Social Rhythm in Psychiatry

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Abstract:

This paper looks at Social rhythm from a psychiatric and mental health viewpoint. Like biological rhythm, social rhythm also plays an important role in the functioning of an individual. Social and biological rhythms interact with each other. We, examine how social rhythms have an impact on the mental health of an individual and how disruption in this rhythm could sometimes lead to mental disorders. The occurrence of mental disorder could also lead to disruption in social rhythm, which otherwise was stable before the onset of disorder. Social rhythm is also a good predictor of the course and prognosis of a psychiatric disorder.

I. INTRODUCTION

Human beings are influenced by two principal types of rhythms, such as social and biological. Social rhythms can be defined as those rhythms that are dependent on the requirements of normal life (working, interaction, bed time, leisure time relationship etc.) and are strongly influenced by the individual's overall social environment (culture, education, environmental conditions, stress levels etc.). Whereas the biological rhythms are internal, physical rhythms that govern physiological functions (Reinberg et al., 1994). Some interdependence can be noticed between social and biological rhythms manifested by the individual's exhibited physical activity levels. Biological rhythms are also influenced by society, culture and sometimes climate. Social rhythms are habitual behaviours, such as social interactions, physical activities, and sleep/wake times that occur in 24 hour cycles (Ehlers et al., 1988). Studies on the rhythms of daily life ascertain the inseparable as well as mutually influential relationship between social and biological rhythms (Hagiwara et al., 2002). Social rhythm has been found to be an important marker of psychological well-being as well as optimal functioning of all faculties of human psyche. In the environment many social organization and social processes factors do have substantial interactions with mental and behavioural disorders at macro- and micro-levels. It is to be noted that one set of factors appears to be causal pathways affecting the population prevalence of mental illness generally or specifically and another set of factors appears as maintenance or perpetuating factors; these factors tend to affect the duration and course of the disorders. Relevant macro-features of social organization and processes mainly have to do with exclusion from access to resources of one kind or another, such as education, employment, goods, social status and access to treatment, and they are realized in social communities, families and individuals, interacting there with micro-level risk and protective factors of many kinds (Bolton, 2010).

II. THEORIES & HYPOTHESES EXPLAINING SOCIAL RHYTHM IN RELATION TO PSYCHIATRY & MENTAL HEALTH

A. Zeitgeber Theory:

The term "zeitgeber,"was first used by Jürgen Aschoff, one of the founders of the field of chronobiology. The word Zeitgeber means "time-giver," which is used to describe environmental, or external, time cues that entrain human circadian rhythms. Social zeitgebers are usually derived from social contact with other individuals, but solitary activities can also be social zeitgebers for the circadian clock. For example, many activities may occur alone or with others, such as, commuting to work, having meals, bedtimes, and watching television (Monk et al., 1991). Ehlers et al (1993) tried to modify the social zeitgeber theory by including physical zeitgebers in addition to social zeitgebers. For example, light is a physical zeitgeber (or "zeitstörer") that can entrain and regulate the circadian rhythms of hormonal, metabolic, and physical activity, which has also been shown to have clinical implications for mood disorders (Wever, 1979). This theory exerts that disruptions in social rhythms influence somatic symptoms (e.g., sleep propensity) in vulnerable individuals and that disruption leads to major psychiatric problem. This theory states that depressed individuals have irregular biological rhythms, such as sleep–wake cycles, temperature, melatonin, and cortisol rhythms (Howland & Thase, 1999). Social zeitgeber theory can also be applied to explain (hypo) manic episodes of individuals with bipolar disorder (Frank et al., 2005; Malkoff-Schwartz et al., 2000, 1998). Grandin et al (2006) did a systemic review of studies suggesting that life events (external triggers) may trigger circadian rhythm disruptions and, consequently, affective episodes in vulnerable individuals as well as studies suggesting these circadian rhythm disruptions are due to a stable, trait-like, dysfunction in vulnerable individuals. Grandin et al (2006) also suggested that this stable dysfunction may be a biological abnormality in unipolar and bipolar individuals' pacemakers. For reasons of parsimony, these authors termed this theory the "internal trigger" theory, referring to an abnormality within the body, such as a genetic mutation. The "internal trigger" hypothesis is contrasted with the social zeitgeber theory, an "external trigger" hypothesis.

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B. Biological Rhythms:

A biological process of the human body that repeats itself approximately every 24 h is considered to have a daily rhythm. Such rhythms are defined as "circadian" if they persist with the same period in the absence of external time cues, or are endogenously driven (Refinetti & Menaker, 1992). Circadian rhythms are described quantitatively as having a "mean," or the level at which the oscillation takes place, a "period," or the time to complete one cycle, an "amplitude," or the distance between the mean and peak of the cycle's oscillation, and an "acrophase" or time of the peak of the circadian rhythm's phase (Minors & Waterhouse, 1985). The suprachiasmatic nucleus (SCN), or internal pacemaker, in the anterior hypothalamus of the brain is suspected of regulating human biological rhythms. The SCN can function autonomously, without the need for external zeitgebers ("free running state"), but it can also be entrained by zeitgebers ("entrained state") (Cermakian & Boivin, 2003;Wever, 1979). For example, the core of the SCN receives photic input from the retina, which triggers a response initiated by various genes and chromatin remodelling within the SCN neurons. The SCN also receives non-photic input from different parts of the brain (Cermakian&Boivin, 2003). The tightly packed neurons in the SCN are believed to integrate these photic and non-photiczeitgebers and then produce an output signal that regulates the circadian rhythms in the body.

C. Vulnerability-Stress-Diathesis Model:

The diathesis-stress model attempts to explain the behaviour as a pre-dispositional vulnerability together with stress from life experiences. The term diathesis came from the Greek term for disposition, or vulnerability, and it can take the form of genetic, psychological, biological, or situational factors (Ingram &Luxtan, 2005). The diathesis, or predisposition, interacts with the subsequent stress response of an individual. Stress refers to a life event or series of events that disrupt a person's psychological equilibrium and potentially serves as a catalyst to the development of a disorder (Oatley et al., 2006).Thus, the diathesis-stress model serves to explore how biological or genetic traits *(diatheses)* interact with environmental influences *(stressors)* to produce disorders, such as depression, anxiety, or schizophrenia. The diathesis-stress model asserts that if the combination of the predisposition and the stress exceeds a threshold, the person will develop a disorder (Lazarus, 1993).In stress literatures 'stress' is conceptualized as the occurrence of "externally" ordained processes but there are two sets of factors which do play an important role in stimulating "internal (individualized)" forces in amplification or moderation of the impact of the stress. Firstly, although some stressful events may be appeared as stress inducing for most of the people but some other events are the results of individuals' own actions (Depue & Monroe, 1986; Hammen, 1991;Monroe & Simons, 1991; Rutter, 1986). This phenomenon can be explained through an example: "A person with significant social skills deficits may develop very strained relationships with his acquaintances, coworkers, and romantic partners that result in the generation of significant stress to him". Vulnerable individuals, or those in a deranged mental state, may therefore play a role in creating their own stresses (Ingram et al., 1998). Another very important factor happens to be the individual quality and skill of apprising or perceiving an event. This angle states that stress is not free from the influence of the individual's appraisals of events. Even though there are a number of events that are ubiquitously appraised as stressful (e.g., the death of a loved one), even in these cases individual differences may determine the degree of stress that is perceived and experienced. In many other cases, events that are perceived as stressful by some individuals may not be regarded as stressful, or minimally stressful, by other individuals. In reality multiple factors can play a role in proliferation or moderation of the reaction and response to stress.

D. Exposure to Stressful Life-Events:

The diathesis stress model proposed that exposure to stressful life-events plays a role in the development of major psychiatric disorder. Post & Weiss (1995) suggested that stress is a spark that starts the process of developing a bipolar episode of mania and depression. According to the social rhythm model, stressful life events interrupt regular exposure to social rhythms; this interruption leads to instability in biological rhythms and disrupted sleep in vulnerable individuals. Research findings support for this model by showing that stressful life events that disrupt social rhythms are associated with sleep disruption in depressed individuals but not normal controls (*Psychological Medicine*, 2006). Childhood trauma / abuse are associated with an increased risk for developing bipolar disorder. Goldberg & Garno (2005) found that 51% patients with bipolar disorder had a history of severe childhood maltreatment. As per Dohrenwend and Dohrenwend (1981) stressful life events are "those that are proximate to, rather than remote from, the onset of the disorder."According to Ezquiaga et al (1987) life events are: "circumstances punctually situated in time that induce stress and require the individual to use adaptation mechanisms "and chronic stress as "adverse circumstances that act uninterruptedly over a prolonged time." Thus, life events entail a change or readjustment by an individual. Stress has long been recognized as an important contributor to the development and course of psychopathology. Exposure to very severe negative events could precipitate psychological disorders even without reference to individual psychological or biological characteristics. According to Hans Selye (1963) stressful events induce marked strain on the person's adaptive capability that in turn causes an interruption of the person's routine or habitual functioning. Selye (1963) stated that stress causes great interference to the system's physiological and psychological homeostasis.

E. Personality Factors, Coping, Socio-cultural Events & Psychological Fall-outs:

Disruption to body rhythms and social rhythms has separate effects on individual. Disturbed circadian

rhythms lead to poor sleep, increased susceptibility to illness and internal desynchronized all of which lead to disease. Disruptions of social rhythms result in the adaptation of new behaviour (alcohol intake, smoking) in response to the interference with social life and stress. Cobb (1974), Brown & Harris (1978) pioneered the idea that one's environment may influence the impact of a stressful event on an affective episode. Specifically, these investigators highlighted the need to understand an individual's current life situation, the nature of social supports available to the person, personal characteristics, and the attitudes of peers when examining the impact of a life event. In support of such a contextual model, some studies suggested that social support, personality, and other psychosocial variables may act as third variables in the relationship of life stress and affective disorders (Leskelä et al., 2004; Paykel, 2001).

F. Dynamic Interplay of Evolutionary, Social & Personal Factors:

The evolutionary theoretical approach states that some factors which are perennially present in the environment are independent of social evaluations or interpretations and these factors in fact are the part of independent evolutionary process. The factors pertaining to the basic evolutionary process tend to remain unaffected by the socially embedded evaluative process. This appeal to facts of the matter independent of social evaluations is just what makes this approach a form of naturalism, intended in this case not so much as an alternative to a social construction of health and disease but at least as a crucial, principled limitation to it, based in an actual fact of the matter concerning what is and what is not functioning as designed (selected for) in evolution. As per this evolutionary approach human functions and dysfunctions are deeply embedded in the evolutionary natural selection process and functions and dysfunctions are in built in that process. But this evolutionary process does not have much relevance to biological systems such as the cardiovascular system, which supposed to be designed, selected for, in evolution, without input from culture or individuals. However, in the case of mental life and behaviour this is not so relevant. Here it is very difficult to assert that who or what is responsible for design and function? But simultaneously following three issues play very important roles in the context of mental and behavioural disorders:

- *Evolutionary natural selection*
- *Socialization processes (education, training, culturalization)*
- *Individual choice (signalled by individual differences, notwithstanding 1 and 2).*

The first of these issues have temporal relationship naturalism (and it is in the purview of the 'natural sciences'), the second issue can best be understood by the principles of social sciences and the third is emphasized by psychology. The relationship quotient among these three factors in human behaviour and psyche is indeed very spiral and ambiguous. The point of naturalism, however, is to construe mental and behavioural mechanisms only in the first way, excluding the second, and then the third will not appear as very relevant, since the main point is to distinguish the first from the second (Bolton, 2010). Evolutionary theorist, Wakefield (1992, 1995, and 1999) tried to explain 'dysfunction' in relation to mental health. As per Wakefield (1992, 1995, 1999) dysfunction is the unfulfilled function or more precisely the failure of some mechanism in the organism to perform desired function. A disorder is different from a failure to function in a socially preferred manner precisely because a dysfunction exists only when an organ cannot perform as it is naturally (i.e., independently of human intentions) supposed to perform. But human social behaviours are highly evolved in nature and that drawing the demarcation between these behaviours as per social or natural environments is a difficult task. Psychological and behavioural issues are not so straightforward like their biological counterparts in relation to their basic properties and functions. These issuesare realized in a concrete social environment, and if the mechanism is failing, so is the concrete social norm. Conversely, if no social norm is being broken, the mechanism is not broken either(Bolton, 2010).The origin and design of psychological as well as behavioral functioning should ideally be an amalgamation of genetic, evolved factors, social factors and very specific individualized factors or individual differences. Depending on which is dominant, or which is thought to be dominant, attributions about the origin and design of the behavior can be made on to human nature, society, subculture, family (to family genes or behavior or both) or to the individual's constitution, character or personal values. In brief, according to current behavioral science in an evolutionary/genetic framework, three kinds of factor are implicated in the design of human behavior – evolutionary/genetic, environmental, including the cultural, and individual – and these three kinds of factor interacting complex ways. To each kind of design there corresponds a type of norm: evolutionary/genetic, social and individual – again with no clear divisions and interplay between them (Bolton, 2010).

III. SOCIAL RHYTHMS IN DIFFERENT PSYCHIATRIC DISORDERS

A. Social & Biological Rhythms & Schizophrenia:

Schizophrenia is characterized by positive symptoms, such as delusions and hallucinations, together with negative symptoms, mainly lack of motivation and interest, flattened affect and social withdrawal (Monti et al., 2013).Patients with schizophrenia frequently complain of poor sleep and are commonly observed to shift their rest-activity cycle. Despite the introduction of newer antipsychotic drugs, sleep-wake abnormalities remain a major complaint of the schizophrenia patients. Cognitive impairment is a cardinal sign of schizophrenia – even patients with apparently intact neuropsychological function are likely to have declined from a higher pre-morbid level. The cognitive ability is dependent on few things like 'time of day', 'adaptability to the day–night cycle' and 'sleep and wake cycles'. However, this periodicity does not automatically follow environmental

or sleep–wake changes. Instead, it is driven by an endogenous circadian clock that oscillates with a period of approximately 24 h (about 1 =*circa diem*) and which is still evident when individuals are isolated from external periodic signals, or 'zeitgebers', such as light, mealtimes or social activities associated with the time of day. Under such 'free-running' conditions, all circadian rhythms continue to oscillate, albeit with a tendency to drift away from the 24-hour period. There are some definite links between impairments in neuropsychological and cognitive function and disrupted circadian rhythms in schizophrenia. Schizophrenia patients with markedly impaired sleep–wake activity do not have the privilege to strong *zeitgebers* because these people have already developed signs of social withdrawal or lack of daytime structure. Another neuropsychological explanation is people with schizophrenia may have intrinsically unstable circadian oscillators. They may have impaired circadian synchronisation between cellular networks of local brain areas participating in sleep–wake regulation and cognition (Wulff & Joyce, 2011). In schizophrenia social skills are grossly affected and social skills make a person better able to adapt to the social rhythms of the environment. Patients with schizophrenia are often disabled in this adaptation. Thus, structuring activities throughout the day has long been known as part of psychosocial treatments (Haug et al., 2000). As schizophrenia affects almost all aspects of human life so it does not spare subtle social perceptual skills like perceiving social intents of people through vocal intonation of prosody. Perceiving social intent via vocal intonation (prosody) is profoundly impaired in schizophrenia. In schizophrenia dysprosodia (disorder of prosody) arises in part from impaired pitch perception that upward generalizes into more complex prosodic processing impairment. Individuals with Amusia (tone-deafness) are profoundly insensitive to pitch change. Like schizophrenia, amusia individuals also have prosody deficits. Amusia sensitivity to aperiodicity (rhythm) in tonal sequences is significantly reduced when these sequences contain tone-pitch changes, but otherwise, these individuals perceive rhythm normally in monotonic sequences. Amusia researchers have therefore suggested that perceptual impairment originates at a secondary processing stage where pitch and time aspects of audio-speech signals are yoked.

B. Social & Biological Rhythms & affective/mood disorders:

While genetic and biologic factors are known to play a major role in the aetiology of bipolar disorder, psychosocial factors are also getting paramount importance form various corners in understanding as well as explaining the timing, type, and outcome of bipolar episodes. Stressful life events have been identified to have an association with the onset of bipolar episode. In addition to the severity or psychological threat associated with life events, it has been suggested that the degree of disruption in social routines associated with an event, even an event representing little psychological threat, may play an important role in the onset of affective episodes. Interest in such "social rhythm disruption (SRD) events" comes from the hypothesis that disturbances in social rhythms or routines may promote disruptions in circadian rhythms, which in turn promote onset of affective episodes in vulnerable persons. This theory derives from the observations that social routines, such as timing of sleeping, eating, and exercise, help to entrain circadian rhythms and that disruptions in circadian rhythms have been implicated in the pathogenesis of both depression and mania (Malkoff-Schwartz et al., 1998).The social zeitgeber theory envisages a potential pathway by which life stress may influence mood. Flaherty et al (1987) found that social rhythm disruptions were associated with the loss of a spouse (a severe negative, social rhythm disruption event), as well as with an increase in depressive symptomatology. In accordance with the social zeitgeber theory, there is some evidence that life events are associated with social rhythm disruptions which, in turn, may trigger affective symptoms (Malkoff-Schwartz et al., 2000, 1998). For example, life events that disrupt individuals' social rhythms are significantly associated with onsets of manic episodes (Malkoff-Schwartz et al., 2000, 1998).

C. Social & Biological Rhythms & anxiety disorders:

Researchers have found strong correlation between the occurrence of negative life events and affective disorders. Researchers have proposed that life events cause disruption of social rhythmicity of vulnerable people and this in turn leads to disturbance in the sense of well being and to disruption of physiologic rhythmicity known to be associated with onset of the episodes of affective disorders. According to Shear et al (1994) like affective disorder low rhythmicity of daily activities might also be characteristic of anxiety disorder patients. Shear et al (1994) studied implication of social rhythmic disturbances of forty-eight patients who met DSM III-R criteria for an anxiety disorder. They analyzed social rhythmicity according to a previously developed algorithm. They noted that anxiety disorder patients report significantly lower regularity of daily activities than normal controls. The low social rhythmicity scores were not accounted for by the presence of comorbid affective disorder. In case of Obsessive compulsive disorder some individuals do develop autistic-like traits, including marked deficits in social and communication behaviors (pragmatics). Bejerot et al (2001) observed that OCD patients with marked autistic were less likely to be married or cohabiting, lower socializing ability and social assertiveness, global functioning, and had greater prevalences of paranoid, schizoid, avoidant, and dependent personality disorders. Pragmatic competence is understood as the ability to use the both linguistic (verbal) and extra-linguistic (non-verbal) communication which are relevant to the context. The relatives in the families with pragmatic deficits had greater lifetime prevalence of OCD and Asperger's disorder. Moreover, they had greater prevalence of separation anxiety disorder, generalized anxiety disorder, tic disorders, body dysmorphic disorder, and pathological nail biting. In addition, these relatives had a greater prevalence of obsessive–compulsive and paranoid personality

disorders and greater number of schizotypal personality disorder traits. These findings provide evidence of aggregation in these families of OCD and Asperger's disorder, and the possible spectrum of psychopathology associated with pragmatic deficits (Samuels et al., 2014).

D. Social & Biological Rhythms & personality disorders:

People with personality disorder suffer high level of distress, self –harm, addiction, family break down and social exclusion. Where, cluster A personality disorder (Paranoid, Schizoid, Schizotypal) have key characteristics of distrust, suspiciousness, socially and emotionally detached, odd belief, socially anxious. Cluster B personality disorder (Antisocial, Borderline, histrionic, Narcissistic) disregards the rights of other, unstable mood and relationship and excessively emotional, attention seeking, grandiose, lackapathy, needs admiration. Cluster C personality disorder (Avoidant, Dependent, Obsessive Compulsive) are socially inhibited, feels inadequate, over sensitive, clinging, submissive, perfectionist, inflexible. Somehow these characteristics plays important role in disturbing the social rhythm of their life. Certain personality types may recruit more adversity into their daily lives than do others. Although this is unarguably true of 'sociopathic' individuals, there is now the suggestion that person high on the personality traits of neuroticism may also experience more adversity (Kiff, 1981; Henderson, 2002).

IV. CONCLUSION

Optimal social rhythm depends on appropriate possession of social and group living skills, adequate presence of other important psychological mechanisms and balanced latent biological rhythms. Social factors have myriad roles in the onset, maintenance as well as outcome of mental disorders. At the same time occurrences of mental disorders in people can also influence the immediate social structure and components significantly. Many mental health researchers do express a view that severe mental disorders are genetic brain disease and the onset of these disorders are related to a neuro-developmental process. Social factors are thought to have mere triggering roles and these factors only speedup the onset of a largely biologically determined disease. Once disorder is established, it is generally conceded that social environments and experiences, particularly interpersonal family relationships, have a role in course and outcome. However, their role in aetiology, beyond that of precipitants, remains contested and debated by many people.

V. REFRENCES

- Bolton, D. (2010). Social, biological and personal constructions of mental illness. In: C. Morgan & D. Bhugra (Eds.), Principles of Social Psychiatry, 2nd edition, John Wiley & Sons, Ltd.
- Bolton, D. (2010). Social, biological and personal constructions of mental illness. In: C. Morgan & D. Bhugra (Eds.), Principles of Social Psychiatry, 2ndedition,John Wiley & Sons, Ltd.
- Brown, G.W., & Harris, T.O. (1978). Social origins of depression. London: Free Press.
- Cermakian, N., &Boivin, B. (2003). A molecular perspective of human circadian rhythm disorders. *Brain Research Reviews*,42, 204- 220.
- Cobb, S. (1974). A model for life events and their consequences. In B.S. Dohrenwend, & B.P. Dohrenwend (Eds.), Stressful life events: Their nature and effects. New York: John Wiley & Sons.
- Depue, R.A., & Monroe, S.M. (1986). Conceptualization and measurement of human disorder and life stress research: The problem of chronic disturbance. *Psychological Bulletin, 99*, 36–51.
- Dohrenwend, B.S., &Dohrenwend, B.P. (1981). Life stress and psychopathology. In: D.A. Regier, & G. Allen (Eds.), Risk factor research in the major mental disorders. DHHS Pub. No. (ADM) 81-1068. Washington D.C.: Supt. Of Docs, U.S. Govt. Print Off.
- Ehlers, C.L., Frank, E., & Kupfer, D.J. (1988). Social zeitgebers and biological rhythms. *Archives of General Psychiatry,* 45, 948- 952.
- Ezquiaga, E., Gutierrez, J., &López, A. (1987). Psychosocial factors and episode number in depression. *Journal of Affective Disorders,*12, 135- 138.
- Grandin, L.D., Alloy, L.B., & Abramson, L.Y. (2006). The social zeitgeber theory, circadian rhythms, and mood disorders: Review and evaluation. *Clinical Psychology Review,* 26, 679–694.
- Hagiwara, S., Bolige, A. Zhang, Y., Takahashi, M., Yamagishi, A. & Goto, K. (2002). Circadian gating of photoinduction of commitment to cell cycle transitions in relation to photoperiodic control of cell reproduction in Euglena. *Photochemicals and Photobiological Sciences,* 76, 105-115.
- Hammen, C. (1991). Generation of stress in the course of unipolar depression. *Journal of Abnormal Psychology, 100,* 555–561.
- Howland, R. H., &Thase, M. E. (1999). Affective disorders: Biological aspects. In T. Millon, P. H. Blaney, & R. D. Davis (Eds.), Oxford textbook of psychopathology (pp. 166- 202). London: Oxford University Press.
- Ingram, R.E., Miranda, J., & Segal, Z.V. (1998). *Cognitive vulnerability to depression.* New York: Guilford Press.
- Kiff, J.A. (1981). Stress, personality and illness. University of Edinburgh, UK.
- Leskelä, U.S., Melarin, T.K., Lestelä-Mielonen, P.S., Rytsälä, H.J., Sokero, T.P., Heikkinen, M.E., et al. (2004). Life events, social support, and onset of major depressive episode in Finnish patients. *The Journal of Nervous and Mental Disease*,192, 373- 381.
- Malkoff-Schwartz, S., Frank, E., Anderson, B., Sherrill, J.T., Siegel, L., Patterson, D., & Kupfer, D.J. (1998). Stressful life events and social rhythm disruption in the onset of manic and depressive bipolar episodes: A preliminary investigation. *Archives of General Psychiatry,55*(8), 702-707.

- Malkoff-Schwartz, S., Frank, E., Anderson, B.P, Hlastala, S.A., Luther, J.F., Sherril, J.T., et al. (2000). Social rhythm disruption and stressful life events in the onset of bipolar and unipolar episodes. *Psychological Medicine,* 30, 1005- 1016.
- Minors, D.S., & Waterhouse, J.M. (1985). Introduction to circadian rhythms. In S. Folkard, & T. H. Monk (Eds.), Hours of work: Temporal factors in work-scheduling (pp. 1- 14). New York, NY: John Wiley & Sons, Ltd.
- Monroe, S.M., & Simons, A.D. (1991). Diathesis-stress theories in the context of life-stress research: Implications for the depressive disorders. *Psychological Bulletin, 110,* 406–425.
- Monti, J.M., Bahammam, A.S., Pandi-Perumal, S.R., Bromundt, V., Warren Spence, D., Cardinali, D.P., & Brown, G.M. (2013). Sleep and circadian rhythm dysregulation in schizophrenia. *Progress in Neuro-Psychopharmacology and Biological Psychiatry,* 43, 209–216.
- Refinetti, R., & Menaker, M. (1992). The circadian rhythm of body temperature. *Physiology and Behaviour,*51, 613- 637.
- Reinberg, A., Bicakova-Rocher, A., Gorceix, A., Ashkenazi, I.E., & Smolensky, M.H. (1994). Placebo effect on the circadian rhythm period t of temperature and hand-grip rhythms: Inter-individual and gender-related differences. *Chronobiology International,* 11, 54–61.
- Samuels, J., Shugart, Y.Y., Wang, Y., Grados, M., Bienvenu OJ, et al. (2014). Clinical Correlates and Genetic Linkage of Social and Communication Difficulties in Families with Obsessive–Compulsive Disorder: Results From the OCD Collaborative Genetics Study. *American Journal Medical Genetics,* 165, 326–336.
- Selye, H. (1963). A syndrome produced by diverse noxious agents. *Nature, 138*, 32.
- Shear, M.K., Randall, J., Monk, T.H., Ritenour, A., Frank, X.T.E., Reynolds, C. & Kupfer, D.J. (1994), Social rhythm in anxiety disorder patients. *Anxiety,* 1, 90–95.
- Wakefield, J. (1995). Dysfunction as a value-free concept. *Philosophy, Psychiatry, and Psychology*,2,233–246.
- Wever, R.A. (1979). The circadian system of man: Results from experiments under temporal isolation. New York, NY: Springer Verlag.