A REVIEW ON ASSOCIATION BETWEEN CHRONONUTRITION PRACTICES AND PSYCHOLOGICA DISTRESS IN YOUNG ADULTS

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ABSTRACT

Chrononutrition, an emerging field linking meal timing with circadian biology, has gained increasing attention for its potential influence on mental health. Young adulthood is critical life stage characterized by irregular eating schedules, academic and occupational stress and heightened vulnerability to psychological distress. This narrative review synthesizes current evidence on the association between chrononutrition practices such as meal timing, breakfast consumption, night time eating, eating window duration and chronotype alignment and stress, anxiety and depressive symptoms among young adults. Psychological outcomes of interest include stress, anxiety, depressive symptoms and overall emotional well-being. Existing literature suggest that misaligned eating patterns including late night eating, breakfast skipping and prolonged eating windows may disrupt circadian rhythms and contribute to

psychological distress through neuroendocrine, metabolic and sleep related pathways. These disturbances collectively contribute to increased psychological distress. Although evidence is growing, findings remain heterogeneous due to methodological limitations and variation in assessment tools. This review highlights key chrononutrition behaviors linked to mental health outcome and identifies gaps for future research, emphasizing the need for further studies in young adult populations. Understanding chrononutrition offers a promising low

cost strategy for improving mental health outcomes in young adults through life style modification.

Key words: Chrononutrition, Meal timing, Circadian rhythm, young adults

INTRODUCTION

Nutrition plays a fundamental role in maintaining human health, traditionally emphasizing macronutrient balance, caloric intake and macronutrient sufficiency. However recent advances in circadian biology have shifted this toward a more integrative approach that include the timing and regularity of food intake[1]. This emerging concept known as chrononutrition, recognizes that metabolic processes are tightly regulated by the body's internal biological clock. The circadian system is governed by a central pacemaker located in the suprachiasmatic nucleus of the hypothalamus, which synchronizes peripheral clocks present in various organs such as liver, pancreas and adipose tissue[2]. These clock regulate essential physiological processes, including glucose metabolism, hormone secretion, appetite regulation and sleep wake cycles. Disruptions in circadian rhythms often caused by irregular eating habits, shift work, exposure to artificial light and erratic sleep schedules can lead to metabolic dysregulation and increased susceptibility to chronic diseases[3]. Importantly growing evidence suggest that such disruptions also have profound effects on mental health. Psychological conditions such as anxiety and depression are increased linked to circadian misalignment[4]. Young adults are particularly at risk due to lifestyle factors such as academic pressure, social engagements, increased screen time, and irregular daily routines[4,5]. These factors contribute to inconsistent meal timing, frequent skipping of breakfast and late night eating behaviors which may exacerbate psychological distress[6]. Eating behaviour influences human health through more than one dietary content alone, it also depend through time dependent biological regulation[7]. Recent scientific attention has shifted toward understanding how the scheduling and regularity of food intake interact with internal circadian system to shape both physiological and metabolic outcome[8, 9]. This perspective challenges conventional nutritional models that primarily emphasize calorie quantity and nutrition composition, suggesting instead that temporal eating patterns play an equally important role in disease development and prevention[10]. Human circadian rhythms coordinate key physiological functions such as glucose regulation, hormone secretion, sleep patterns and energy utilization. When food intake occurs in alignment with this rhythms, metabolic processes tend to function efficiently[11]. In contrast prolonged eating periods, irregular meal timing and late night food consumption can disturb circadian signaling, leading to impaired metabolic responses. Beyond metabolic consequences altered eating habits has growing relevance for mental health[12]. Evidence suggest that inconsistent or late night eating patterns can negatively affect sleep quality, stress regulation and emotional stability[13]. These factors are closely linked to psychological conditions such as anxiety, depressive symptoms and mood fluctuations. Despite this connection, most mental health nutrition research has historically focused on dietary quality rather than the timing of intake, leaving an important gap in understanding how circadian misalignment contributes to psychological vulnerability[14, 15]. Chrononutrition based interventions offer a practical approach to restoring biological synchrony. Strategies such as intermittent fasting and time restricted feeding emphasize structured eating windows and extended fasting periods, often without requiring intentional calorie reduction[16]. These approach have demonstrated beneficial effect on metabolic regulation including improved insulin sensitivity, reduced fat storage and protection against metabolic disease progression[17]. By stabilizing circadian rhythm such interventions may also support mental well being through improved architecture and stress adaptation.

CHRONONUTRITION: CONCEPT AND KEY COMPONENTS

Chrononutrition integrates principles of circadian biology with nutritional sciences emphasizing temporal eating behaviors[18]. Core components include timing of meals, regularity of eating patterns, duration of daily eating windows, alignment with chronotype and consistency between feeding and sleep wake cycles[19]. Disruption of these patterns- commonly referred to as chronodisruption can impair hormonal rhythms, metabolic homeostasis and neural pathways involved in emotional regulation[20].

1. Meal Timing

The timing of meals influences metabolic efficiency. Morning consumption align with peal insulin sensitivity, where as late night eating is associated with impaired glucose metabolism[21].

2. Meal Regularity

Consistent meal timing supports circadian synchronization. Irregular eating patterns can disrupt hormonal rhythms including cortisol and melatonin secretion[20, 21].

3. Eating Window Duration

The daily duration of food intake significantly impacts metabolic and circadian health. Time restricted eating promotes alignment with biological rhythms[22].

4. Chronotype Alignment

Chronotype refers to an individuals natural preference for activity timing. Misalignment between eating patterns and chronotype can negatively affect health outcomes[23, 22].

5. Fasting Periods

Adequate fasting periods allow metabolic recovery and cellular repair mechanisms such as autophagy[24].

CHRONONUTRITION PRACTICES COMMONLY OBSERVED IN YOUNG ADULTS

Young adults frequently exhibit behaviors that disrupt circadian alignment:

1. Skipping breakfast due to late waking or time constraints

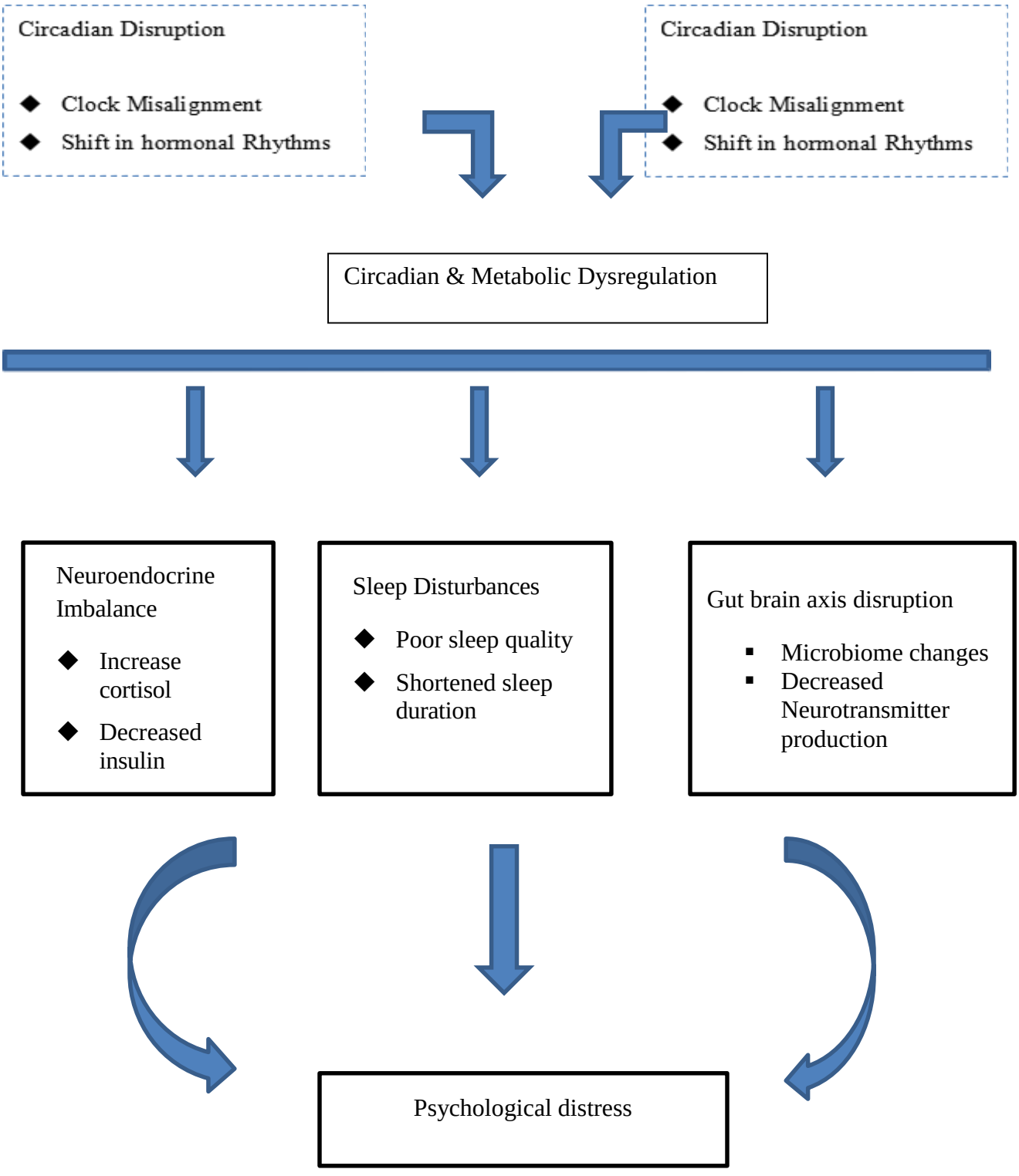
2. Consuming late night meals

3. Irregular meal timing due to academic schedules

4. n Extended eating windows exceeding 14-16 hours[25].

Academic demands, shift work, social activities and screen exposure contribute delayed eating schedules. These behaviors often coexist with inadequate sleep and poor diet quality, creating a cumulative burden on circadian alignment[26].

PATHOPHYSIOLOGY



BIOLOGICAL PATHWAYS LINKING CHRONONUTRITION AND MENTAL HEALTH

1. Circadian Rhythm Disruption

Irregular meal timing can desynchronize peripheral clocks from the central circadian pacemaker, leading to altered cortisol rhythms and impaired stress responses. Chronic circadian misalignment has been associated with emotional instability and depressive symptoms[27].

2. Neuroendocrine and metabolic mechaism

Late eating and prolonged feeding windows may impair glucose regulation and increase inflammatory markers, both of which have been implicated in anxiety and depression. Dysregulated insulin and leptin signaling may further influence mood and appetite control[28].

3. Sleep-Eating interactions

Chrononutrition and sleep are closely interconnected. Late night eating is associated with reduced sleep quality and shorter sleep duration, which are independent risk factors for psychological distress[29]. The bidirectional relationship between sleep disruption and emotional dysregulation amplifies mental health vulnerability[30].

4. Gut Brain Axis

Emerging evidence suggest that meal timing influence gut microbia which plays a role in neurotransmitter production and mental health[31].

ASSOCIATION BETWEEN SPECIFIC CHRONONUTRITION PRACTICES AND PSYCHOLOGICAL OUTCOMES

Breakfast Skipping

Consistent evidence suggest that breakfast skipping is associated with higher perceived stress, depressive symptoms and poorer emotional well being. Regular morning eating may support cortisol rhythm stabilization and improved cognitive function[32].

Late Night Eating

Night time energy intake has been linked to increased anxiety and depressive symptoms, possibly due to circadian misalignment and impaired sleep[33]. Young adults engaging in frequent late night eating may experience heightened emotional reactivity and stress[34].

Eating Window Duration

Extended daily eating windows, particularly those exceeding 14-16 hours are associated with poorer mood profiles. Time restricted eating aligned with daylight hours may offer protective effects, although evidence in young adults remain limited[35].

Chronotype Mismatch

Evening chronotype often displays irregular eating schedules and greater psychological distress compared to morning types. Misalignment between chronotype and social schedules may exacerbate stress and mood disturbances[36].

METHODOLOGICAL LIMITATIONS IN EXISTING LITERATURE

Despite the growing body of evidence exploring the relationship between chrononutrition and psychological distress several methodological limitations restrict the strength, consistency and generalizibility of current findings[37].Current studies are predominantly cross sectional limiting causal inference. Many studies assess dietary timing and psychological outcomes at a single point in time which make it difficult to determine the direction of causality[38].
Variability in chrononutrition assessment tools and mental health scales contribute to inconsistent findings. Concepts such as late night eating, irregular meals and eating window duration are defined inconsistently leading to variability in findings[39]. Additionally different studies employ diverse psychological assessment scales making it difficult to synthesize results. There is a limited number of longitudinal and Interventional studies. Randomized controlled trials examining the effect of chrononutrition interventions such as time restricted eating or structured meal timing on psychological outcomes are scarce[40]. Many studies rely on self reported dietary timing, which may introduce recall bias. Further more young adult are often underrepresented in intervention based research[41]. The short duration of follow up periods in many studies further limit the abilty to observe long term effects. Technological limitations in dietary tracking have historically hindered precise measurement of eating patterns[42].

IMPLICATIONS FOR RESEARCH AND PRACTICE

Understanding chrononutrition mental health associations offers opportunities for low cost, behaviour based interventions[43]. Integrating meal timing education into mental health promotion programs may improve psychological well being among young adults[44, 45]. Promoting time restricted eating aligned with circadian rhythms, developing standardized tools for chrononutrition assessment, conducting randomized controlled trial in young adults and integrating chrononutrition into clinical guidelines[46, 47].

CONCLUSION

Emerging evidence indicates that chrononutrition practice play a meaningful role in psychological health among young adults. Irregular meal timing, late night eating , breakfast skipping and chronotype misalignment appear to be associated with increased stress, anxiety and depressive symptoms[48]. While

findings are promising stronger evidence is needed to establish causality and inform clinical recommendations. Aligning eating behaviors with circadian rhythms may represent a novel and practical approach to improving mental well being in this vulnerable population[49].

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