 2014; Mason et al., 2016; Miller et al. 2012; Miller et al., 2014) three articles have an experimental design (Allirot et al., 2017; Alberts et al. 2012; Timmerman et al., 2017) an article clinical trial (Mason et al., 2017)) and one article shows a pilot study (Dalen et al., 2010).

Four of the 9 articles provided mindfulness-based on eating interventions on obesity or overweight, one article on eating disorders, two articles implemented this intervention in the case of diabetes mellitus and one article tested the effect of mindful eating on chronic kidney disease patients, but there was one article that did not mention the targets for this intervention, but the intervention is aimed at adult women by showing the BMI provision as one of the inclusion criteria. The results obtained in each article are varied. The researchers categorized the results of the diet based on the effect of mindfulness-based on eating up to 3 diet yield domains, ie physical domain (table 2), biochemical domain (table 3) and behavioral domain (table 4).

3.1 Mindfulness-based on eating on physical dietetic domain

BMI and weight have been measured as outcomes in mindfulness-based on eating exercises in several studies (Alberts et al., 2012; Dalen et al., 2010; Mason et al., 2016; Miller et al., 2012; Miller et al., 2014; Kristeller & Wolever 2014; Timmerman et al., 2017). Dalen et al., (2010) in the MEAL (Mindful Eating and Life) study, compared BMI and weight measurements at baseline with follow-up 12 months after the intervention obtained a mean BMI decreased from 37 kg / m² to 35.7 kg/ m² and weight decreased significantly from 101 kg to 97 kg (For a mean BMI and weight loss of 1.3 kg / m² and 4 kg (p <0.01). BMI and weight also measured in the baseline to post intervention were reduced from 32.02 kg / m² to 31.57 kg/ m² (p = 0.04) with weight loss of 203.21 kg to 199.91 kg (p = 0.03) after mindful eating program in the dietary intake setting in patients chronic kidney disease (Timmerman et al., 2017). In contrast to Alberts et al (2012) with his research through mindfulness-based eating program, the BMI score in the intervention group before and after the treatment resulted in decreased BMI in small significance (p = 0.07).

Table 1: All the studies have been summarized in the review.

Study	Design	Intervensi/Lenght	Target population / sample	Diet Outcome	Measures	Main finding
(Dalen et al., 2010)	Pilot study	MEAL class includes an eating exercise and several common meal situations (hungry, full, alone, social)/ 6 weeks, 3-month follow-up (12 weeks)	Obesity/ 10 Adults	BMI Weight C-reactive-protein Eating behavior	<i>Binge Eating Scale (BES)</i> , Weight and waist/hip measurements	Statistically significant increase in measures of decreases in weight, eating disinhibition, binge eating and C-reactive protein
(Allirot et al., 2017)	Experimental study	Mindful eating include watching video, tasting session, Buffet-Style Snack/ not reported	Not mentioned / 70 adult women	Food choice and liking Energy intake Macronutrient (fat, protein, carbohidrat)	Tasting session on a 100-mm electronic VAS. FIZZ, Weighing food	Mindful group showed a reduced number of high-energy-dense food items eaten and a decreased energy intake, fat and protein except carbohydrates. There were no differences in liking of the four finger foods between participants in the mindful and control conditions
(Mason et al., 2016)	RCT	Mindful eating/12 weekly sessions, 3 biweekly sessions, and one session 4 weeks later	Obesity/ 194 Adults	Eating of sweets, fasting glucose	The Block FFQ, standardized clinical assays	Mindfulness group showed increased maintenance of fasting glucose from baseline to 12 bulan post intervensi. Increases of mindful eating were associated with decreased eating of sweets and fasting glucose levels among mindfulness group participants
(Kristeller et al., 2014)	RCT	Mindfulness-Based Eating Awareness Training (MB-EAT)/ 12 session (9 weekly session, 3 monthly booster session)	Obese or overweight/ 150 individuals	Weight loss, BMI, Binge eating disorder	Calibrated scale, Binge Eating Scale (BES)	Results showed 28% of the MB-EAT group lost more than 5 pounds (lbs) during treatment. Compared with the control wait-list group, the MB-EAT group showed significant differences in binge eating disorder scale (BED) after 1 and 4 month intervention, 95% of

Study	Design	Intervensi/Lenght	Target population / sample	Diet Outcome	Measures	Main finding
						MB-EAT group did not show BED criteria after 4 months after intervention.
(Miller et al., 2014)	RCT	MB-EAT for Diabetes (MB-EAT-D) dibandingkan dengan smart choice (SC) DSME-based/8 weekly, 2 biweekly, one and 3-month follow-up session)	Diabetes melitus/ 52 Adult	Weight loss, Energy, Nutrition outcome expectations	Electronic scale, food frequency questionnaire (FFQ), positive and negative expectations regarding healthy food choice, glycemic and quality of life regarding eating behavior	There was no significant difference in weight loss between MB-EAT-D and SC groups. Significant improvement was obtained in the outcome expectations aspect of nutrition and disinhibition control regarding eating behavior in both groups
(Alberts et al., 2012)	Experimental study	MBCT-based eating intervention/ 8 week	Disorder eating/ 26 woman	BMI, Food craving, Dichotomous thinking (good or bad food)	Weight measure (kg), The Dichotomous Thinking Scale (DTS), General Food Craving Questionnaire Trait (G-FCQ-T)	The intervention group showed a significant decrease in the aspects of food craving and dichotomous thinking. Marginally significant decrease BMI for those in the experimental condition
(Timmerman et al., 2017)	Experimental study	Self management of dietary intake using mindful eating (SM-DIME)/ 6 weekly	Mild to moderate chronic kidney disease/ 19 partisipant	Wight, BMI, Dietary intake	Weight measured using calibrated beam medical scale and height using stadiometer, three 24-h dietary recalls	Weight loss and BMI were significantly in the respondents group after intervention, but not the dietary intake
(Miller et al., 2012)	Prospective randomized controlled trial	MB-EAT for Diabetes (MB-EAT-D)/ 3 month intervention, 8 weekly and two biweekly	Diabetes melitus/ 52 Adult	Dietary intake Weight Waist Circumference, HbA1c, Fasting glucose	Food frequency questionnaire (FFQ), electronic scale (Tanita crop), standar enzymatic procedure	There were significant differences between the two groups seen in the dietary intake / 1000 kcal aspects of trans fat, total fiber and sugar. Decreased energy and energy load also occurred significantly but differences in weight, waist circumference and glycemia were not statistically significant

Study	Design	Intervensi/Lenght	Target population / sample	Diet Outcome	Measures	Main finding
(Mason et al., 2017)	Single-arm clinical trial pre-post intervention design	Self paced smartphone-delivered intervention using mindful eating/ 28 days	Overweight or obese/ 104 partisipan	Craving related eating Weight	Food craving questionnaire-trait-reduced (FCQ-T-R), self-report questionnaire, weighed on Tanita BC-568	Decreased craving related eating behavior and self reported overeating behavior (trait food craving) significantly. This decrease is also associated with significant weight loss for timely completers

Table 2: Changes in physical outcome domain in the mindfulness-based on eating intervention group.

Dietetic domain	Study	Outcome measure	Difference changes post intervention (M±SD)	Follow up (M±SD)	p value
Physical	(Dalen et al. 2010)	BMI	n/a	-1.3 kg/m ²	< 0.01
	(Alberts et al, 2012)	BMI	-0.38 kg/m ² *)	Not given	0.07
	(Timmerman et al. 2017)	BMI	-0.45 kg/m ² *)	n/a	0.04
	(Kristeller et al. 2014)	BMI	-0.09 kg/m ² *)	0.42 kg/m ² *)	NS
	(Dalen et al. 2010)	Weight	n/a	-4 kg	< 0.01
	(Kristeller et al. 2014)	Weight	-10.67 lbs*)	-10.72 lbs*)	NS
	(Timmerman et al. 2017)	Weight	-3.3 kg*)	Not given	0.03
	(Miller et al. 2012)	Weight	n/a	-1.53	0.07
	(Miller et al. 2014)	Weight	n/a	-1.53	0.07
(Miller et al. 2012)	Waist circumference	n/a	-2.48 cm	0.052	

*) Difference changes within intervention group between baseline or pre test to post test or follow up p value < 0.05

Kristeller et al (2014) also tested the effect of MB-EAT (Mindfulness-based on Eating Awareness Training) program in reducing BMI 39.63 kg / m² at baseline condition to 39.54 kg / m² after 1 month of intervention with an average weight loss of 10.67 lbs , but after 4 months of follow-up BMI increased to 40.05 kg / m² with an average weight loss of 10.72 lbs. Although BMI and weight were not the main focus of this study, the practice of mindfulness in this study predicted improvements in some variables including BMI and weight (r = -0.33, p <0.05). Conducted two studies to compare the effect of MB-EAT-D with SC in patients with diabetes mellitus including weight and waist circumference as the output seen (Miller et al., 2012; Miller et al., 2014). Measurement the effect of interventions on baseline conditions to 3 months of follow-up post-intervention. The results showed no significant difference in body weight between the MB-EAT-D

group compared with the SC group (-1.53 ± 0.54 kg vs. -2.92 ± 0.54 kg, p = 0.07). Neither the waist circumference results obtained significant differences in the two groups after 3 months of follow-up (-2.48 ± 0.80 vs. -4.71 ± 0.81, p = 0.052).

3.2 Mindfulness-based on eating on biochemical dietetic domain

Biochemical values were measured in several studies of dietary intervention. It can also be found in several studies of the influence of mindfulness-based on eating related diet programs (Allirot et al., 2017; Dalen et al., 2010; Mason et al., 2016; Miller et al., 2012; Timmerman et al., 2017). Allirot et al (2017) in his research that aims to determine the effect of mindful eating on energy intake through macronutrient measurements such as fat, protein and

carbohydrates. Regarding macronutrient intake, energy intake from lipids and proteins was lower in the mindful condition than in the control condition (135.54 ± 17.98 kcal vs 190.41 ± 21.04 kcal, $p = 0.024$ for lipid; 39.45 ± 4.88 kcal vs 53.77 ± 6.25 kcal, $p = 0.049$ for protein) except carbohydrate (28.10 ± 4.95 kcal vs 28.10 ± 3.40 kcal, $p = 0.111$).

Dalen et al (2010) also showed significant results in other biochemical measurements such as the value of C-reactive protein after 12 weeks of follow-up of the study of the MEAL program. Statistically significant decrease in levels of C-reactive protein from 0.30 mg / dl to 0.24 mg/ dl ($p < 0.04$).

Biochemicals that commonly seen especially in patients with diabetes mellitus is fasting glucose and HbA1c. Miller et al (2012) measured many aspects of biochemical such as fasting glucose and HbA1c through comparing MB-EAT-D and SC groups under baseline conditions to 3 months of follow-up after mindful eating interventions. There were no significant differences in both groups in the fasting glucose (-5.43 ± 8.38 mg / dl vs. -14.68 ± 8.60 mg / dl, $p = 0.442$) and HbA1c (-0.83 ± 0.24 mg / dl vs. -0.67 ± 0.24 mg/ dl, $p = 0.622$). Mason et al (2016) also measures fasting glucose as the main output in mindfulness-based on eating program.

Tabel 3: Changes in biochemical outcome domain in the mindfulness-based on eating intervention group.

Dietetic domain	Study	Outcome measure	Difference changes post intervention (M±SD)	Follow up (M±SD)	p value
Biochemical	(Dalen et al. 2010)	C-reactive	n/a	-0.06 mg/dl*)	<0.04
	(Miller et al. 2012)	Trans fat	n/a	0.05g	0.048
		Cholesterol	n/a	-4.01mg	0.582
		Total sugar	n/a	-1.50g	0.044
		Total fiber	n/a	0.86g	0.022
		HbA1c	n/a	-0.83%	0.622
		Fasting glucose	n/a	-5.43 mg/dl	0.442
		Total energy	n/a	-490 kcal	0.219
	(Mason et al. 2016)	Fasting glucose	0.00*)	-0.10 mg/dl*)	0.63/ 0.28
	(Allirot et al. 2017)	Carbohydrat	28.10 kcal	Not given	0.111
		Lipid	135.54 kcal	Not given	0.024
		Protein	39.45 kcal	Not given	0.049
		Total energy	275.55 kcal	Not given	0.024
		(Timmerman et al. 2017)	Protein	-0.5 kcal*)	Not given
		Carbohydrat	-7.25 kcal*)	Not given	0.32
		Total fat	-4.07 kcal*)	Not given	0.22

*) Difference changes within intervention group between baseline or pre test to post test or follow up p value < 0.05

There were no significant differences in the intervention group at baseline 6 months after the intervention (86.8 ± 8.5 , $p = 0.63$) and 12 months of follow-up (86.9 ± 8.5 , $p = 0.28$), unfortunately the study showed that the control group increased the fasting glucose after 12 months of follow-up ($p = 0.035$) than in the intervention group, while post 6 months of intervention and 12 follow-up in the intervention group were predicted to decrease glucose fasting significantly at both time ($p = 0.009$; $p = 0.0023$).

Miller et al (2012) also assessed other biochemical levels such as trans fat, cholesterol, total sugar, total fiber and total energy. Significant differences were obtained after 3 months of

intervention between the MB-EAT-D group and the SC group at levels of trans fat (0.05 ± 0.10 kcal, $p = 0.048$), total sugar (-1.50 ± 2.95 kcal, $p = 0.044$) and total fiber (0.86 ± 0.70 kcal, $p = 0.022$). A significant reduction in total energy and glycemic load can be seen after 3 months of intervention in both groups of MB-EAT-D and SC groups ($p < 0.0001$). Contrast to the results of research conducted by (Timmerman et al., 2017) through self-management mindful eating program to test its influence on dietary intake. Decreased levels of fat, protein and carbohydrate post intervention were not statistically significant on each (-4.07 kcal, $p = 0.22$; -0.5 kcal, $p = 0.92$; -7.25 kcal, $p = 0.32$).

3.3 Mindfulness-based on eating on behavioral dietetic domain

Behavioral outcomes in the diet associated with behavioral changes in eating activities including those related to thinking in determining an attitude such as Alberts et al (2012) study tested the dichotomous thinking as one of the outcomes to be seen as a result of the influence of mindfulness-based interventions. Dichotomous thinking is a fragile cognitive condition where reality in terms of polarities is good and bad in food. The results showed a reduction in dichotomous thinking scale (DTS) scores in the experimental group after intervention based on mindfulness (2.48 ± 0.32 to 2.10 ± 0.57 , $p = 0.03$).

Dalen et al (2010) looked at the outcome of binge eating, eating of sweet and eating disinhibition in his research on the influence of mindful eating program. The results showed that there was a significant decrease in BES score from baseline to post 6 weeks and post 12 weeks of intervention (9.2 ± 5.1 , $p = 0.003$; 7.2 ± 2.3 , $p = 0.001$) with decreased eating of sweet behavior in the mindfulness group seen from the count of sweet foods consumed in 24 hours but not statistically significant either 6 month or 12 month post intervention ($8.4 \pm 7.3\%$, $p = 0.54$, $8.2 \pm 6.2\%$, $p = 0.12$). Nevertheless mindful eating can predict reduction of negative eating behavior in the intervention group at 6 month and 12 month post intervention ($p = 0.003$; $p = 0.108$) than control group ($p = 0.579$; $p = 0.611$). Eating disinhibition also significantly decreased after 6 weeks and 12 weeks post intervention from baseline condition (6.4 ± 2.8 , $p = 0.05$; 4.5 ± 2.5 , $p = 0.02$) through TEFQ score measurement. Research Kristeller et al (2014) also showed positive results in lowering binge eating as a result of mindfulness-based on

awareness training (MB-EAT) program. Obtained lower BES scale in the MB-EAT group than in the PECB group and wait list at 1 month and 4 month post intervention (15.24 ± 9.06 ; 13.53 ± 9.12 , $p < 0.001$). The MB-EAT group also didn't meet BED criteria as much as 95% of participant after 4 month intervention.

Food craving is measured as an outcome in 2 related studies mindfulness-based on eating that is Mason et al (2017) and Alberts et al. (2012). Both showed positive results in reducing the scale of food craving. Through the FCQ-T-R measurement, the food craving scale for the intervention group decreased from -15.19 ($p < 0.001$) after treatment, similar to Alberts et al (2012) research, the scale of food craving decreased after the provision of mindfulness-based interventions on eating behavior. In the intervention group showed a reduction in food craving score difference of -0.38 through measurements using GFC-Q-T after treatment of baseline conditions ($p = 0.03$). Measurements of self-report questionnaire also showed a decrease of scale of food craving in the intervention group -21.39 after treatment ($p = 0.001$). Consumption of healthy food behaviors including fruits and vegetables can be an outcome as a result of behavior in diet programs seen in research of Miller et al (2014) comparing the effectiveness of conscious eating (MB-EAT-D) with diabetes self-management (SC) in diabetic patients not showing (0.24 ± 0.28 , $p = 0.022$, 0.04 ± 0.28 , $p = 0.606$) and fruit (0.27 ± 0.14 , $p = 0.049$, 0.20 ± 0.14 , $p = 0.155$) in the feeding group post-intervention mindful and follow up 3 months. However, positive results were obtained on the nutritional outcome expectation in the MB-EAT-D group in both post-intervention and 3 month follow-up through the assessment of positive and negative expectation regarding healthy food choice, glycemic control and quality of life (1.35 ± 0.20 , 1.32 ± 0.20 , $p < 0.0001$).

Tabel 4: Changes in behavioral outcome domain in the mindfulness-based on eating intervention group.

Dietetic domain	Study	Outcome measure	Measurement	Difference changes post intervention (M±SD)	Follow up (M±SD)	p value
Behavioral	(Dalen et al. 2010)	Binge eating	BES	-7*)	-9*)	0.003/ 0.001
	(Dalen et al. 2010)	Eating disinhibition	TFEQ	-3.1*)	-5*)	0.05/ 0.02
	(Allirot et al. 2017)	Food choice and liking		7.03 (LED Savory)	Not given	0.60
				7.38 (HED Savory)	Not given	0.22
				7.15 (LED Savory)	Not given	0.49
				7.20 (HED Sweet)	Not given	0.76
	(Mason et al. 2016)	Eating of sweet		-3.2%*)	-3.4%*)	0.54/ 0.12
	(Mason et al. 2017)	Food craving	FCQ-T-R	-15.19*)	Not given	<0.001
			Self-report questionnaire	-21.39*)	Not given	<0.001
	(Kristeller et al. 2014)	Binge eating	BES	15.24	13.53	<0.001
	(Miller et al. 2014)	Nutrition outcome expectation		1.35	1.32	<0.0001
	(Miller et al. 2014)	Serving of fruit		0.27 kcal	0.20 kcal	0.049/ 0.155**)
	(Miller et al. 2014)	Serving of vegetables		0.24 kcal	0.04 kcal	0.022/ 0.160**)
	(Alberts et al. 2012)	Food craving	GFC-Q-T	-0.54*)	Not given	0.02
	(Alberts et al. 2012)	Dichotomous thinking	DTS	-0.38*)	Not given	0.03

BES = Binge Eating Scale; TFEQ = Three-Factor Eating Questionnaire; FCQ-T-R = Food Craving Questionnaire-Trait-Reduced; GFC-Q-T = General Food Craving Questionnaire Trait; DTS = The Dichotomous Thinking Scale; LED = Low Energy Dense; HED = High Energy Dense

*) Difference changes within intervention group between baseline or pre test to post test or follow up

***) p value < 0.0125

p value < 0.05

4 DISCUSSION

Research articles have been featured in this systematic review of dietary outcomes derived from the effects of mindfulness-based on eating grouped under several outcome domain physical, biochemical and behavioral patterns. Most studies show positive outcomes in the physical aspects associated with physical body changes that resulted in weight loss, waist circumference and significant BMI rates in most research articles. Mindfulness-based therapy can help a person to lose weight and improve health through restoring a person's ability to detect and respond to natural body cues that are hunger and satiety signals (Dalen et al., 2010).

The practice of mindfulness in eating activities also regulates an excessive eating process by increasing appreciation of food in smaller portions and controlling the cycles of the desire to eat

(Warren et al., 2017; Kristeller et al., 2014). Awareness while eating is easier to reduce the frequency of overeating or eating compulsively so that the impact on the intake taken (Peluso et al., 2016). It has believed to affect body weight and BMI due to mindfulness-based on eating form adaptive eating behavior will directly affect the portion and intake of food obtained by the body to allow for weight loss.

Attention while eating also has a positive effect on emotional response and stress (Warren et al., 2017). Emotional eating increases the consumption of fats and sugars resulting in an increase in energy intake and an impact on weight gain (Mason et al., 2016). There are three research articles that test the value of fat and sugar levels consumed after eating intravenously with mindfulness. The three articles showed significant results in lowering the level of fat and sugar consumption after intervention and follow-up. Perceptions of food taste are considered

as internal food stimuli that are affected by the appearance, texture, sound and food temperature that affects a person likes food. In addition to focusing on weight management, mindful eating also examines one aspect of paying attention to the nature sensory of food and its effects in laboratory setting (Seguias & Tapper, 2018).

Mindful eating has been found in several studies that focusing on food sensory sensations is associated with a reduction in intake of food intake and contributes to the caloric intake and nutritional content contained in the food consumed and come in along with the consumed intake that will appear in the biochemical condition of the body. As well as the effect on portions and food intake, the adjustment of appropriate food choices is also predicted due to the attention that is present in the mindfulness of the eating activity (Seguias & Tapper, 2018). Eating mindfully positively impacts subjective expectations and food pleasures, even on foods normally considered neutral (Jiang et al., 2014).

The articles reviewed above have unequal results and it can not be ascertained that their effects do not always appear in all aspects of the biochemical tested in one study, but from some aspect to be seen at least one or more biochemical marker values can be seen to have the effect of mindful eating. This may be because the intake of food intake is individualized and depends on the type and amount of intake consumed that varies. Behavioral outcomes due to the effects of mindfulness-based on eating exercises are mostly found in this research article can be seen in article reviews working on cases of obesity and over-eating (44.4%). This is also supported by Beshara et al (2013) which shows the relevance of mindful eating intervention with serving size including emotional and disinhibition eating on the research.

Most of the results significantly decrease excessive eating behavior (binge eating), craving eating, and eating disinhibition. Attention to eating activities is associated with the emergence of the calm characteristics of ego, wisdom, altruism, the sense of interdependence with all living things, openness to change, low negative influences, and physical and psychological wellbeing so that conscious eating will help increase the enjoyment of food in people with neophobic disorders, picky eating behaviors, or poor dietary practices (Hong et al., 2014).

Mindful eating is also believed to provide information on the constraints that may arise in the size control measures serving (eating behavior) that can be seen from the calculation of the scale of eating emotionally and disinhibited (Beshara et al., 2013). Attention to eating activities can also help a

person maintain awareness to make choices that support their own health by considering the factors as well as the impact of food selection (Verstuyf et al., 2012). It is thought that the pressure-reducing process is felt during meals, thus reducing the risk of eating emotionally, including the role of self-cognitive controls reducing impulsive reactions in feeding activities, the ability to overcome food cravings, and the selection of foods that indirectly establish appropriate dietary patterns.

5 CONCLUSION

This study evaluated the effect of mindfulness-based on eating on the measurement of dietetic outcomes in various health problems. Nine research articles have been summarized in this study. The research articles tested showed mixed results on dietetic outcomes both physical, biochemical and behavioral, but each article had a significant positive outcome in one or more aspects of dietetic outcome in each study. Most of the studies show that mindfulness-based on eating are recommended for the management of diet programs including improving eating related behavior, and affecting the biochemical and physical bodies. However, many of these studies have a disadvantage in term of method and sample size, we suggest to do further research with good preparation in all aspect to determine effectiveness the intervention.

REFERENCE

- Alberts, H.J.E.M., Thewissen, R. & Raes, L., 2012. Dealing with problematic eating behaviour. The effects of a mindfulness-based intervention on eating behaviour, food cravings, dichotomous thinking and body image concern. *Appetite*, 58(3), pp.847–851.
- Allirot, X. et al., 2017. Effects of a Brief Mindful Eating Induction on Food Choices and Energy Intake: External Eating and Mindfulness State as Moderators. *Mindfulness*.
- Baer, R., 2003. Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology Science and Practice*, 10, pp.125–143.
- Beshara, M., Hutchinson, A. D., & Wilson, C. (2013). Does mindfulness matter? Everyday mindfulness, mindful eating and self-reported serving size of energy dense foods among a sample of South Australian adults. *Appetite*, 67: 25–29.
- British Dietetic Association. 2011. Model for Dietetic Outcomes. Birmingham: British Dietetic Association.
- Cruwys, T., Bevelander, K.E. & Hermans, R.C.J., 2015. Social modeling of eating: A review of when and why

- social influence affects food intake and choice. *Appetite*, 86, pp.3–18.
- Dalen, J. et al., 2010. Pilot study: Mindful Eating and Living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine*, 18(6), pp.260–264.
- Fung, T.T. et al., 2016. An Expanded Model for Mindful Eating for. *Journal of the Academy of Nutrition and Dietetics*, 116(7), pp.1081–1086.
- Goodwin, R. et al., 2017. Exploring Mindful Eating and Weight Status Among Underserved Youth and Their Parents Living in Public Housing. *Mindfulness*, 8(4), pp.973–983.
- Hong, P.Y., Lishner, D.A. & Han, K.H., 2014. Mindfulness and Eating: An Experiment Examining the Effect of Mindful Raisin Eating on the Enjoyment of Sampled Food. *Mindfulness*, 5(1), pp.80–87.
- Jiang, Y., King, J.M. & Prinyawiwatkul, W., 2014. A review of measurement and relationships between food, eating behavior and emotion. *Trends in Food Science and Technology*, 36(1), pp.15–28.
- Kristeller, J., Wolever, R.Q. & Sheets, V., 2014. Mindfulness-Based Eating Awareness Training (MB-EAT) for Binge Eating: A Randomized Clinical Trial. *Mindfulness*, 5(3), pp.282–297.
- Kristeller, J., Wolever, R. Q., & Sheets, V. 2014. Mindfulness-Based Eating Awareness Training (MB-EAT) for Binge Eating: A Randomized Clinical Trial. *Mindfulness*, 5(3), 282–297.
- Kristensen, S.T. & Køster, A., 2014. Contextualising eating problems in individual diet counselling. *Health (London, England : 1997)*, 18(3), pp.319–331.
- Leech, R.M. et al., 2015. Understanding meal patterns: Definitions, methodology and impact on nutrient intake and diet quality. *Nutrition Research Reviews*, 28(1), pp.1–21.
- Mason, A.E. et al., 2016. Effects of a mindfulness-based intervention on mindful eating, sweets consumption, and fasting glucose levels in obese adults: data from the SHINE randomized controlled trial. *Journal of Behavioral Medicine*, 39(2), pp.201–213.
- Mason, A.E., Epel, E. S., Kristeller, J., Moran, P. J., Dallman, M., Lustig, R. H., Daubenmier, J. 2016. Effects of a mindfulness-based intervention on mindful eating, sweets consumption, and fasting glucose levels in obese adults: data from the SHINE randomized controlled trial. *Journal of Behavioral Medicine*, 39(2): 201–213.
- Mason, A.E. et al., 2017. Testing a mobile mindful eating intervention targeting craving-related eating: feasibility and proof of concept. *Journal of Behavioral Medicine*, pp.1–14.
- Miller, C.K. et al., 2012. Comparative Effectiveness of a Mindful Eating Intervention to a Diabetes Self-Management Intervention among Adults with Type 2 Diabetes: A Pilot Study. *Journal of the Academy of Nutrition and Dietetics*, 112(11), pp.1835–1842.
- Miller, C.K. et al., 2014. Comparison of a Mindful Eating Intervention to a Diabetes Self-Management Intervention Among Adults With Type 2 Diabetes. *Health Education & Behavior*, 41(2), pp.145–154.
- Peluso, A. (2016). Comparison of mindful and slow eating strategies on acute energy intake, dissertation, University of Pittsburgh
- Pintado-Cucarella, S. & Rodríguez-Salgado, P., 2016. Mindful eating and its relationship with body mass index, binge eating, anxiety and negative affect. *Journal of Behavior, Health & Social Issues*, 8(2), pp.19–24.
- Seguias, L., & Tapper, K. (2018). The effect of mindful eating on subsequent intake of a high calorie snack. *Appetite*, 121, 93–100.
- Tak, S. R., Hendrieckx, C., Nefs, G., & Speight, J. (2015). The association between types of eating behaviour and dispositional mindfulness in adults with diabetes. Results from Diabetes MILES. *Appetite*, 87: 288–295.
- Timmerman, G.M. et al., 2017. Self-management of dietary intake using mindful eating to improve dietary intake for individuals with early stage chronic kidney disease. *Journal of Behavioral Medicine*, 40(5), pp.702–711.
- Verstuyf, J., Patrick, H., Vansteenkiste, M., & Teixeira, P. J. 2012. Motivational dynamics of eating regulation: A self-determination theory perspective. *Int J Behav Nutr Phys Act*, 9:2.
- Warren, J.M., Smith, N. & Ashwell, M., 2017. A structured literature review on the role of mindfulness, mindful eating and intuitive eating in changing eating behaviours: effectiveness and associated potential mechanisms. *Nutrition Research Reviews*, pp.1–12.