Biological Rhythm Research
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/nbrr20

Relations between Social Rhythm, Sleep Phase and Minor Psychiatric Symptoms in Healthy Workers

Regina Schimitt [a c], Rosa Levandovski [a c] & Maria Paz L Hidalgo [a b c d]

[a] Laboratório de Cronobiologia do HCPA/UFRGS

[b] Departamento de Psiquiatria e Medicina Legal da Faculdade de Medicina da Universidade Federal do Rio Grande do Sul

[c] Programa de pós-graduação em Ciências Medicas: Psiquiatria - UFRGS

[d] Programa de pós-graduação em Medicina: Ciências Médicas - UFRGS

Available online: 21 May 2012

To cite this article: Regina Schimitt, Rosa Levandovski & Maria Paz L Hidalgo (2012): Relations between Social Rhythm, Sleep Phase and Minor Psychiatric Symptoms in Healthy Workers, Biological Rhythm Research, DOI:10.1080/09291016.2012.692256

To link to this article: http://dx.doi.org/10.1080/09291016.2012.692256

Relations between Social Rhythm, Sleep Phase and Minor Psychiatric Symptoms in Healthy Workers

Regina Schimitt[1,3], Rosa Levandovski[1,3], Maria Paz L Hidalgo[1,2,3,4,*]

1-Laboratório de Cronobiologia do HCPA/UFRGS

2- Departamento de Psiquiatria e Medicina Legal da Faculdade de Medicina da Universidade Federal do Rio Grande do Sul.

3- Programa de pós-graduação em Ciências Medicas: Psiquiatria - UFRGS

4-Programa de pós-graduação em Medicina: Ciências Médicas - UFRGS

*Corresponding Author:

Maria Paz Loayza Hidalgo

Laboratório de Cronobiologia do Hospital de Cínicas de Porto Alegre

Ramiro Barcelos, 2350 sala 12107

ZIP: 90035-003, Porto Alegre, RS, Brazil

e-mail: mpaz@cpovo.net

Received 24 Febr 2012
Accepted 26 April 2012

Abstract

Objectives: To determine the correlation of social rhythm, sleep phase, and exposure to light with in healthy workers exhibiting minor psychiatric symptoms. **Materials and Methods:** Cross-sectional study, 143 healthy workers. Minor psychiatric symptoms, evaluated by SRQ-20; social rhythm by the SRM Scale; exposure to light and sleep variables, by MCTQ; correlations, analyzed by Pearson's correlation coefficient, and multivariate regression analysis utilized. **Results:** Quantity of activities correlated with schooling and mean duration of sleep and, inversely, MSF and minor psychiatric symptoms; daily regularity correlated with age, minor psychiatric symptoms and number of days worked; minor psychiatric symptoms correlated inversely with quantity of activities and regularity. **Conclusions:** Social rhythm variables had an inverse correlation with minor psychiatric symptoms. Minor psychiatric symptoms were explained by low levels of activity rather than by low regularity of social rhythm. Age, number of days worked per week, and minor psychiatric symptoms interfere with the regularity of social rhythm.

Key words: Chronobiology; social rhythm; psychiatric symptoms; MCTQ; depression; social jetlag.

1. Introduction

Social *zeitgebers* are external stimuli capable of synchronizing the function of the internal mechanism responsible for circadian rhythms. Social rhythm mainly refers to the regularity of daily life, the routine imposed by the social compromises that organize the day and establish a pattern that is rhythmic. Social rhythm is the behavior resulting from the interaction with social *zeitgebers*. In general, social rhythms also exhibit a circadian pattern (Monk et al., 2004). Although social stimuli can be *zeitgebers*, it has been considered to be a weak one when compared to the light/ dark cycle (Roenneberg et al., 2003; 2007). Nevertheless, social stimuli contribute to the synchronization of biological rhythms such as the rhythm of body temperature, hormone levels, and sleep, and have been studied since the first investigations in chronobiology (Aschoff, 1971).

The role of social *zeitgebers* in disease processes has been mainly considered in the etiology of mood disturbances. There are two theoretical strands that link mood disturbances with alterations in biological rhythms. One of them is that of the internal trigger, which attempts to explain the alteration that is observed in biological rhythms through the hypothesis that there is a genetic abnormality in the circadian pacemaker (Grandin et al., 2006). The other is the theory of the external trigger, which proposes that stressing events in life induce changes in the social *zeitgebers*, where these changes cause disruption of the social rhythm, which subsequently leads to disturbances in biological rhythms (Brown & Harris, 1978; Ehlers et al., 1993; Frank et al., 1994; 2005). The consequences of this cascade are a series of somatic symptoms, including those meeting the criteria for certain mood disturbances.

Research has led to the junction of the two strands; that is, there are individuals who due to an abnormality of the circadian pacemaker become less responsive to the synchronizing action of social *zeitgebers*, or are more vulnerable to their disruption (Frank et al., 2000). There is evidence that bipolar patients who were treated by social rhythm therapy (whereby the premise is to strengthen social *zeitgebers)*, demonstrated a more rapid recovery from their crises and experienced a greater interval between them (Frank et al., 2000). Although social rhythm could interfere with the pattern of exposure to the photic zeitgeber (Milstlberger & Skene, 2004), the combined action of these two agents in the synchronization of biological rhythms is still weakly studied. Therefore, the objective of the present study is to analyze the correlation between social rhythm, sleep phase, and minor psychiatric symptoms in healthy workers.

2. Materials and Methods

The study protocol was approved by the ethics committee of the institute where the study was conducted. All participants gave informed signed consent.

The investigation was designed as cross-sectional study to be conducted in the city of Porto Alegre, located in the southernmost part of Brazil (30°05′ S, 51°10′ W). The data were collected by four research assistants, blinded to the objectives of the study, and who were previously trained in the application of instruments to standardize the process. The study was conducted over a period of three months in order to avoid greater variations in the duration of daytime and nighttime. The study was concluded before the beginning of summer, to avoid alterations in the biological rhythm of sleep, which could interfere with the results.

The participants were instructed about filling out each of the forms. During the period of data collection, the participants were contacted at least once by telephone in order to clarify any doubts and to control any bias of measurements on the Social Rhythm Scale.

2.1. Participants

The study involved 143 day shift, healthy workers from the Hospital das Clinicas de Porto Alegre, who were between the ages of 18 and 60 years old, and who completed at least a primary level of schooling. Excluded from this study were nightshift workers or those recently coming off this work regime, pregnant women, parents of children less than six months of age, person who had recently traveled to places with a different time zone, or those who had a score of less than 59 in the total score of activities on the Social Rhythm Scale.

2.2. Instruments

All instruments utilized in the present study were validated and adapted to the Brazilian population. The demographic information was collected from the standard anamnesis questionnaire, Life Habits and Demographic Characteristics utilized in the psychiatric outpatient service of Hospital de Clinicas (Hidalgo & Caumo, 2002) **.**

Minor psychiatric symptoms were assessed by the Brazilian version of *Self-Report Questionnaire*-20 (SRQ-20). This is a self-applied questionnaire with 20 questions with a yes or no option, created to identify indicators of depressive thoughts and somatic manifestations of anxiety. In the Brazilian population, the cutoff point for the presence of

minor psychiatric disturbances is a score of 6 points for women and 8 points for men (Mari & Willians, 1986).

Social rhythm was evaluated by the Scale of Social Rhythm, the Brazilian version of the *Social Rhythm Metric* (Schimitt & Hidalgo, 2009; 2010). This instrument is composed of 17 activities, 15 required and 2 optional, which record the daily frequency of activities performed, the time, and also the existence and degree of social interaction inherent in each activity. The scale was to be filled out by each participant at the end of each day during the specified period. If the time of occurrence of the activity did not vary by more than 45 min (more or less) for a minimum of three days, this activity was considered a "hit," which means that it contributed to the establishment of a regular routine. The score of regularity was obtained from the quantity of "hits" in the period evaluated. Another index provided by the scale is the quantity of activities obtained by simply counting the number of activities performed in the specified period.

Exposure to light and the variables related to sleep were assessed by the *Munich Chronotype Questionnaire* (MCTQ) (Roenneberg et al., 2003). Each question of MCTQ was analyzed as an independent variable. Social jetlag was determined by the difference in hours between the midpoint of sleep on free days and work days (Wittmann et al., 2006). The midpoint of sleep on free days, MSF, was evaluated by the local time.

2.3. Analyses

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, USA) 12.0 version (Rowland et al., 1991). The asymmetric variables were square-root transformed. The correlations were analyzed by Pearson's

correlation coefficient, and multivariate regression analysis was utilized to control for collinearity between variables and potential confounding effects.

3. Results:

The score of number of activities showed a significant correlation with schooling and mean duration of sleep; it showed an inverse correlation with MSF and minor psychiatric symptoms. This result was confirmed by multivariate regression with the same variables maintained in the model, which explained 20% of the variance (Table 1).

With respect to the regularity of activities, this variable was correlated with age, number of days worked per week, mean duration of sleep, and mean exposure to light, with an inverse correlation with MSF, minor psychiatric symptoms, and social *jetlag*. In multivariate regression, taking regularity as the dependent variable, only age, minor psychiatric symptoms, and number of days worked were maintained in the model, which showed R^2=35% (Table 2).

Minor psychiatric symptoms showed an inverse correlation between quantity of activities and regularity, a result that was maintained in multivariate regression in which the model explained 15% of variance (Table 3).

4. Discussion

In this study, psychiatric symptoms were inversely correlated with regularity, consistent with the model proposed by the social *zeitgeber* theory. The model showed that these variables interfere with regularity in 35% of those with mild psychiatric symptoms,

which is a reasonable percentage of variance. By controlling confounders and collinearity with the use of multivariate analysis, we observed that minor psychiatric symptoms were explained predominately by lower levels of activity than by low regularity of social rhythm. Chronobiological research has already investigated the role of social *zeitgebers* in the etiology of mood disturbances, but to the best of our knowledge, this is the first study to evaluate social rhythm, the variables of MCTQ, and their correlation with minor psychiatric disturbances.

Quantity and regularity are two independent variables of the Social Rhythm Scale, but together they provide information on the force of social zeitgebers. Based on this study, both factors were correlated with biological and environmental aspects. On a biological level, quantity is related to sleep pattern (duration and MSF), and on the environmental level, quantity of activity is related to schooling (resources, stimuli, input). However, it should be noted that regularity, from a biological standpoint, is related to aging; while from an environmental standpoint, it is related to organization of time by work. Both variables showed a significant inverse correlation with minor psychiatric symptomatology. The social zeitgeber theory asserts that the treatments that promote the regulation of social rhythms helps in the recovery of mood disturbances by strengthening social *zeitgebers*. The hypothesis to consider from the present study is that perhaps this occurs because the establishment of a routine obliges the subject to keep active, since the level of activity explained more significantly the psychiatric symptoms.

In this study, the positive correlation between regularity and mean duration of sleep and the inverse correlation between MSF and social jetlag, which are variables referring to sleep pattern, were upheld in multivariate analysis, which indicates that, at least for this

biological rhythm, there is no robust association with regularity. However, the quantity of activity is a variable that shows an association with the biological rhythm of sleep insofar as there are a positive correlation with the duration of sleep and an inverse negative correlation with MSF.

The association between regularity and exposure to light was not upheld. On analyzing just the activity of work of subjects, which accounts for the large exposure of light upon leaving home, the sample was separated into three groups by the number of days worked per week (5, 6 or 7 days). There were no evident differences between any of the three groups in relation to the quantity of exposure to light, although the group that worked 7 days per week showed higher scores of regularity. Therefore, the photic *zeitgeber* was not correlated with the social *zeitgeber*. A question raised by previous studies is whether this phenomenon occurs because social stimuli truly do interfere with biological rhythms, or if this association is due to the interference with the pattern of light exposure.

Another question investigated was if there was an association between depressive symptoms and sleep pattern. This study did not find any evidence of an association between sleep pattern and minor psychiatric symptomatology; only an inverse correlation between the variables of social rhythm, which were regularity and quantity of activities. It is possible that the association found between depressive symptoms and sleep pattern in previous studies was due to the fact that the confounding effects of social rhythm was not taken into consideration.

The results of this study are in accordance with the idea that social behavior is highly linked to the survival of many species and it proves to be especially important for humans, where individuals synchronize their biological time with social time to assure the

maintenance of this naturally occurring rhythmic pattern. This synchronization leads to the emergence of a circadian social rhythm for the species, whose force resides in such capacity.

References

1. Aschoff J, Fatranská M, Giedke H. (1971). Human Circadian Rhythms in Continuous Darkness: Entrainment by Social Cues. Science, 171, 213-215.
2. Brown G & Harris T. Social Origins of Depression. (1978). New York: The Free Press.
3. Ehlers CL, Kupfer DJ, Frank E, Monk TH. (1993). Biological Rhythms and Depression: The Role of Zeitgebers and Zeitstörers. Depression, Pittsburgh, 1, 285-293.
4. Frank E, Anderson B, Reynolds CF, Ritenour A, Kupfer DJ. (1994). Life Events and the Research Diagnostic Criteria Endogenous Subtype. Archives of General Psychiatry, Pittsburgh, 51, 519-525.
5. Frank E,Swartz HA,Kupfer *DJ.* (2000). Interpersonal and Social Rhythm Therapy: Managing the Chaos of Bipolar Disorder. *Biological psychiatry,* 48, 593-604.
6. Frank E. (2005).Treating Bipolar Disorder. New York: Guilford Press.
7. Grandin LD, Alloy LB, Abramson LY. (2006). The Social Zeitgeber Theory, Circadian Rhythms, and Mood Disorders: Review and Evaluation. Clinical Psychology Review, Philadelphia, 26, 679-94.
8. Hidalgo MP, Caumo W (2002). Sleep disturbances associated with minor psychiatric disorders in medical students. *Neurological Sciences,* 23(1), 35-9.
9. Mari, J.J.; Willians, P (1986). A validity study of a psychiatric screening questionnaire (SRQ 20) in primary care in the city of São Paulo. Br J Psychiatry, 148, 23-6.

10. Mistlberger RE, Skene DJ. (2004). Social influences on mammalian circadian rhythms: animal and human studies. Biol Rev., 79, 533-556.
11. Monk TH, Reynolds CF, Kupfer DJ, Hoch CC, Carrier J, Houck PR (1997). Differences over the life span in daily Life-Style Regularity. International Society for Chronobiology, 14(3): 295-306.
12. Monk TH, Buysse DJ, Potts JM, DeGrazia JM, Kupfer DJ. (2004). Morningness-eveningness and lifestyle regularity. Chronobiology International, 21 (3), 435-443.
13. Roenneberg T, Daan S, Merrow M. (2003). The art of entrainment. Journal of Biological Rhythms, 18, 183-194.
14. Roenneberg T, Wirz-Justice A, Merrow M. (2003). Life Between Cloks: Daily Temporal Patterns of Human Chronotypes. Journal of Biological Rhythms, 18 (1), 80-90.
15. Roenneberg T, Kumar CJ, Merrow M. (2007). The Human Circadian Clock Entrains to Sun Time. Current Biology, 17 (2), 44-45.
16. Roenneberg T, Kuehnle T, Juda M, Kantermann T, Allebrandt K, Gordijn M, Merrow M. (2007). Epidemiology of the Human Circadian Clock. Sleep Med Rev,11, 429-38.
17. Rowlan D, Akkelin D, Crisler L. (1991). Computer-based data analysis using SPSS X in the social and behavioral sciences. Chicago: Nelson Hall Publishers.
18. Schimitt R, Hidalgo MP (2009). Tradução e validação de conteúdo da versão em português da Social Rhythm Metric-17 (SRM-17). Revista de Psiquiatria do Rio Grande do Sul, 31 (2), 120-127.

19. Schimitt RL, Zanetti T, Mayer M, Koplin C, Guarienti F & Hidalgo MP. (2010). Propriedades Psicométricas da Escala de Ritmo Social em Trabalhadores de Turno Regular. Revista Brasileira de Psiquiatria, 32 (1), 47-55.

20. Wittmann M, Dinich J, Merrow M, Roenneberg T. (2006). Social Jetlag: The mis-alignment of biological and social time. Chronobiology International, 23, (1-2), 497-509.

Table 1. Bivariate analysis and multiple linear regression among **Score of Total Activities** sleep pattern, exposure to light and demographic characteristics

Variables	***r***	***p***	β	***p***
Sex	0.02	0.8	-0.02	0.8
Age	0.05	0.6	0.1	0.5
BMI	-0.1	0.3	-0.02	0.8
Schooling in years	0.2**	<0.01	0.2**	<0.01
Number of days worked per week	-0.06	0.5	-0.03	0.7
Midpoint of sleep in free days– (chronotype)	-0.2*	=0.05	-0.3*	<0.05
Mean duration of sleep	0.2*	<0.05	0.2*	<0.05
Social jetlag	0.02	0.8	0.2	0.8
Mean exposure to light	0.03	0.7	-0.02	0.8
Minor psychiatric disturbances	-0.3**	=0.001	-0.2**	<0.01

R^2 of multivariate analysis =0. 199

Table 2. Bivariate analysis and multiple linear regression among **Index of regularity of activities** sleep pattern, exposure to light and demographic characteristics

Variables	***r***	***p***	***β***	***p***
Sex	0.05	0.6	-0.04	0.6
Age	0.34	<0.001	0.2	<0.001
BMI	0.1	0.3	0.01	0.9
Schooling in years	-0.1	0.5	0.002	0.9
Number of days worked per week	0.4	<0.001	0.3	<0.001
Midpoint of sleep on free days– (chronotype)	-0.3	<0.001	-0.1	0.1
Mean duration of sleep	0.2	<0.05	0.1	0.1
Social jetlag	-0.3	<0.001	-0.1	0.5
Mean exposure to light	0.2	<0.05	0.1	0.1
Minor psychiatric disturbances	-0.2	<0.05	-0.2	<0.05

R^2 of multivariate analysis =0. 352

Table 3. Bivariate analysis and multiple linear regression among **SRQ-20** and social rhythm, sleep pattern, exposure to light and demographic characteristics

Variables	***r***	***p***	β	***p***
Index of regularity of activities performed	-0.2*	<0.05	-0.2**	=0.01
Score of total activities performed	-0.3**	=0.001	-0.2**	<0.01
Sex	0.1	0.4	0.1	0.3
Age	0.02	0.9	0.03	0.8
BMI	0.2	0.07	0.1	0.1
Schooling in years	-0.04	0.7	0.04	0.6
Number of days worked per week	0.07	0.5	0.1	0.2
Midpoint of sleep on free days (chronotype)	0.07	0.4	0.05	0.7
Mean duration of sleep	-0.09	0.3	-0.01	0.9
Social jetlag	-0.03	0.7	-0.1	0.4
Mean exposure to light	-0.01	0.9	0.04	0.7

R^2 Of multivariate analysis = 0.15