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## 2 **Effects of the quality of sleep and the mediating role** 3 **of eating on self-esteem in healthcare personnel**

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10

11 **Abstract:** In recent decades, organizational research has given special attention to the mechanisms  
12 promoting the health and wellbeing of nursing professionals. In this context, self-esteem is a  
13 personal resource which influences wellbeing at work and psychological wellbeing of nurses. The  
14 purpose of this study was to analyze the mediating role of eating in the effect of sleep quality on  
15 self-esteem in nursing professionals. The sample of 1073 nurses were administered the Rosenberg  
16 General Self-Esteem Scale, the Pittsburgh Sleep Quality Index and the Three-Factor Eating  
17 Questionnaire-R18. The results show that poor sleep quality and type of eating directly and  
18 indirectly affect self-esteem. More so, poor sleep quality deteriorated self-esteem through emotional  
19 eating, and even though emotional eating facilitated disinhibited eating, this relationship had no  
20 significant effects on self-esteem. The findings of this study suggest that hospital management  
21 should implement employee health awareness programs on the importance of healthy sleep and  
22 design educational interventions for improving the quality of their diet.

23

24 **Keywords:** self-esteem; quality of sleep; eating; nursing

25

### 26 **1. Introduction**

27 Positive Occupational Health Psychology (POHP) is a discipline for the “scientific study of  
28 optimal functioning of the health of persons and groups in organizations, effective management of  
29 their psychosocial wellbeing at work and the development of healthy organizations” [1] (p. 23). Far  
30 from the tendencies of more traditional research concentrating on the negative aspects of health, this  
31 new vein of positive psychology emerged from the need to provide more complete comprehension  
32 of the mechanisms that promote occupational health and wellbeing of workers [2-3].

33 One of the most influential theoretical frameworks in research on wellbeing and job stress is the  
34 Job Demands-Resources Model, JD-R [4]. This model underlines the relevance of workers’ personal  
35 resources, because of their capacity for buffering the negative impact of job demands, and at the same  
36 time, promoting job commitment and positively influencing job performance [5-6]. Personal  
37 resources can also drive growth and professional development, and are determinant to workers’  
38 psychological and occupational wellbeing [7]. In this context, self-esteem has been one of the personal  
39 resources most widely studied in the area of organization, although its value has also been widely  
40 recognized in education [8-10].

41 Self-esteem is a multi-dimensional construct referring to an individual’s evaluation of their own  
42 worth [11]. Somehow, self-esteem determines the way we are and our social behavior, so its relevance  
43 stems from the effects it has on individuals and different results in their lives [12]. For example, high  
44 levels of self-esteem are related to higher satisfaction in interpersonal relations and at work [13],  
45 physical and psychological wellbeing [14], and academic performance [15] and effective management

46 of stress and coping adequately in conflict situations [16]. In brief, the level of self-esteem influences  
47 the success and wellbeing of persons in important areas of life, such as health, social relations, work  
48 and education [14, 17].

49 In the scope of organization, empirical research in self-esteem has given special attention to  
50 nursing professionals as the majority group in the healthcare profession [18]. Another source of this  
51 interest is the nature of their work and its effects on their wellbeing, among which are the following:  
52 a) many of the tasks involved in the integral care of patients require demanding physical activity  
53 (physical exhaustion); b) permanent contact with patients and their families involving continual  
54 exposure to suffering and illness (emotional and psychological burnout), and c) attention to a high  
55 volume of patients during their workday (work overload) [19-21]. Thus, workers' positive personal  
56 evaluations increase their wellbeing and satisfaction, thereby improving the therapeutic relationship  
57 with their patients [22-23].

58 One question related to health and satisfaction of nursing professionals has to do with  
59 inadequate sleep, which could result from different factors, such as working rotating shifts and high  
60 levels of stress [24-25]. A sleep deficit, whether in amount or duration, negatively influences an  
61 individual's physical and psychological health, socioemotional functioning and psychosocial  
62 adjustment [26-27]. Because it reduces the tendency to think positively, it is linked with negative  
63 emotional states, decreases motivation for gratifying social activities and deteriorates interpersonal  
64 relations [28-29]. Likewise, insufficient sleep has been associated with ineffective decision-making,  
65 stronger emotional reactions (e.g., irritability), an impulse control deficit and deterioration of  
66 emotional regulation, which is the main mechanism linking lack of sleep with psychological health  
67 [30-31]. However, poor quality and short duration of sleep in nursing professionals not only has  
68 negative consequences for them, but also for the organization, as it diminishes job performance and  
69 service quality, increasing risk of making mistakes on the job and endangering patient safety [32].

70 In addition to the above, poor-quality or insufficient sleep as a result of rotating shifts and/or job  
71 stress is in itself a stress factor which acts as an indicator of psychological stress, and can even lead  
72 to maladjustment in diet and eating behavior [25, 33]. In a systematic review, it was observed that  
73 negative emotions can cause a feeling of being full, which leads to a decrease in the amount of food  
74 eaten. Nevertheless, the amount eaten may also increase to alleviate the distress of those negative  
75 emotions. This phenomenon has been explained as "emotional eating" [34]. For example, Van Strien  
76 & Koenders (2014) showed that an association between short duration of sleep and increase in the  
77 body mass index (BMI) in women was due to emotional eating, not disinhibited eating or by cognitive  
78 restriction. Similar results were found by Dweck et al. [33] who found a relationship between worse  
79 sleep quality and emotional and disinhibited eating. Indeed, emotional eating has been considered a  
80 predictor of Binge Eating Disorder [36]. In this line, it has been demonstrated in normal and obese  
81 populations that emotional eating is associated with a higher BMI, which may be reflected in weight  
82 gain [34]. Frederick, Sandhu, Morse, & Swami [37] showed that BMI is an important predictor of body  
83 image, such that an increase in weight causes greater body dissatisfaction. Some authors, such as  
84 Griffiths et al. [38] and Oh, Song, & Shin [39] found that body dissatisfaction has adverse effects on  
85 the emotional wellbeing of individuals, negatively affecting their self-esteem and quality of  
86 psychosocial life.

87 Because of the important implications that self-esteem, sleep and eating behavior have for the  
88 general wellbeing of workers, our objective was to analyze the mediating role of eating on the effect  
89 that quality of sleep has on the level of self-esteem in nursing professionals.

## 90 2. Materials and Methods

### 91 *Participants*

92 The original sample consisted of 1094 nurses in Andalusia (Spain). Incomplete questionnaires or  
93 those answered at random were discarded. The final study sample was made up of a total of 1073  
94 Spanish nurses aged 22 to 57 with a mean age of 32.32 (SD=6.62). Of this sample, 14.7% (n=158) were  
95 men and 85.3% (n=915) women, with mean ages of 32.79 (SD=6.27) and 32.24 years (SD=6.68),

96 respectively. The sample was distributed by sleep quality as follows: 60% (n=644) had sleep problems  
97 and the remaining 40% (n=429) had no sleep problems.

98

99 *Instruments*

100 *Rosenberg Self-Esteem Scale* [11]. Developed for evaluating self-esteem in adolescents, it consists  
101 of 10 items which focus on one's own feelings of respect and acceptance. Items are rated on a four-  
102 point Likert-type scale (from 1 = Strongly agree, to 4 = Strongly disagree). Other studies have  
103 demonstrated its adequate psychometric characteristics in both the general population [40] and in  
104 more specific populations [41]. In this study, internal consistency was  $\alpha = .82$ .

105 *Pittsburgh Sleep Quality Index* (PSQI, [42]; Spanish version by Macías & Royuela [43]). This  
106 questionnaire, which was developed to measure sleep quality, discriminates between good and poor  
107 sleepers. It consists of 24 items, five for evaluation by a roommate or bed partner, which are not  
108 included in the subject's self-evaluation score. The 19 self-reported items focus on aspects such as  
109 sleep latency and duration, frequency and severity of sleep problems. Seven components are  
110 generated based on the subject's answers: subjective quality, latency, habitual sleep efficiency,  
111 disturbances, use of sleeping medication and repercussion on daytime activity. An overall sleep  
112 quality score is found from the sum of these partial components. Royuela & Macías [44] reported  
113 reliability indices for the instrument of .81 with clinical population and .67 in a sample of students.

114 *Three-Factor Eating Questionnaire-R18*. The brief version of the original 51-item TFEQ [45]  
115 translated and adapted to Spanish (TFEQ-SP) by Jáuregui-Lobera, García-Cruz, Carbonero-Carreño,  
116 Magallares, & Ruiz-Prieto [46] and adapted by Pérez-Fuentes, Molero, Gázquez, & Oropesa [47] for  
117 a nursing population was used in this study. The questionnaire consists of 18 items which are rated  
118 on a four-point response scale (definitely true: 1, mostly true: 2, mostly false: 3, definitely false: 4). It  
119 evaluates three dimensions of eating behavior: (a) Uncontrolled eating (tendency to eat more than  
120 usual due to a loss of control over eating with a subjective sensation of hunger); (b) Emotional eating  
121 (inability to resist emotional signals, eating as a response to negative emotions); and (c) Cognitive  
122 restraint (conscious restraint of eating directed at controlling body weight and/or promoting weight  
123 loss). The TFEQ-R18 shows adequate coefficients of reliability on all three subscales (varies from .75  
124 to .87) [46], and adequate in the nursing population (from .85 to .90) [47]. In this study, reliability  
125 indices were .89 for disinhibited eating, .84 on emotional eating and .74 on cognitive restriction.

126

127 *Procedure*

128 Before collecting data, compliance with information standards, and confidentiality and ethics in  
129 data processing were guaranteed to the participants. The questionnaires were administered on a Web  
130 platform which enabled participants to fill them in online. For control of random or incongruent  
131 answers, a series of control questions were included, and any such cases were discarded from the  
132 study sample.

133

134 *Data analysis*

135 First, to test the relationship between the variables to be included in the causal analyses, bivariate  
136 correlations were calculated. Then the descriptive statistics for these variables were found. To test for  
137 the existence of significant differences in self-esteem and eating between the groups with and without  
138 sleep problems, a Student's *t* for independent samples was done.

139 The Preacher & Hayes [48] macro for SPSS was used for estimating the mediation model, in this  
140 case for multiple mediation effects [49]. This resource enables computation of different regression  
141 models, finding information on indirect effects, while avoiding the limitations of the classical Baron  
142 & Kenny [50] proposal. To do this, bootstrapping was applied with 5000 bootstraps which provided  
143 a confidence interval of 95%, and determined the multiple mediating effect of the mediator variables.  
144 In this study, an analysis of multiple mediation was carried out with two mediator variables forming  
145 a causal chain.

146

147 **3. Results**148 *Descriptive and correlational analyses*

149 Table 1 shows the descriptive statistics and correlations between variables: overall self-esteem,  
 150 sleep quality, and eating. The global score on the PSQI was taken for sleep quality, in a range of 0 to  
 151 21 points, where 0 points = No sleep problems and 21 points shows the existence of severe problems  
 152 in all areas or dimensions evaluated by the instrument [42-43].

153 **Table 1.** Descriptive statistics and correlations between the self-esteem, sleep quality and eating  
 154 variables.

	<i>M</i>	<i>SD</i>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1. Self-esteem	32.43	4.54	–				
2. Sleep quality	6.44	2.90	-.23***	–			
3. Disinhibited eating	17.38	5.88	-.21***	.17***	–		
4. Emotional eating	5.75	2.50	-.24***	.19***	.74***	–	
5. Cognitive restraint	16.08	4.55	-.002	.05	.23***	.25***	–

155 \*\*\* $p < .001$

156 The table shows data confirming the existence of a negative correlation ( $r = -.23$ ,  $p < .001$ ) between  
 157 the predictor variable (global PSQI score) and self-esteem as the dependent variable. Furthermore, of  
 158 the variables considered as potential mediators (Disinhibited eating, Emotional eating, and Cognitive  
 159 restraint), those observed to maintain correlations, in this case negative, with the dependent variable,  
 160 were Disinhibited eating ( $r = -.21$ ,  $p < .001$ ) and Emotional eating ( $r = -.24$ ,  $p < .001$ ). Therefore, these are  
 161 the variables included later as mediators in the analysis.

162 Table 2 shows the results of the analysis of mean scores in Self-Esteem and the TFEQ-R18  
 163 subscales for comparison of subjects with and without sleep problems. The results reveal the  
 164 existence of significant differences in relation to the level of self-esteem, ( $t_{(1071)} = 5.01$ ;  $p < .001$ ;  $d = .31$ )  
 165 between those who had sleep problems ( $M = 31.88$ ;  $SD = 4.73$ ) and those who did not ( $M = 33.25$ ;  
 166  $SD = 4.12$ ), where the latter had higher scores.

167 In addition, when the groups were compared for the eating dimensions that correlated with  
 168 sleep quality, statistically significant differences were observed in Disinhibited eating ( $t_{(1071)} = -4.96$ ;  
 169  $p < .001$ ;  $d = .31$ ) and Emotional eating ( $t_{(1071)} = -4.21$ ;  $p < .001$ ;  $d = .26$ ), where those who had sleep problems  
 170 had the highest points in both cases. There were no statistically significant differences between  
 171 groups in Cognitive restraint ( $t_{(1071)} = -1.80$ ;  $p = .071$ ).

172 **Table 2.** Self-esteem and eating (emotional/disinhibited). Descriptive statistics and *t* test by sleep  
 173 quality (No problem/problems).

	Sleep quality						<i>t</i>	<i>p</i>	<i>d</i>
	No problem			Problems					
	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>			
Self-esteem	429	33.25	4.12	644	31.88	4.73	5.01***	.000	.31
Disinhibited eating	429	16.32	5.36	644	18.08	6.11	-4.96***	.000	.31
Emotional eating	429	5.37	2.28	644	6.01	2.60	-4.21***	.000	.26
Cognitive restraint	429	15.77	4.53	644	16.28	4.55	-1.80	.071	--

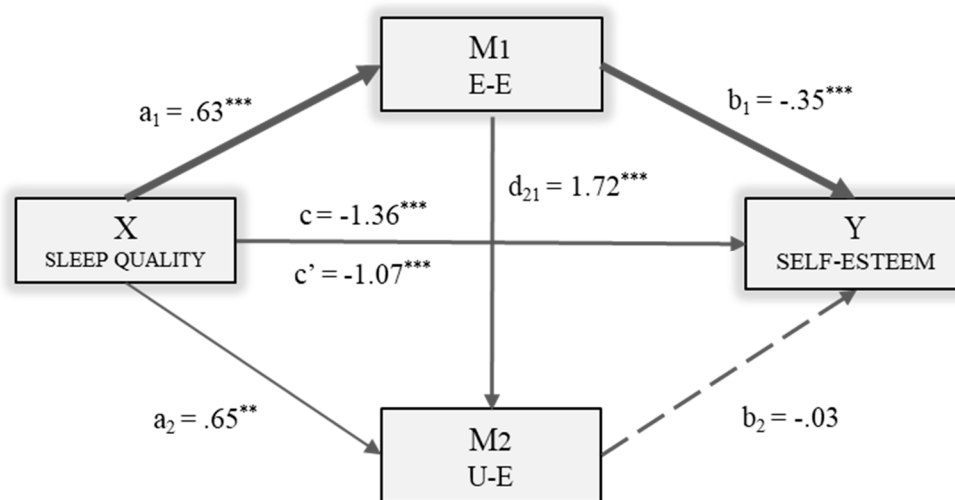
174 \*\*\* $p < .001$

175 *Multiple Mediation Analysis*

176 The mediation analysis was carried out based on the following mediation hypothesis: Having  
 177 sleep problems involves a tendency to emotional eating, which has a negative repercussion on self-  
 178 esteem. Emotional eating facilitates disinhibited eating, although it does not have indirect effects on  
 179 self-esteem by this path.

180 For computation of the model, the PSQI global score was taken as the independent or predictor  
 181 variable. In this case, the variable was previously dichotomized following the authors' [42] proposal,  
 182 where a Global PSQI >5 suggests severe problems sleep in at least two areas, or moderate problems  
 183 in more than three areas. We therefore had two groups coded as 0=no sleep problem and 1=sleep  
 184 problems. The dependent variable proposed in the model was self-esteem, and as mediators,  
 185 emotional eating (M<sub>1</sub>) and disinhibited eating (M<sub>2</sub>).

186 Thus, the multiple mediation model was computed with two mediating variables (M<sub>1</sub>: E-E and  
 187 M<sub>2</sub>: U-E). Figure 1 shows the model, including the direct, indirect and total effects. In the first place,  
 188 it may be observed that there was a statistically significant effect [ $B_{PSQI}=.63, p<.001$ ] of sleep quality  
 189 (X) on emotional eating (M<sub>1</sub>). The second regression analysis took Mediator 2 as the result variable  
 190 and included sleep quality (X) and emotional eating (M<sub>1</sub>) in the equation. There was a significant  
 191 effect of emotional eating [ $B_{E-E}=1.72, p<.001$ ] and of sleep quality [ $B_{PSQI}=.65, p<.01$ ] on disinhibited  
 192 eating (M<sub>2</sub>). The third regression analysis, taking self-esteem (Y) as the result variable, estimated the  
 193 effect of the independent variable and of the two mediators. In this case, the effects of emotional  
 194 eating [ $B_{E-E}=-.35, p<.001$ ] and sleep quality [ $B_{PSQI}=-1.07, p<.001$ ] as the independent variable were  
 195 significant. Meanwhile, disinhibited eating (M<sub>2</sub>) did not have a significant effect [ $B_{U-E}=-.03, p=.265$ ] on  
 196 the dependent variable. The total effect of sleep quality on self-esteem was significant [ $B_{PSQI}=-1.36$   
 197  $p<.001$ ].  
 198



199  
 200 **Figure 1.** Multiple Mediation Model of eating (emotional/disinhibited) on the relationship between  
 201 sleep quality and self-esteem. Note. E-E = Emotional eating; U-E = Disinhibited eating.  $**p < .01$ ,  
 202  $***p < .001$

203 Finally, the analysis of the indirect effect by bootstrapping found data supporting the  
 204 significance of Path 1 [Indi:  $X \rightarrow M_1 \rightarrow Y; B = -.22, SE = .07, 95\% CI (-.41, -.10)$ ]. Therefore, sleep quality had  
 205 a stronger effect on self-esteem through emotional eating (M<sub>1</sub>) than the two mediators operating in  
 206 series. Thus, the path or indirect effect would basically take place through emotional eating.

#### 207 4. Discussion

208 Most nursing professionals showed poor sleep quality (60%), which could be the result of  
 209 working in rotating shifts and high job stress [24-25]. The results also showed that poor sleep quality  
 210 negatively influenced self-esteem [ $B_{PSQI}=-1.36, p<.001$ ], suggesting that inadequate sleep reduces the  
 211 tendency to think positively and is related to negative emotional states which affect the emotional  
 212 and psychological wellbeing of nurses [28].

213 Moreover, the data show that poor sleep quality functions as a predictor of eating behavior.  
214 Specifically, workers with poorer sleep quality had higher rates of emotional and disinhibited eating.  
215 Similarly, Dweck et al. [33] suggested that both eating styles are associated with poor sleep quality  
216 and not its duration. This finding could be explained by a deficit of impulse control and deterioration  
217 of emotional regulation and decision-making caused by deficient sleep quality [29]. In agreement  
218 with previous studies, no significant relationship was found between sleep quality and cognitive  
219 restriction [10].

220 The mediation models confirmed our hypotheses. In the first place, a deficit in sleep quality  
221 implies more emotional eating, which negatively affects self-esteem [ $B=-.22$ ,  $SE=.07$ , 95%  $CI (-.41$ ,  
222  $-.10)$ ]. Poor sleep quality causes generalized emotional distress. In response to those negative  
223 emotional signals, people tend to increase eating to feel better. Some authors have noted that it is an  
224 atypical response of the organism which may be explained by inadequate emotional regulation. It  
225 has also been suggested that emotional eating is related to maladaptive coping strategies [35]. More  
226 so, these sleep problems are associated with eating more junk foods, which are high in fats and  
227 sugars, and therefore, emotional eating leads to weight gain [27, 34]. Thus, individuals faced with  
228 weight gain feel greater dissatisfaction with their body image, and as a result, this negative affect  
229 influences self-esteem and their psychosocial quality of life [37, 39]. Keeping in mind that self-esteem  
230 is a personal resource determining workers' psychological wellbeing and their wellbeing at work,  
231 their job performance and quality of service given patients will be [5, 22].

232 In the second place, emotional eating [ $BE-E=1.72$ ,  $p<.001$ ] facilitates disinhibited eating, although  
233 it does not affect self-esteem [ $BU-E=-.03$   $p=.265$ ], even though these two different dimensions of eating  
234 behavior are closely related ( $r=-.74$ ,  $p<.001$ ). Emotional eating is provoked by an absence of adapted  
235 emotional regulation, which in turn, is associated with a deficit in impulse control, more characteristic  
236 of disinhibited eating [29, 36]. The findings of Van Strien & Koenders [35] offer a possible explication  
237 for the absence of any effect of disinhibited eating on self-esteem. These authors showed that self-  
238 esteem is only weakened when there is an increase in BMI. However, this relationship was only found  
239 when emotional eating was the only mediator between poor sleep quality and self-esteem.

240 The results of this study have relevant practical implications. For one thing, the importance of  
241 self-esteem as an essential personal resource for nursing professionals [7-8], should be emphasized.  
242 For another, the effects of sleep quality and diet on the general wellbeing of nurses and the quality of  
243 their attention to patients should also be underlined [28, 34]. Organizations should implement health  
244 awareness programs for workers emphasizing the importance of healthy sleep to prevent health  
245 problems, and educational programs to facilitate tools which improve the quality of their diet [32].  
246 Following the recommendations of Amutio et al. [26] it would also be of interest to include positive  
247 interventions (e.g., mindfulness) to improve the quality of sleep of these healthcare professionals.

248 This study has some limitations. First, its cross-sectional nature impedes establishing any causal  
249 relationship between the study variables, for which a longitudinal design would be necessary. The  
250 second is that the data may be biased by the variance in the common method because of how the data  
251 were collected, and therefore, we propose inclusion of other qualitative methods and more objective  
252 and exhaustive measures to offer more precise information on the duration and quality of sleep.

253 As future lines of research, it is suggested that variables related to work demands (e.g., shifts)  
254 be included with individual and collective results on the organization (e.g., engagement, job  
255 performance). Similarly, multilevel studies of the deficit in sleep quality in different areas of work  
256 would be of interest for implementing preventive programs.

## 257 5. Conclusions

258 This study analyzed the mediating role of eating on the effect of sleep quality on self-esteem in  
259 nursing professionals. It emphasizes the importance of self-esteem in the organizational environment  
260 as a personal resource essential to the psychological and emotional wellbeing of workers, in addition  
261 to positively influencing organizational results (e.g., job performance) and improving therapeutic  
262 relations with patients.

263 Furthermore, the TFEQ-R18 [47] is a valid instrument for studying the three dimensions of  
264 eating behavior (emotional, behavioral and cognitive), not only for persons with obesity, but also in  
265 the normal population.

266 This study provides important contributions to Positive Occupational Health Psychology  
267 (POHP) by emphasizing eating behavior and sleep quality as essential aspects for health and  
268 wellbeing of nursing professionals and quality of patient care. In fact, it was demonstrated that both  
269 factors have direct and indirect effects on self-esteem.

270 The main finding of this study is that poor sleep quality can deteriorate self-esteem of nurses  
271 through emotional eating, suggesting that this relationship could cause job performance to diminish  
272 and patient service quality to deteriorate. The second most important finding is that there is a close  
273 relationship between the emotional dimension of eating (emotional eating) and its behavioral  
274 dimension (disinhibited eating), however, this association does not negatively influence self-esteem  
275 of nursing professionals.

276 Altogether, the results suggest the relevance of implementing health awareness programs to  
277 make healthcare professionals aware of the importance of healthy sleep and educational programs  
278 for improving the quality of their diet.

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280 design of the review. J.J.G.L. applied the search strategy. All authors applied the selection criteria. All authors  
281 completed the assessment of risk of bias. All authors analyzed and interpreted data. M.M.M.J., M.C.P.F.,  
282 A.B.B.M., and A.M.M. wrote this manuscript. M.M.M.J., M.C.P.F. and J.J.G.L. edited this manuscript. M.C.P.F.  
283 is responsible for the overall project.

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