

THE PSYCHO-PHYSIOLOGICAL OUTCOMES OF INTERMITTENT FASTING AND BINGE EATING PATTERNS

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ABSTRACT

This review focuses into the psycho-physiological outcomes of Intermittent Fasting (IF) and Binge Eating (BE) on mental and physical well-being. IF, characterized by fasting and eating cycles, demonstrates potential benefits such as improved mood, stress resilience, and metabolic health. Various IF methods, including time-restricted and modified-calorie fasting, are discussed, emphasizing individual responses. The impact of IF on neuropsychiatric conditions, weight management, diabetes, cardiovascular health, and blood pressure is assessed. Conversely, binge eating, associated with adverse psychological and obesity-related consequences, is scrutinized. The paper concludes with future research directions, including investigating neurobiological aspects and cultural influences on Binge eating and fasting outcomes.

KEYWORDS: Psycho-Physiological Outcomes, Intermittent Fasting, Binge Eating Patterns, Behavioral Patterns.

1. INTRODUCTION

Eating disorders (ED) represent intricate psychiatric disorders linked to considerable psychological and physical challenges. Those affected by EDs face an elevated risk of suicide attempts, increased mortality rates, and a diminished quality of life compared to both the general population and individuals with other psychiatric disorders. Intermittent fasting and binge eating have become notable dietary patterns in recent years, capturing attention for their potential effects on psycho-physiological outcomes. With individuals exploring various strategies for weight management and overall health, researchers have undertaken investigations to comprehend the impact of these eating patterns on mental and physical well-being [1].

1.1 Intermittent Fasting

Sustained adherence to extremely low-calorie diets resulted in physiological adjustments that hindered further weight loss. Conversely, intermittent fasting presented an approach involving alternating periods of reduced calorie intake and regular eating, potentially circumventing these adaptive responses. However, research outcomes varied in demonstrating the consistent superiority of intermittent fasting over continuous low-calorie

diets in achieving weight reduction. Intermittent fasting gained popularity for its ability to alleviate plateaus in weight loss. By incorporating fasting intervals, it could potentially help sustain a higher metabolic rate and insulin sensitivity, countering the body's attempts to conserve energy in response to prolonged caloric restriction. Nevertheless, individual responses to intermittent fasting were diverse, and this strategy's efficacy was dependent on elements like adherence, meal choices, and overall lifestyle. Continuous low-calorie diets could also prove successful with proper management. Therefore, the decision between intermittent fasting and continuous calorie restriction should be based on individual preferences, needs, and long-term sustainability, as both methods present viable avenues for weight reduction [2].

1.2 Types of Intermittent Fasting

1.2.1 Time-Restricted Intermittent Fasting

Time-restricted eating entails consolidating your daily meals and snacks into a designated time window, followed by a fasting period for the remainder of the day. This method is widely embraced in intermittent fasting and is especially well-suited for those new to the practice, as it allows for gradual adjustments such as eliminating late-night snacks and delaying breakfast by a few hours. Moreover, during the fasting period, you are permitted to consume water, unsweetened tea, and black coffee, helping to alleviate the sense of deprivation [3].

1.2.2 Modified-Calorie Intermittent Fasting

Altered-calorie eating strategies integrate both calorie reduction and time-restricted eating on designated days. The objective is to prompt the body to utilize its fat reserves more extensively, relying on stored fat when primary fuel sources, such as carbohydrates, are restricted. This mechanism requires additional energy and, consequently, facilitates the process of weight loss. One of the most well-known altered-calorie plans is the 5:2 methodology [3].

1.2.3 Changing Days and Intermittent Fasting

Similar to the 5:2 methodology, alternate-day fasting (ADF) follows a pattern of alternating between regular eating days and days where one's calorie intake is limited to 500 calories for women or 600 calories for men. Allowing your body a complete day for recovery after eating is crucial for the manifestation of the health benefits associated with fasting [3].

1.3 Binge Eating

Recurrent bouts of consuming large amounts of food coupled with a felt loss of control over eating behavior are indicative of binge eating disorder (BED). According to estimates, the frequency of BED will vary between 0.6% and 1.8% among adult women and between 0.3% and 0.7% among adult males worldwide between 2018 and 2020. Obesity and concomitant disorders related to physical and mental health are usually connected with BED. BED patients deal with significant obstacles and disturbances in their lives, yet the illness is frequently misdiagnosed and mistreated [4].

2. SIGNIFICANCE OF PSYCHO-PHYSIOLOGICAL OUTCOMES OF INTERMITTENT FASTING AND BINGE EATING

2.1 Intermittent Fasting - IF is a dietary approach characterized by alternating cycles of fasting and eating. Scientific investigations indicate that intermittent fasting may positively impact mental well-being by alleviating symptoms of depression and anxiety. Research has highlighted enhancements in mood, stress resilience, and cognitive function during intermittent fasting phases. From a physiological perspective, intermittent fasting has been associated with improved metabolic health, encompassing benefits such as weight loss, decreased inflammation, and heightened insulin sensitivity [5]. Studies indicate that intermittent fasting can influence the regulation of hormones, leading to alterations in insulin, ghrelin, and leptin levels, which are integral to appetite control and energy balance. The individual response to intermittent fasting may vary based on factors like age, gender, and overall health status [6].

2.2 Binge Eating - BE is a form of disordered eating characterized by episodes of excessive food consumption without subsequent compensatory behaviors like purging or excessive exercise. In contrast, binge eating is linked to adverse mental health outcomes, including an elevated risk of depression, anxiety disorders, and a compromised quality of life. The behavior is associated with various physiological risks, including obesity, cardiovascular issues, and metabolic disturbances [7]. Dys-regulation of neurotransmitters like serotonin and dopamine is evident in individuals with binge eating disorders, contributing to the recurring pattern of binge eating behavior. Psychosocial elements, such as stress and emotional regulation, can impact the frequency and severity of binge eating episodes [8]. Effect of Intermittent Fasting on different organs showed in Figure: 1.

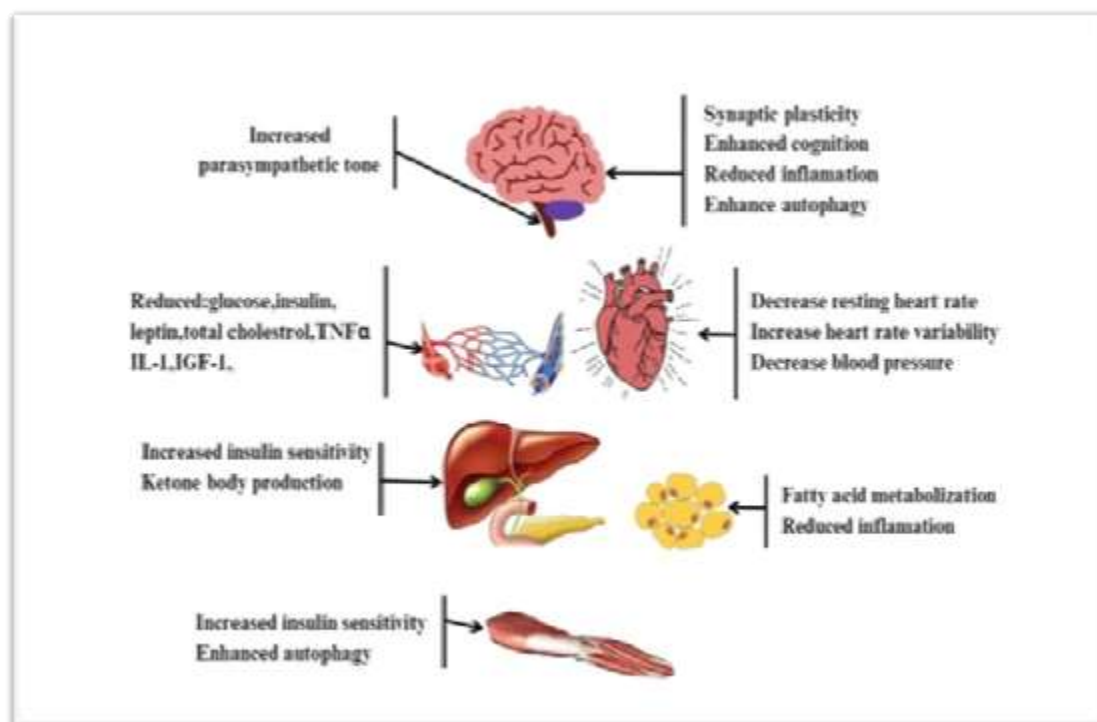


Figure 1: Effect of Intermittent Fasting (IF) on different organs:
TNF- α : Tumor Necrosis Factor α , IL-1: Interleukin-1, IGF-1: Insulin Like Growth factor-1.

3. EFFECT OF IF ON BODY

3.1 IF on Psychological Health

On the flip side, certain research has indicated that brief periods of fasting can result in improved mood, evident through heightened positive feelings and energy, along with reduced negative emotions. For instance, during an 18-hour fasting period among healthy women, it was observed that fasting could contribute to heightened irritability but also an increase in positive emotional experiences, including feelings of accomplishment, reward, pride, and control [9]. The findings demonstrated that fasting is not just induced negative emotional emotions, such as agitation, but also triggered favorable psychological responses, including an enhanced feeling of accomplishment, self-assurance and authority. This study is one of the few showing that fasting, even in healthy persons, can result in good psychological experiences. Participants reported feeling more-hungry and finding it harder to fast. These findings complement the cognitive-behavioral and cognitive-interpersonal theories of anorexia nervosa (AN), implying that positive reinforcement plays a role in the maintenance of fasting. Furthermore, the results can clarify how regular dieting or fasting might lead to severe food limitations [10].

3.2 IF on Disorders of the Brain

Neurological conditions constitute significant sources of illness globally. Neurodevelopmental and psychiatric disorders can lead to enduring challenges on a personal, social, and emotional level. Given the metabolic, cellular, and circadian effects associated with fasting, Intermittent Fasting (IF) holds considerable promise for the potential treatment and prevention of brain-related diseases [11].

3.3 Inquiry on Neuropsychiatric Conditions

Anxiety and mood problems constitute a category of conditions characterized by a common feature of a generally altered sentimental condition, resulting in experiences of despair or fear. This clinically appears in subsequent cognitive, emotional, behavioral, and physiological reactions. The examination of the effects of intermittent fasting (IF) on about anxiety and mood problems is conducted collectively, given the significant comorbidity observed between these conditions [12]. A recent study involving mice demonstrated that a 9-hour fast led to an increase in BDNF levels, which are linked to both chronic stress and chronic depression. This fasting period also induced antidepressant effects [13]. The impact of fasting was nullified by the administration of a 5-HT_{2a} receptor agonist, indicating a connection between fasting and this neurotransmitter system associated with mood. In individuals who were in good health, a period of six months practicing intermittent fasting (IF) resulted in enhanced mood, as assessed through the World Health Organization Wellbeing Index and the Hospital Anxiety and Depression Scale [14]. In elderly men, a three-month period of fasting combined with calorie restriction resulted in a decrease in indications of emotional reactivity including stress and rage, as measured by the Mood States Profile questionnaire. However, there was no observed reduction in depression symptoms. Moro et al. discovered that time-restricted feeding (TRF) lowered the TNF α , IL-6, and IL-1 β inflammatory markers in 34 healthy individuals, which are linked to behaviors resembling anxiety and depression [15].

3.4 IF on Weight Management

The predominant focus of human studies on Intermittent Fasting (IF) has revolved around investigating its potential as a strategy for weight reduction and the correction of unfavorable metabolic parameters in individuals who are obese or overweight. This emphasis is crucial, as the challenges associated with sustained adherence are generally accepted as effective approaches to continuous energy restriction (CER) for managing weight [16]. A dietary strategy called continuous energy restriction (CER) has been shown to help people lose weight, regardless of their weight—both obese and normal-weight people. It entails capping daily calorie consumption between 15 to 60 percent of baseline energy requirements. Because it requires self-regulation and calorie tracking, this practice can be difficult to maintain over time. Moreover, CER may cause the body to adjust physiologically in an attempt to counteract calorie restriction, which might prevent additional weight reduction. As a result of its increased efficacy, intermittent energy restriction (IER), an alternate dietary approach, has become more well-liked [17].

3.5 IF on Diabetes

In a clinical trial, early Time-Restricted Feeding (e TRF) was found to reduce morning insulin and glucose levels during fasting, elevate fasting insulin at night, and diminish 24-hour blood glucose peaks. The unexpected reduction in the 24-hour glucose peak contradicted the anticipation of a higher postprandial glucose level in the e TRF group, given the condensed meal consumption within a short timeframe. A plausible explanation for this decline, especially during lunchtime, was proposed: the continued elevation of circulating insulin from a recently consumed breakfast might obviate the need for renewed activation of pancreatic β cells to secrete insulin, resulting in a smaller plasma glucose peak. The practice of condensing meals within a shorter daily timeframe appears to be advantageous for controlling 24-hour blood glucose levels, irrespective of the circadian rhythm. This intriguing relationship merits further exploration in subsequent clinical trials, as it holds potential for effectively managing 24-hour blood glucose levels [18].

3.6 IF on Cardiovascular Health

Atherosclerosis stands as the primary cause of vascular diseases globally, posing a significant threat to mortality and pathogenicity in both developed and underdeveloped countries. Its clinical manifestations include conditions like peripheral artery disease, ischemic stroke, and ischemic heart disease, contributing to cerebrovascular accidents, acute myocardial infarction, and ultimately accounting for a substantial number of cardiovascular-related deaths worldwide. Intermittent fasting proves effective in impeding the progression of fatty plaque atherosclerotic by lowering the levels of inflammatory indicators as homocysteine, CRP, and IL-6. The intermittent fasting nutrition brings about an elevation in plasma adiponectin concentrations as well as a reduction in the amounts of resistin and leptin. Through these alterations in adipokine levels, intermittent fasting hinders monocytes' adherence to vascular endothelial cells, suppresses neutrophil and the proactive actions of macrophages, as well as reduce platelet aggregation. Numerous studies, involving both human subjects and models based on animals and focusing on reduction in weight through intermittent fasting, consistently validate a decreased danger of heart-related illnesses. This risk reduction is closely tied to the modulatory impact of the intermittent fasting diet on a range of developmental risk factors, including insulin resistance, type II diabetes, obesity, poor nutrition, and arterial hypertension [19].

3.7 Effect of IF on Blood Pressure

Hypertension is a prevalent condition in the modern era, impacting 86 million adults in the United States and posing a chance of stroke, chronic renal disease, and cardiovascular disease. It is characterized by Diastolic blood pressure (DBP) of at least 90 mmHg or systolic blood pressure (SBP) of at least 140 mmHg. The implementation of an intermittent fasting (IF) diet demonstrates a favorable impact on blood pressure reduction, a phenomenon initially observed in animal studies and subsequently validated in human research. Investigations carried out in the United States at the University of Buffalo, involving Sprague-Dawley male rats, affirmed the positive influence of the IF diet about the heart system. The rats were subjected to either a lower-calorie diet or an IF regimen, involving alternate-day feeding under a circadian rhythm. Telemetry Transmitters were inserted to track cardiac activity. function. Following a couple weeks of watching, a decline in both SBP and DBP was observed, accompanied by a decrease in heart rate [20]. Side effects of Intermittent Fasting (IF) showed in Figure: 2.

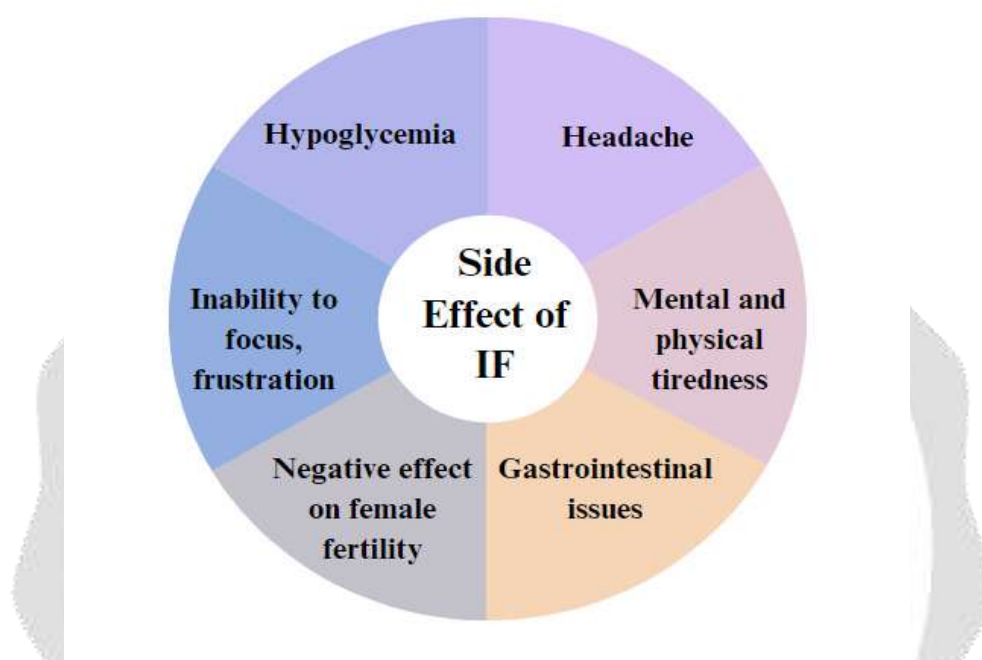


Figure 2: Side Effect of Intermittent Fasting (IF) on Human Health.

4. IMPACT OF IF ON HEALTH

- Weight and fat loss with the preservation of muscle mass occur at a rate of 0.2 to 0.8 kg per week, or a range of 4–15% weight loss for individuals who are overweight [21].
- Reduced appetite and diminished food cravings are experienced, with hunger fluctuating like a wave. It is advised to disregard it, as it typically fades away after consuming a cup of tea or coffee.
- Enhanced metabolic health is evident, with restored insulin sensitivity by 20–31% and reduced cholesterol levels (a 21% decrease in LDL cholesterol and a 32% decrease in triglycerides), along with a reduction in abdominal fat [22].
- A decline in blood pressure and heart rate is observed, suggesting potential improvement in heart health, particularly when it is coupled with weight loss.
- The levels of human growth hormone (HGH) surge significantly, rising by 2,000% in men and 1,300% in women during a 24-hour fasting period. Elevated HGH levels contribute to improved faster wound healing, more protein synthesis, and faster fat loss all contribute to muscle development and recovery.
- Intermittent fasting proves effective in the prevention of chronic diseases. It is beneficial in averting diabetes, although it is not recommended for individuals already diagnosed with the condition. Additionally, in mice and rats, intermittent fasting appears to reduce the chance of coronary heart disease. However, in humans, adopting habits such as skipping breakfast and consuming a large meal late at dinner increases the risk of dying from a heart attack by five times. It's worth noting that individuals engaging in these habits often have other detrimental practices like smoking, a sedentary lifestyle, high stress, and extended working hours. Intermittent fasting also shows promise in preventing certain malignancies, inflammatory bowel disease, non-alcoholic fatty liver disease, and

hypertension. The mechanism behind fasting's anti-inflammatory effects may be attributed to the production of fewer monocytes, which plays a crucial role in fostering a healthy and extended life among fasting individuals [23]. Contraindications of intermittent fasting are discussed in Table: 1 [24].

Table 1: Contraindications of IF

Contraindications of IF

Intermittent fasting (IF) is advantageous for preventing diabetes, but it is not recommended for individuals already diagnosed with diabetes or other metabolic disorders.

Elevated blood pressure or cardiovascular diseases may make people more susceptible to electrolyte imbalances.

Eating problems.

Anxiety and depression (calorie restriction only temporarily relieves depression).

Pregnancy, breastfeeding and the efforts of women to conceive.

Hypotension (IF lowers blood pressure).

Below a healthy weight.

Migraines that are not well managed.

IF: Intermittent fasting

5. EFFECT OF BINGE EATING (BE) ON BODY

5.1 BE on Psychological Health

Binge-eating, also known as "compulsive overeating," entails the rapid consumption of a substantial amount of food until one reaches an uncomfortable level of fullness. This eating disorder is characterized by persistent, uncontrollable, and impulsive eating, representing a widespread problem with negative psychological and social consequences globally. Binge-eating is more prevalent among women than men and can significantly diminish the overall quality of life while impairing social functioning. Following episodes of binge-eating, individuals often grapple with feelings of shame and self-loathing, frequently experiencing anxiety, depression, and a sense of isolation. Those affected by binge-eating also face heightened risks of various anxiety disorders, including alcohol dependence, loneliness, social stress, and stress related to daily activities [25].

5.2 BE on Obesity

Binge Eating Disorder (BED) and obesity exhibit a close correlation. In the youth population, these two conditions have shared risk factors and consequences, impacting both physical and psychological aspects and necessitating specialized attention. More precisely, BED serves as a risk factor for obesity during childhood and adolescence, and conversely, being overweight or obese may elevate the risk of developing BED. This association is particularly evident in populations where individuals, on average, carry excess weight [26]. Studies concentrating on BED within particular medical problems, prospective studies investigating medical conditions in BED, and cross-sectional studies analyzing medical conditions in BED were found to be the three primary categories of medical comorbidity in Binge Eating Disorder (BED). Cross-sectional epidemiological data show a connection between BED and diseases including diabetes, hypertension, dyslipidemias, insomnia, and pain disorders that are associated with obesity. Furthermore, BED and these illnesses may be linked without reference to co-occurring mental problems or obesity. Based on prospective research, there might be a connection between BED and metabolic syndrome and type 2 diabetes. Furthermore, there is a correlation between BED, or binge eating disorder, and gastrointestinal symptoms and problems as well as asthma. It is associated with intracranial hypertension, polycystic ovary syndrome, pregnancy difficulties, and menstrual abnormalities in women [27].

5.3 BE on Diabetes

One known risk factor for the onset of Type 2 diabetes mellitus (T2DM) is BED. Nieto-Martínez et al. did a meta-analysis of cross-sectional studies and found that those with BED were more likely to develop type 2 diabetes than people without BED (OR = 3.7, 95% CI = 1.1, 12.1). Cohort studies, however, showed that the link was not significant (OR = 3.3, 95% CI = 0.9, 13.1). The care of people with type 2 diabetes is made more difficult when BED is present. This condition presents both physical and psychological difficulties, which emphasizes the need of diagnosing and treating BED. The effect of binge eating on glycemic control is one significant issue, as it not only exacerbates the development of type 2 diabetes but also makes managing it more difficult. In this context, a seminal research looked at how a single day of a high-fat, high-calorie diet affected insulin sensitivity. In comparison to their baseline non-overeating levels, the total insulin sensitivity of 15 healthy people was shown to drop by 28% after a binge-eating session. According to this research, every binge eating episode may lower insulin sensitivity [28].

5.4 BE on Cardiovascular Health

While Bulimia Nervosa (BN) and Binge Eating Disorder (BED) are similar, BED sufferers do not engage in compensatory activities to prevent weight gain. Consequently, individuals with BED often fall into the overweight or obese category and face an increased risk of developing metabolic syndrome. Obesity is linked to various complications, particularly those impacting the cardiovascular system, including ischemic heart disease, hypertension, and congestive heart failure (CHF). Eating Disorders (EDs) are becoming a more prevalent source of morbidity among adolescents and young adults (AYAs), with cardiovascular complications playing a significant role in their overall medical burden. Adolescents, physiologically distinct from adults, exhibit unique responses to the stress induced by undernourishment resulting from EDs. Cardiovascular complications encompass structural and functional abnormalities in the heart, irregularities in heart rate and rhythm, hemodynamic changes, and abnormalities in peripheral vasculature [29].

5.5 BE on Blood Pressure

Elevated blood pressure is identified as one of the adverse health-related consequences associated with Loss of Control (LOC)-eating. Numerous cross-sectional studies have shown a connection between adult hypertension and binge eating. Notably, a study on young people (ages 12 to 18) discovered that those who reported having recently eaten large amounts of food had greater systolic blood pressure than those who did not partake in such activity, even after accounting for adiposity. The elevated blood pressure levels observed among youth with LOC-eating, though not clinically significant, may serve as an early indicator of potential future deterioration in heart health. Typically, Increases in blood pressure indices are more frequently seen in adults and are frequently indicative of comorbidities such as atherosclerosis, which is linked to the slow hardening of big arteries over time. Therefore, early identification of hypertension risk factors, such as elevated blood pressure, in younger populations holds clinical significance. While the findings are preliminary, the present study suggests a potential correlation between the Adolescent girls with elevated anxiety had a greater diastolic blood pressure and a frequency of consuming LOC [30].

6. BE AND MINDFUL EATING

Most research on binge eating included certain mindful eating techniques. Common mindfulness practices like body scans and breathing exercises, which were a component of a more comprehensive mindfulness curriculum like MB-EAT, MBSR, or mindfulness-based cognitive therapy, were frequently used in conjunction with these. Furthermore, there have been sporadic integrations of ACT (action-based cognitive therapy) with mindfulness. Notably, this research did not place as much emphasis on the knowledge of internal hunger cues. These findings suggest that mindful eating stands out as an essential strategy for treating binge eating [31].

7. FUTURE DIRECTIONS

Investigate the neurobiological underpinnings of mindful eating and intermittent fasting, exploring how these practices influence brain structures and neurotransmitter systems. Consider incorporating advanced neuroimaging techniques to study changes in brain activity and connectivity during mindful eating and fasting [32]. Evaluate the effectiveness of mindful eating interventions in clinical populations, such as individuals with eating disorders, obesity, or metabolic disorders. Explore the integration of mindfulness-based approaches into existing treatment modalities [33]. Explore the cultural and sociodemographic factors that may influence the adoption and effectiveness of mindful eating practices. Investigate the cultural variations in attitudes toward food, eating rituals, and mindfulness practices [34]. Investigate the consequences of sporadic fasting and

mindful eating on the composition and diversity of the gut microbiota. Explore how changes in the gut microbiota may contribute to the psycho-physiological outcomes of these dietary patterns [35].

8. CONCLUSION

In conclusion, this review underscores the psycho-physiological impacts of intermittent fasting (IF) and binge eating patterns on mental and physical well-being. IF demonstrates potential benefits, including improved mood, stress resilience, and metabolic health, while various methods cater to individual preferences. Conversely, binge eating poses risks to psychological and obesity-related health. Future research should delve into neurobiological aspects and cultural influences on Binge eating and fasting outcomes. The intricate interplay of these dietary patterns with neuropsychiatric conditions, weight management, diabetes, cardiovascular health, and blood pressure necessitates further exploration for a holistic understanding of their implications on overall health.

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