

Comparison of good and poor sleepers: stress and life satisfaction of university athletes

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COMPARACIÓN DE LOS DURMIENTES BUENOS Y MALOS: ESTRÉS Y SATISFACCIÓN DE VIDA DE ATLETAS UNIVERSITARIOS

KEYWORDS: Sleep quality, university athletes, perceived stress, stress appraisal, life satisfaction.

ABSTRACT: The aim of the present study was to compare differences in level of perceived stress, type of stress appraisal and life satisfaction between university athletes who declare problems with sleep (Poor Sleepers, PS, $n = 72$) and those without problems (Good Sleepers, GS, $n = 105$). In preliminary analyses the PS and GS were compared for group homogeneity with (a) the Chi-Square test for gender and type of sport, and (b) the Mann-Whitney U test for practice time and weekly frequency of trainings. In both analyses no differences were present. In the main analysis, prepared with the Mann-Whitney U test, GS and PS were compared in terms of psychological variables. Athletes who reveal problems with sleep quality (in comparison to their counterparts with good sleep quality) most often appraise stressful situations as a threat, perceive more stress in everyday life and declare lower life satisfaction. The differences between GS and PS groups may result from the bi-directional relationship between sleep quality and stress and life satisfaction. High stress and low life satisfaction can result in poor sleep quality and, on the other hand, sleep problems can aggravate stress and reduce the life satisfaction. Further studies and the use of advanced analyzes are needed to indicate the relationship between the studied variables in university athletes (e.g., mediation analysis, SEM).

The role of sleep in athletes is generally emphasized in the context of recovery (e.g., Samuels, 2008) and athletic performance (e.g., Fullagar et al., 2015). In a research review performed by Fullagar et al., presented studies results were generally in line with a suggestion that sleep loss (sleep deprivation and sleep restrictions) influences exercise and cognitive performance and might cause a mood changes – worsens performance and mood. However, the authors of the review, point out that previous data are not sufficient to indicate a clear relationship between sleep deprivation and exercise performance.

As for sleep, not only its amount but also its quality is important. According to Buysse, Reynolds, Monk, Berman, and Kupfer (1989, p. 195) sleep quality, as a general construct,

should be evaluated in terms of seven aspects related to sleep, which are: "subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction". People with poor sleep quality might have problems only in specific aspects of sleep, mentioned above, but if more problems occur the sleep quality decrease. The recently published research of Knufinke, Niewenhuis, Geurts, Coenen, and Kompier (2017) showed that 41% of elite athletes had poor sleep quality - scored five points or higher in the Pittsburg Sleep Quality Index (PSQI). Moreover, sleep quality in athletes decrease especially before important competitions (e.g., Erlacher, Ehrlenspiel, Adegbesan, and Galal El-Din, 2011; Silva et al., 2012).

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Due to the interconnectedness with sleep, the issue that is widely discussed in relation to athletes, is stress. Data obtained by Silva and Paiva (2013) showed that higher level of precompetitive stress was present in group of gymnasts with poor sleep quality. Other research points out that sleep quality might decrease under different stressful circumstances like sport season overload (e.g., Brink, Visscher, Coutts, and Lemmink, 2012). The primary stress appraisal (the construct from transactional model of stress) can also play a significant role in explaining disturbed sleep. Lazarus and Folkman (1984) explained that during primary appraisal stage, an individual determines if the experienced situation is or is not stressful. When the situation is treated as a stressor, three types of primary appraisal may occur: harm/loss, threat and challenge. Based on this information we can come up with the hypothesis that interpreting a stressful situation as a threat or harm/loss, in contrast to the challenge, may cause sleep problems. Unfortunately, there is a lack of research among athletes in the field of stress appraisal and sleep.

Sleep quality was also analyzed in association with well being and its cognitive component – life satisfaction. The study of Weinberg, Noble and Hammond (2016) showed that sleep quality was correlated with subjective well-being and stress (i.e., poor sleep quality was accompanied by lower subjective well-being and higher stress). Moreover, at the same time sleep quality significantly partially mediated the relation between stress and well-being. Similar findings were provided by Howell, Digdon, Buro, and Sheptycki (2008) and Pilcher, Ginter, and Sadowsky (1997) where among students poor sleep quality was related to lower well-being. On the other hand, Lopes, Milheiro, and Maia (2013) showed their study outcomes, where less satisfaction with life was one of predictors of poor sleep quality. Such relationships can be expected among athletes, but there is no research conducted in this particular group.

The objective of the study is to compare university athletes with good and poor sleep quality in terms of stress, stress appraisal and life satisfaction.

Method

Participants

The study involved 177 university athletes (from different individual and team sport disciplines e.g., volleyball, football, track and field, swimming; from amateur to high-performance

athletes) recruited from one of the Polish universities (45 women, 132 men; 21.3 ± 1.69 years). The basic requirement for active participation in the study was involvement in sport, understood as a training in a sport clubs, under academic sport association or having an individual training routine. Participants, who met the requirement, were divided into two groups based on the PSQI score. Persons whose score was higher or equal to 5 were considered as a group called *Poor Sleepers* (PS, $n = 72$), and people with lower results were in a group called *Good Sleepers* (GS, $n = 105$). We tested the groups homogeneity in terms of gender, type of sport, practice time and weekly frequency of trainings. No differences were noted (all $p > .05$). The data are presented in Table 1.

Instruments

In the study we used a set of psychological instruments which are listed below.

Perceived stress. The Perceived Stress Scale (PSS-10; Cohen, Kamarck, and Mermelstein, 1983; Polish adaptation by Juczyński and Ogińska-Bulik, 2009) evaluates the intensity of perceived stress during the last month.

Type of stress appraisal. The Stress Appraisal Questionnaire, version B (Włodarczyk and Wrześniewski, 2010) measures the four types of dispositional stress appraisal: Threat, Harm/loss, Challenge-activity, Challenge-passivity.

Well-being. The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, and Griffin, 1985; Polish adaptation by Juczyński, 2001) measures cognitive component of well-being.

Sleep quality. The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). Results above 5 indicate "poor sleep" (Buysse et al., 1989). In the study cut-off criteria for low sleep quality was set at 5 or more points (Samuels, 2008).

The Cronbach's alfa coefficients for instruments used in the study were generally on satisfactory level (higher than .70). For two variables: Challenge-activity ($\alpha = .55$) and Sleep quality ($\alpha = .57$) the coefficients were lower than expected.

Procedure

The recruitment process lasted from November 2015 to January 2016. Participants were given a written study information and filled the informed consent along with a set of psychological questionnaires and a survey about basic socio-demographic and sport-related information. Data collected in the research are a part of the project realized under the program of the Polish Ministry of Science and Higher Education called

Academic Sport Development. The project got the approval of the Ethics Committee for Scientific Research from the first author's university.

Data analysis

The analyses were prepared in Statistica v12, and included: descriptive statistics, verification of normal distribution with Shapiro-Wilk test, Chi-Square test, and Mann-Whitney *U* test. Cohen's *d* estimator was calculated for the effect size of significant comparisons between GS and PS. Internal consistency of measures was estimated with Cronbach's alpha coefficient. Statistical significance was defined for *p* value lower than .05.

Results

As it was previously mentioned, we controlled the sociodemographic and sport-related variables in GS and PS groups (see Table 1). This preliminary analyses allowed us to prepare the main analysis in which the psychological variables were compared. Not all variables had a normal distribution (see Table 2) and Mann-Whitney *U* test was used for the comparison (see Table 3). PS group had significantly different scores than GS in three psychological variables: higher stress appraisal - threat (Cohen's *d* = .381), higher perceived stress (Cohen's *d* = .634) and lower life satisfaction (Cohen's *d* = .357). The values of Cohen's *d* indicate that differences in perceived stress had a medium effect size. Effect size in type of stress appraisal - threat and life satisfaction was small.

Discussion

In presented research, PS university athletes scored higher than GS in specific type of dispositional appraisal - threat. They also had higher level of perceived stress and lower satisfaction with life. We controlled for possible confounding variables (i.e., gender, type of discipline, practice time and weekly frequency of trainings), what reinforce the obtained results of comparison between PS and GS in psychological variables. The presence of different results in PS and GS groups can be explained in two ways.

First explanation is that low life satisfaction and higher stress can result in sleep problems occurrence. Such an interpretation is in line with the data obtained by Lopes et al. (2013) where life satisfaction was a predictor of poor sleep

quality. Furthermore, the proposed explanation can be supported by Weinberg's et al. (2016) study results, where they reported a direct positive effect of stress on sleep quality. Taking into account the assumptions of a transactional model of stress (Lazarus and Folkman, 1984), the dispositional appraisal of situation as stressful (particularly appraised as a threat) can lead to lower sleep quality.

Second explanation of differences between PS and GS refers to reverse relation, in which sleep difficulties can make athletes less satisfied with their lives and more sensitive to the surrounding stressors. Confirmation of this reasoning may be the results of the study performed by Barber, Rupperecht and Munz (2014). They conclude that better sleep (understood as good sleep hygiene) might decrease negative stress appraisal and lead to higher subjective well-being. Also previously mentioned research of Weinberg et al. (2016) can support the proposed interpretation because in the mediation analysis sleep quality had a significant negative effect on subjective well-being.

It should be emphasized that the studies, mentioned in the discussion, were not conducted with university athletes, which may constitute a restriction with the conclusions drawn from them towards this particular group. The limitations of the presented study are: lack of control on the athlete's competition level, the study included only subjective but not objective sleep quality measures and performed statistical analyses do not allow us to draw unequivocal conclusions about mutual relations between variables.

To conclude, university athletes beside their active sport participation (e.g., trainings, competitions) have to face with the challenges of many social roles (a student, friend, partner in a relationship or an employee, etc.). Among them, those with low sleep quality have higher level of stress and frequently appraise stressors as a threat. They also declare lower life satisfaction than athletes with good sleep quality. Due to the lack of studies covering the analyzed variables it is advisable to conduct further research in this field. We also would like to suggest testing the relations between sleep quality and psychological variables with the usage of advanced statistical methods like mediation analysis or SEM. It would also be advisable to combine the objective and subjective measures of sleep quality, and conducting long-term measurements at different stages of a training schedule.

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	GS (n = 105)	PS (n = 72)	Chi-Square value	df	p	Z	p
Gender (%)							
Women	55.56	44.44	.35	1	.551		
Men	60.61	39.39					
Type of sport (%)							
Individual	62.63	37.37	1.02	1	.313		
Team	55.13	44.87					
Practice time - in years	6	8				-1.49	.135
Median [range]	[.25 - 19]	[1 - 15]					
WFT - number of trainings	4	4				-0.56	.574
Median [range]	[1 - 12]	[1 - 15]					

Note. WFT = weekly frequency of trainings.

Table 1. The preliminary analysis - groups homogeneity verification with Chi-Square test and Mann-Whitney U test

Variables	GS		PS		α
	(n = 105)		(n = 72)		
	W	p	W	p	
Stress appraisal					
TH	.97	.019	.96	.019	.85
HL	.96	.001	.96	.016	.77
Ch-A	.97	.014	.98	.215	.55
Ch-P	.99	.286	.96	.014	.82
Perceived stress	.98	.270	.98	.366	.84
Life satisfaction	.99	.563	.98	.178	.70

Note. TH = threat, HL = harm/loss, Ch-A = challenge – activity, Ch-P = challenge - passivity.

Table 2. Results of Shapiro-Wilk test for normal distribution and internal consistency of variables analyzed in the study

	GS (n = 105)		PS (n = 72)		Z	p
	Mean (SD)	Median [range]	Mean (SD)	Median [range]		
Stress appraisal						
TH	.75 (.46)	.67 [.00 - 2.00]	.95 (.53)	1.00 [.00 - 2.67]	-2.49	.013
HL	.85 (.54)	.75 [.00 - 2.25]	.99 (.60)	1.00 [.00 - 2.25]	-1.49	.137
Ch-A	1.93 (.47)	1.80 [1.00 - 3.00]	1.98 (.51)	2.00 [.80 - 3.00]	-.80	.421
Ch-P	1.48 (.64)	1.60 [.00 - 3.00]	1.51 (.59)	1.50 [.20 - 2.60]	-.55	.585
Perceived stress	13.33 (5.50)	13.00 [1.00 - 27.00]	17.01 (5.65)	17.00 [7.00 - 33.00]	-4.02	< .001
Life satisfaction	22.61 (4.61)	22.00 [11.00 - 35.00]	21.00 (4.48)	21.00 [12.00 - 30.00]	2.34	.019

Note. TH = threat, HL = harm/loss, Ch-A = challenge - activity, Ch-P = challenge - passivity.

Table 3. Results of Mann-Whitney U test - comparison of Good Sleepers (GS) and Poor sleepers (PS) in terms of stress appraisal, perceived stress and satisfaction with life

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PALABRAS CLAVE: Calidad del sueño, atletas universitarios, estrés percibido, evaluación del estrés, satisfacción con la vida.

RESUMEN: El objetivo del presente estudio fue comparar las diferencias en el nivel de estrés percibido, el tipo de evaluación del estrés y la satisfacción con la vida entre los atletas universitarios quienes declaran tener problemas de sueño (durmientes malos, DM, $n = 72$) y aquellos sin tales problemas (durmientes buenos, DB, $n = 105$). En los análisis preliminares los DM y los DB se compararon por la homogeneidad del grupo sobre la base de (a) la prueba Chi-Square por el género y el tipo de deporte, y (b) la prueba U de Mann-Whitney por el tiempo de práctica y la frecuencia semanal de entrenamientos. En ambos análisis no se detectaron diferencias. En el análisis principal, preparado con la prueba U de Mann-Whitney, los DB y los DM se compararon en términos de variables psicológicas. Los atletas quienes revelan problemas con la calidad del sueño (en comparación con sus homólogos con buena calidad del sueño) suelen evaluar las situaciones estresantes como una amenaza, perciben más estrés en la vida cotidiana y declaran una menor satisfacción con la vida. Las diferencias entre los grupos de DB y DM pueden ser el resultado de la relación bidireccional entre la calidad del sueño y el estrés y la satisfacción con la vida. El alto estrés y la baja satisfacción con la vida pueden resultar en mala calidad del sueño y, por otro lado, los problemas del sueño pueden agravar el estrés y reducir la satisfacción con la vida. Se requieren los estudios posteriores y el uso de análisis avanzados para indicar la relación entre las variables estudiadas en los atletas universitarios (p.ej., análisis de mediación, SEM).

References

- Barber, L. K., Rupperecht, E. A. and Munz, D. C. (2014). Sleep Habits May Undermine Well Being Through the Stressor Appraisal Process. *Journal of Happiness Studies*, 15, 285-299. doi:10.1007/s10902-013-9422-2
- Brink, M. S., Visscher, C., Coutts, A. J. and Lemmink, K. A. (2012). Changes in perceived stress and recovery in overreached young elite soccer players. *Scandinavian Journal of Medicine & Science in Sports*, 22, 285-292. doi:10.1111/j.1600-0838.2010.01237.x
- Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R. and Kupfer, D.J. (1989). The Pittsburgh Sleep Quality Index (PSQI): A new instrument for psychiatric research and practice. *Psychiatry Research*, 28, 193-213. doi:10.1016/0165-1781(89)90047-4
- Cohen, S., Kamarck, T. and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396. <http://dx.doi.org/10.2307/2136404>
- Diener, E., Emmons, R. A., Larsen, R. J. and Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, 49, 71-75. http://dx.doi.org/10.1207/s15327752jpa4901_13
- Erlacher, D., Ehrlenspiel, F., Adegbesan, O. A. and El-Din, H. G. (2011). Sleep habits in German athletes before important competitions or games. *Journal of Sport Sciences*, 29, 859-866. doi:10.1080/02640414.2011.565782
- Fullagar, H. H., Skorski, S., Duffield, R., Hammes, D., Coutts, A. J. and Meyer, T. (2015). Sleep and Athletic Performance: The Effects of Sleep Loss on Exercise Performance, and Physiological and Cognitive Responses to Exercise. *Sports Medicine*, 45, 161-186. doi:10.1007/s40279-014-0260-0
- Howell, A. J., Digdon, N. L., Buro, K. and Sheptycki, A. R. (2008). Relations among mindfulness, well-being, and sleep. *Personality and Individual Differences*, 45, 773-777, <https://doi.org/10.1016/j.paid.2008.08.005>
- Juczyński, Z. (2001). Narzędzia pomiaru w promocji i psychologii zdrowia [*Measurement tools in the promotion and health psychology*]. Warsaw, Poland: Pracownia Testów Psychologicznych PTP.
- Juczyński, Z. and Ogińska-Bulik, N. (2009). Narzędzia pomiaru stresu i radzenia sobie ze stresem [*Tools for measuring stress and coping with stress*]. Warsaw, Poland: Pracownia Testów Psychologicznych PTP.
- Knufinke, M., Nieuwenhuys, A., Geurts, S. A. , Coenen, A. M. and Kompier, M. A. (2017). Self-reported sleep quantity, quality and sleep hygiene in elite athletes. *Journal of Sleep Research*. doi:10.1111/jsr.12509
- Lazarus, R. S., Folkman, S. (1984). *Stress, appraisal, and coping*. New York, USA: Springer.
- Lopes, E., Milheiro, I. and Maia, A. (2013). Sleep quality in college students: a study about the contribution of lifestyle, academic performance and general well-being. *Sleep Medicine*, 14, e185. doi:10.1016/j.sleep.2013.11.437
- Pilcher, J. J., Ginter, D. R. and Sadowsky, B. (1997). Sleep quality versus sleep quantity: relationships between sleep and measures of health, well-being and sleepiness in college students. *Journal of Psychosomatic Research*, 42, 583-596. [http://dx.doi.org/10.1016/S0022-3999\(97\)00004-4](http://dx.doi.org/10.1016/S0022-3999(97)00004-4)
- Samuels, C. (2008). Sleep, Recovery, and Performance: The New Frontier in High-Performance Athletics. *Neurologic Clinics*, 26, 169-180. <https://doi.org/10.1016/j.ncl.2007.11.012>
- Silva, A., Queiroz, S. S., Winckler, C., Vital, R., Sousa, R. A., Fagundes, V., ... de Mello, M. T. (2012). Sleep quality evaluation, chronotype, sleepiness and anxiety of Paralympic Brazilian athletes: Beijing 2008 Paralympic Games. *British Journal of Sports Medicine*, 46, 150-154. doi:10.1136/bjism.2010.077016
- Silva, M. and Paiva, T. (2013). Sleep, precompetitive stress and achievements in young performance athletes. *Sleep Medicine*, 14(Suppl. 1), e269. <https://doi.org/10.1016/j.sleep.2013.11.656>
- Weinberg, M. K., Noble, J. M. and Hammond, T. G. (2016). Sleep well feel well: An investigation into the protective value of sleep quality on subjective well-being. *Australian Journal of Psychology*, 68, 91-97. doi:10.1111/ajpy.12098
- Włodarczyk, D. and Wrześniewski, K. (2010). Kwestionariusz Oceny Stresu [The Stress Appraisal Questionnaire]. *Przegląd Psychologiczny*, 53, 479-496.