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**Aashirwad Mahajan**  
PhD Research Scholar and  
Assistant professor, Dr. APJAK  
College of Physiotherapy, Pravara  
Institute of Medical Sciences, Loni,  
Taluka Rahata, Ahmednagar,  
Maharashtra, India.

**Constantinos Koutsojannis**  
Vice-President, Technological  
educational Institute of Western  
Greece

**Marina Theodoritsi**  
Lecturer, School of Health and  
Welfare, Technological educational  
Institute of Western Greece

**Kalliopi Pouliasi**  
Lecturer, School of Health and  
Welfare, Technological educational  
Institute of Western Greece

**Elias Tsepis**  
Director, School of Health and  
Welfare, Technological educational  
Institute of Western Greece

**Subhash Khatri**  
Principal, and Professor  
Dr.APJAK College of  
Physiotherapy, Pravara Institute  
of Medical Sciences, Loni, Taluka  
Rahata, Ahmednagar,  
Maharashtra, India

**Nupoor Kulkarni**  
PhD Research Scholar and  
Assistant professor, Dr. APJAK  
College of Physiotherapy, Pravara  
Institute of Medical Sciences, Loni,  
Taluka Rahata, Ahmednagar,  
Maharashtra, India.

#### Correspondence

**Aashirwad Mahajan**  
Department of Physiotherapy,  
Technological Educational  
Institute of Western Greece,  
Patras, Greece, 1 Meg. Alexandrou,  
Koukouli, Patras, Greece

## Preliminary extent of poor sleep quality and its risk factors in Greek older adults

**Aashirwad Mahajan, Constantinos Koutsojannis, Marina Theodoritsi, Kalliopi Pouliasi, Elias Tsepis, Subhash Khatri and Nupoor Kulkarni**

### Abstract

**Objectives:** Poor sleep quality is associated with increased risk for cardiovascular mortality, impaired cognition and decreased quality of life in older adults. Hence the objective of this preliminary study was to understand the prevalence of poor sleepers and finding the risk factors associated with poor sleep among Greek older adults.

**Method:** 258 older adults were screened out of which 153 were included through face to face interview Validated Greek version of Pittsburgh Sleep Quality Index (GR-PSQI) was used to assess sleep quality. Medical history of participant was also taken and confirmed by their medical reports. Greek versions of Geriatric Depression scale (GDS) and Test your Memory (TYM) were also used for depression and cognitive impairment respectively.

**Results:** Data was analyzed by Analysis of variance, Chi square test and multiple logistic regression. The prevalence of poor sleep quality in Greek older adults was 60.95%. The prevalence of poor sleepers in females was 66.2% and was statistically significant than the prevalence of poor sleepers in males which was 33.7% ( $p < 0.001$ ). Older adults with cardiovascular disease, arthritis and who scored more on GDS and less on TYM had poorer sleep ( $p < 0.05$ ). Also, use of sedatives was significantly associated with poor sleep ( $p < 0.05$ ).

**Conclusion:** The prevalence of poor sleep quality in Greek older adults was 60.95%. Elderly with cardiovascular disease, arthritis, higher GDS score, lower TYM score and who used sedatives had poorer sleep

**Keywords:** sleep; sleep quality; older adults; prevalence, Greek

### Introduction

Ageing is associated with many changes in the body. These changes also cause alterations in sleep. Along with age related physiological changes, many other psychological factors like depression and anxiety which may be due to impaired functional status, chronic co morbidities, loss of spouse and retirement also contribute to sleep complaints in older adults (Foley *et al.* 1995) [1].

Around 40% of older adults report difficulty in initiating and maintaining sleep (Vitellio, 1997) [2]. They are also unhappy with their sleep quality. Poor sleep quality in older adults may lead to daytime sleepiness. Excessive daytime sleepiness is often associated with increased risk for cardiovascular mortality, impaired cognition and decreased quality of life (Chasens *et al.* 2007) [3]. Daytime sleepiness is also linked to depression (Fava, 2004) [4]. Thus, sleep quality is an important aspect of sleep and it is necessary to understand the nature of subjective sleep quality in older adults due to its complex and multifactorial nature.

Being a complex phenomenon it is difficult to measure it objectively (Harvey *et al.* 2008) [5]. Self-reported sleep quality measured qualitatively may differ from sleep measured by Polysomnography (PSG) (Moul *et al.* 2002) [6]. Sleep satisfaction is as important as objectively measured sleep. Less attention is paid to the impact of self-reported sleep satisfaction on overall health. Studies have reported poor sleep satisfaction in older adults. Older adults with abnormal sleep parameters do not seek professional help unless the problem is ascertained through dissatisfaction with their sleep (Jacobs *et al.* 2006) [7]. Hence a detailed assessment of different aspects of sleep should be done with a tool which can properly evaluate sleep quality. Many tools have been reported to be used to assess sleep dysfunction in adults. Pittsburgh Sleep Quality Index (PSQI),

Self-Rated Sleep Questionnaire and the Sleep Dissatisfaction Questionnaire, Basic Nordic Sleep Questionnaire, Leeds Sleep Evaluation Questionnaire, Medical Outcomes Study - Sleep Problems Measures, Pittsburgh Sleep Diary are some of the tools used (Devine *et al.* 2005) [8]. Epworth Sleepiness scale for Daytime sleepiness has been also used widely (Johns, 1991) [9].

The PSQI is one of the most widely used general measures of sleep quality available. (Buysse *et al.* 1989) [10]. This self-rated questionnaire is specially designed for the sleep quality and can give the idea of the person's sleep quality in a period of one month. Not only does the Pittsburgh Sleep quality index differentiate between poor sleepers and good sleepers, it also is a standardized tool to interpret the sleep quality in patients. It has high test-retest reliability and a good validity for patients with primary insomnia. (Backhaus *et al.* 2002; Smith & Wegener 2003) [11, 12]. It has also been tested for its reliability and validity in older adults (Spira *et al.* 2011) [13]. The Greek version of Pittsburgh sleep quality index (GR-PSQI) has been validated in sleep lab population (Perantoni *et al.* 2012) [14]. It gives a quantitative measure of reported sleep quality in the form of the sleep quality index. However previous studies have not comprehensively assessed sleep quality and have relied on self-reported information about the individuals' sleep. Also, the quality of sleep in Greek older adults has been less researched upon. It is necessary to gain an insight into the sleep quality considering its detrimental effects. Aging, medical conditions, chronic illnesses, use of sleep medications have been already reported to be related to poor sleep in older population in other countries (Luo *et al.* 2013; Roth *et al.* 2007) [15, 16]. No previous study has been done to assess the sleep quality in Greek older adults with GR-PSQI. Hence this study was aimed at finding out the sleep quality in Greek older adults with the GR-PSQI, to determine the prevalence of poor sleepers and finding the risk factors associated with poor sleep among Greek older adults.

### Materials and methods

This cross-sectional study was conducted commencing from January 2015 until May 2015, among Greek older adults. The study received approval from Institutional ethical committee of Technological Educational Institute of Western Greece. The source of data and the study setting was community day care centers for older adults [KAPI] in the Patras, Greece. 258 older adults were screened and a total of 153 were included in the study depending upon the inclusion and exclusion criteria. Participants included were male and female older adults with age more than 60 years, who were attending community day care centers regularly, and willing to participate in the study. Participants excluded were smokers, alcoholics, having severe vision or hearing problems and those who were illiterate. Written informed consent was taken from the participants. Participants were given a set of questionnaires consisting of a screening form, a form of sociodemographic details to fill in which consisted of questions about age, gender, marital status, educational status, occupational status, financial status and medical history.

Sleep quality index was assessed by Greek version of PSQI (GR-PSQI). Permission regarding the same was obtained from PROQOLID database run by Mapitrust. Greek versions of Test your memory (TYM) scale and Geriatric Depression scale (GDS) were used to assess cognitive

impairment and depression respectively. For information about physical activity, participants were asked whether they exercised for more than 3 days per week for a period of at least 20 minutes per day.

### Sleep quality by GR-PSQI

GR-PSQI has 19 questions which are to be answered by the patient. Along with this, there are 5 additional questions which are to be answered by the person's roommate or bed partner. The 19-items are grouped into 7 component scores: 1) Subjective Sleep Quality (1 item); 2) Sleep Latency (2 items); 3) Sleep Duration (1item); 4) Habitual Sleep Efficiency (3 items); 5) Sleep Disturbances (9items); 6) Use of Sleeping Medication (1 item); and 7) Daytime Dysfunction (2 items).The Pittsburgh Sleep Quality Index gives the global score which is used to discriminate good sleepers and poor sleepers. The Global Score ranges from 0 to 21. All component scores range from 0 to 3.The score >5 indicates that the person is a poor sleeper. The score ≤5 indicate that the person is a good sleeper. The 5 additional questions were not asked since they did not have any effect on the global score. Data entry analysis was performed with IBM SPSS 20.0 software and Graphpad InStat version 3.10 software. ANOVA, Chi square test and multiple logistic regression were used.

### Results

The study sample consisted of 153 participants comprising of 56 males and 97 females. Out of these 146 people filled the questionnaires. Seven questionnaires were incomplete and hence were excluded from the study. The mean age of the sample was 71.21±6.646 years. The prevalence of poor sleep quality in these community dwelling older adults was 60.95% (PSQI>5). The mean PSQI score was 6.97±3.69. The mean PSQI in 52 males was 6.65±3.47 and that in 94 females was 7.15±3.82. Sleep medications were reported by 19.1% individuals. The average TYM score was 36.93(SD=11.75) and average GDS score was 8.01(SD=5.38). Amongst the prevalence of medical disorders, hypertension (40.41%) was the highest followed by Diabetes (23.5%) and Dyslipidemia (21.3%).

### Components of Sleep quality

The average time at which the Greek older adults slept was 10.48 pm and average time at which they woke up was 7.58 am. Their average reported hours of sleep was 6.33(SD=1.49). Individual components of sleep quality are listed in Table 1 and Table 2.

Average sleep latency in Greek older adults was 36.20 minutes (SD=36.21) which is quite high. Females took longer time (39.1 minutes) than males (27.2 minutes) to fall asleep ( $p<0.05$ ). Also, 29.45% older adults took more than 30 minutes for falling asleep. 19.1% older adults used sleep medications and there was no difference in sleep medication use among males and females.

Females scored poorer in subjective sleep quality (1.03 vs. 0.78,  $p<0.05$ ). There were no significant differences between other components among males and females. Age specific scores showed that there was significant difference in sleep duration and sleep disturbances as age progressed. Older individuals had lesser sleep duration ( $p<0.05$ ) and more sleep disturbances ( $p<0.05$ ). Other components showed no significant differences between age categories.

**Table 1:** Age specific scores of sleep quality as measured by Greek version of Pittsburgh Sleep Quality index

Age in years	60-69 (n=64)	70-79 (n=65)	>80 (n=17)	p value
Subjective sleep quality, m(SD)	0.93(0.72)	1.078(0.697)	1.058	0.43
Sleep latency(min), m(SD)	33.04(30.41)	42.26(37.56)	30.58(41.82)	0.24
<15min, n(%)	22(34.3)	22(33.8)	8(47.05)	0.65
16-30min, n(%)	24(37.5)	18(27.6)	6(35.2)	
31-60min, n(%)	14(21.8)	18(27.6)	2(11.7)	
>60 min, n(%)	4(6.2)	7(10.7)	1(5.8)	
Sleep duration(h), m(SD)	6.5 (1.49)	6.16(1.54)	5.5(1.47)	0.04*
<5h, n(%)	12(18.7)	19(29.2)	7(41.1)	0.5
5-6 h, n(%)	20(31.2)	17(26.1)	2(11.7)	
6-7h, n(%)	17(26.5)	14(21.5)	4(23.5)	
>7 h, n(%)	15(23.4)	15(23.07)	4(23.5)	
Sleep disturbances, m(SD)	1.26(0.46)	1.265(0.51)	1.58(0.48)	0.04*
Sleep medications, n(%)	11(17.1)	13(20)	4(23.5)	0.81
Daytime disturbances, m(SD)	0.36 (0.65)	0.43(0.57)	0.17(0.78)	0.35

Abbreviations: m=mean, SD=Standard deviation, n=no. of individuals, h=hours, min=minutes, \*statistically significant

**Table 2:** Gender specific scores of sleep quality as measured by Greek version of Pittsburgh Sleep Quality index

	Total=146	Male=52	Female=94	p value
Subjective sleep quality	1 (0.72)	0.78(0.68)	1.03(0.73)	0.04*
Sleep latency(min)	36.16(36.21)	27.2(26.8)	39.1(36.04)	0.03*
<15min, n(%)	52(35.6)	22(42.3)	30(31.9)	0.34
16-30 min, n(%)	51(34.9)	19(36.5)	32(34)	
31-60 min, n(%)	32(21.91)	9(17.3)	23(24.4)	
>60 min, n(%)	11(7.53)	2(3.8)	9(9.5)	
Sleep duration (h), m(SD)	6.5(1.49)	6.16(1.54)	6.48(1.47)	0.21
<5 h, n(%)	39(26.7)	17(32.6)	22(23.4)	0.69
5-6 h, n(%)	39(26.7)	15(28.8)	24(25.5)	
6-7 h, n(%)	36(24.6)	12(23)	24(25.5)	
>7 h, n(%)	32(21.9)	10(19.2)	22(23.4)	
Sleep disturbances, m(SD)	1.21 (0.5)	1.30 (0.5)	1.26 (0.5)	0.64
Use of Sleep medications, n(%)	28 (19.1)	10(19.2)	18(19.1)	1.0
Daytime disturbances, m(SD)	0.36 (0.65)	0.31(0.57)	0.36 (0.68)	0.65

Abbreviations: m=mean, SD=Standard deviation, n=no. of individuals, h=hours, min=minutes, \*statistically significant

### Demographic factors and medical disorders:

Poor sleepers had higher proportion of cardiovascular disease (23.5% vs. 8.7%,  $p=0.02$ ), arthritis (21.3% vs 7.01%,  $p=0.03$ ) and took more sedatives ( $p=0.002$ ) and antipsychotics ( $p=0.04$ ) (Table 3). Also there were less poor

sleepers who exercised regularly, (77.5% vs. 87.7%) though the result was not statistically significant ( $p=0.13$ ). The GDS score was higher ( $9.09\pm 5.56$  vs.  $7.08\pm 5.39$ ,  $p=0.03$ ) and TYM score was lesser in poor sleepers ( $38.31\pm 8.15$  vs  $42.52\pm 8.2$ ,  $p=0.02$ ).

**Table 3:** Medical disorders and demographic factors between good and poor sleepers

Medical Disorders	Good sleepers=57	Poor sleepers=89	p value
Hypertension, n(%)	25(43.8%)	34(38.2%)	0.6
Cardiovascular disease, n(%)	5(8.7%)	21(23.5%)	0.02*
Dyslipidemia, n(%)	12(21%)	19(21.3%)	1.0
Diabetes, n(%)	10(17.5%)	21(23.5%)	0.41
Arthritis, n(%)	4(7.01%)	19(21.3%)	0.03*
History of Carcinoma, n(%)	2(3.5%)	7(7.8%)	0.48
Osteoporosis, n(%)	5(8.7%)	13(14.6%)	0.43
COPD/Asthma, n(%)	4(7.01%)	7(7.8%)	1.0
Sedative, n(%)	4(7.01%)	24(26.9%)	0.002*
Antipsychotics, n(%)	3(5.2%)	16(17.9%)	0.04*
Thyroid abnormalities, n(%)	6(10.5%)	10(11.2%)	1.0
Sleep disorders, n(%)	0(0)	3(3.3%)	0.28
Exercise, n(%)	50(87.7%)	69(77.5%)	0.13
TYM, m, (SD)	42.52(8.2)	38.31(8.15)	0.02*
GDS, m, (SD)	7.08(5.39)	9.09(5.56)	0.03*
Age in years, m (SD)	70.63(6.72)	71.71(6.61)	0.34
Female, n(%)	35(61.4%)	59(66.2%)	0.67

Abbreviations: COPD=Chronic obstructive Pulmonary disease, TYM=Test your memory, GDS=Geriatric Depression scale, n=no. of individuals, m=mean, SD=standard deviation

\*statistically significant

### Risk factors related to poor sleep quality

Multiple logistic regression analysis of demographic factors and medical disorders was done and is shown in Table 4. In model 1, females had higher risk of having poor sleep quality than males (Odds Ratio= 1.65, 95% CI=0.78-3.5), but it was not statistically significant (p=0.18). In model 2

GDS score was found to be statistically significant (p=0.02). Participants having a higher GDS score were positively associated with poor sleep quality. In model 3 use of sedatives was found to be statistically significant (p=0.03). Increased use of sedatives was positively associated with poor sleep quality. [Table 4 near here]

**Table 4:** Multiple logistic regression analysis of factors associated with poor sleep quality

	Model 1	p value	Model2	p value	Model 3	p value
Female	1.65(0.78-3.5)	0.18	1.47(0.68-3.17)	0.32	1.35(0.54-3.37)	0.51
Age	1.61(0.52-5.0)	0.40	1.69(0.49-5.76)	0.39	2.34(0.6-9.1)	0.21
Exercising	0.88(0.29-2.5)	0.81	0.85(0.28-2.5)	0.77	0.62(0.17-2.21)	0.46
TYM score	-	-	0.99(0.95-1.02)	0.62	0.98(0.87-1.02)	0.51
GDS score	-	-	0.92(0.86-0.99)	0.02*	0.94(0.95-1.02)	0.18
Hypertension	-	-	-	-	0.93(0.41-2.13)	0.87
Cardiovascular disease	-	-	-	-	2.61(0.8-8.5)	0.11
Dyslipidemia	-	-	-	-	0.92(0.34-2.46)	0.92
Diabetes	-	-	-	-	1.38(0.53-3.57)	0.5
Arthritis	-	-	-	-	1.00(0.2-4.9)	0.99
Depression	-	-	-	-	0.35(0.06-2.13)	0.25
COPD/Asthma	-	-	-	-	0.46(0.08-2.49)	0.37
Osteoporosis	-	-	-	-	2.31(0.63-8.5)	0.2
Sedatives	-	-	-	-	3.66(1.06-12.6)	0.03*
Antipsychotics	-	-	-	-	1.83(0.41-8.16)	0.42
Carcinoma history	-	-	-	-	4.62(0.44-48.44)	0.2
Thyroid disorders	-	-	-	-	1.25(0.3-5.16)	0.75

Abbreviations: TYM= Test your memory, GDS= Geriatric Depression Scale, COPD= Chronic Obstructive Pulmonary Disease, \*statistically significant

### Prevalence of poor sleep quality

The mean global score in Greek older adults was 6.98(95%CI=6.38-7.57) (Table 5). Males had lesser score than females (6.65, 95%CI=5.68-7.62) indicating better sleep quality than females (7.15, 95% CI=6.37-7.94), though not statistically significant. The prevalence of poor sleep quality in Greek, community dwelling older adults as measured by GR-PSQI was 60.95% (PSQI>5). The prevalence of poor sleepers in females was 66.2% and was

statistically significant than the prevalence of poor sleepers in males which was 33.7% (p<0.001). The average global score of GR-PSQI in 60-69 years age group was 6.21(SD=3.88), in 70-79 years age group was 7.12(SD=4.14) and in >80 years age group was 6.11(SD=3.49). The prevalence of poor sleepers in 60-69 years age group was 54.68%, in 70-79 years age group was 63.07% and in >80 years age group was 58.82%.

**Table 5:** Global score measured with Greek version of Pittsburgh Sleep Quality Index and Prevalence of poor sleep quality in Greek community dwelling older adults

	No. of individuals	Poor sleep quality prevalence(95%CI)	p value	GR-PSQI global score(95%CI)	p value
Total	146	60.95		6.98(6.38-7.57)	
Male	52	66.2(59.48-72.91)	<0.001*	6.65(5.68-7.62)	0.43
Female	94	33.8(20.64-46.95)		7.15(6.37-7.94)	

Abbreviations: GR-PSQI= Greek version of Pittsburgh Sleep Quality Index  
\*statistically significant

### Discussion

This study used the validated GR-PSQI for assessing the sleep quality and its associated risk factors. The prevalence of poor sleep quality in Greek community dwelling older adults was 60.95%. This was more than the prevalence reported by the other studies done in other countries (Luo *et al.* 2013; Rocha *et al.* 2002) [15, 17]. The reasons behind this might be attributed to Greece being warmer than rest of Europe. Also more daylight hours contribute to more social evening activities and lead to delayed sleeping time. Furthermore, in the Greek culture daytime napping remains a socially acceptable behaviour (Paparrigopoulos *et al.* 2010) [18].

There was no previous published study on the sleep quality among older adults in Patras which was assessed by PSQI. A study done in 201 Greek older adults has reported prevalence of insomnia to be 42.78%. However, this study

used the ICD-10 criteria to diagnose insomnia and did not assess sleep quality of older adults (Patelaros & Argyriadou 2004) [19]. Another study done in a representative sample of Greek population with age >18 years reported the prevalence of insomnia to be 25.3%. However, it was not done exclusively in older adults and used the Athens Insomnia scale for assessing insomnia symptoms (Paparrigopoulos *et al.* 2010) [18].

Our study did not show a significant difference of age, gender and exercise between good and poor sleepers. Other studies have reported females having poorer sleep quality than males (Luo J *et al.* 2013) [15]. This study showed similar results but without statistical significance. Also there was no increase in global score of GR-PSQI, indicating no poorer sleep quality with an increase in age. These findings might be due to lesser sample size as compared to other studies.

Presence of chronic medical diseases significantly affected sleep quality. Cardiovascular diseases (CVD) were found to be significantly associated with poor sleep quality. This was in accordance with study done by Suzuki *et al.* (2009)<sup>[20]</sup> who evaluated association between poor sleep quality and cardiovascular disease. Another study done by Hoevenaar-Blom *et al.* (2011)<sup>[21]</sup> reported that short sleepers with poor sleep quality had a 63% higher risk of CVD and a 79% higher risk of CHD. Arthritis was also found to be significantly associated with poor sleep quality. This finding was similar to the study done by Hawker *et al.* (2010)<sup>[22]</sup> which not only found high prevalence of poor sleepers in older adults with arthritis, but also linked poor sleep quality and arthritis to fatigue in older adults.

This study reported significant difference between mean GDS scores of good and poor sleepers indicating an association of depression with poor sleep quality. A study reporting similar findings was done by Cho *et al.* (2008)<sup>[23]</sup>, but this study used the Beck depression inventory for evaluating depression.

Our study showed that TYM score was significantly lower in poor sleepers; showing that poor sleep quality in older adults has an effect on their cognitive performance. This was comparable to findings of a study done by Nebes *et al.* (2009)<sup>[24]</sup> who concluded an association between self reported poor sleep quality and cognitive performance. Our study used TYM score to assess cognitive performance and was not as detailed in relation to different aspects of cognitive performance. But study by Nebes *et al.* (2009)<sup>[24]</sup> was more comprehensive as it used Repeatable Battery for the Assessment of Neuropsychological Status and reported that poor sleep in healthy older adults is associated with individual differences in cognitive performance which is true only for certain cognitive tasks like measure of fluid intelligence.

The current study revealed a significant difference between good and poor sleepers using sedatives and antipsychotics. Poor sleepers were using more sedatives and antipsychotic medications. It has been reported that benzodiazepine consumption is related to insomnia (Patelaras & Argyriadou 2004)<sup>[19]</sup>. Therefore, despite using sedatives, the problem of poor sleep quality is still present and warrants attention. Further assessment and other treatment approaches should be considered for resolution of poor sleep quality.

The strength of the study was that detailed assessment was taken with face to face interviews using the validated version of GR-PSQI rather than just using simple unstructured questions. Also, the medical disorders reported by the participants were confirmed by their medical reports. Certain limitations in our study need to be highlighted. The most important being a small sample size. Due to a standardized comprehensive tool like GR-PSQI, illiterate people were excluded. Smokers and alcoholics were also excluded since alcohol and smoking were already proved significant predictors for insomnia (Paparrigopoulos *et al.* 2010)<sup>[18]</sup>. Hence there was a small sample size. Another limitation of this study is that the use cause and effect relationship between sleep disturbances and disorders could not be found out. Many other factors associated with poor sleep quality have been reported to be significant in other studies. Even though our study showed similar results, some of them were not statistically significant.

## Conclusion

60.95% of community dwelling Greek older adults have poor sleep quality as measured by GR-PSQI was associated with sex, co-morbidities and use of sedatives. The prevalence of poor sleepers in females was more than the prevalence of poor sleepers in males and also in those with cardiovascular disease, arthritis, high GDS score, low TYM score, and those using sedatives.

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## Conflict of interest

The authors declare that there are no conflicts of interest.

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