



# Sleeping Habits among School Children and their Effects on Sleep Pattern

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## ABSTRACT

**Introduction:** Sleep problems can occur at any age. Inadequate sleep affects the physiological as well as psychological well-being of an individual. Thus, the objective of the present study is, to determine the pre sleep habits, duration and pattern of sleep among school children and to determine association between their sleep schedules and sleep habits.

**Methods:** This cross-sectional study comprised of 1050 children attending the government school. Based on inclusion and exclusion criteria children were from three age groups: 4-5 years, 6-10 years and 11-15 years of age. A questionnaire about demographical data, sleep problems and habits, was duly filled by the parents. The parents of children were questioned for bed time, wakeup time, sleep time and sleep duration during both weekdays and weekends.

**Results:** Total sleep time during weekdays was 8.9 (1.2) hours and 10.7 (1.1) hours during weekends. The wakeup time was significantly delayed during weekends in all age groups. Moreover, total sleep time increased significantly during weekends in all age groups. Children using media after 8 pm and sleeping alone are also in significant sleep debt. Screen activities such as TV, internet and cellular phones in a child's bedroom had a negative effect on children's sleep/wake patterns and duration of sleep. Children in higher grades are sleep debt compared to younger ones. Practices such as co sleeping and sharing bed with parents significantly improve the duration and quality of sleep.

**Conclusion:** The sleep durations reported in the present study were lower than recommended sleep duration for children.

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## Introduction

Sleep loss is one of the common plagues of modern societies.<sup>1</sup> Inadequate sleep has been associated with a rainbow of physical and psychosocial health deficits,<sup>2</sup> including impaired ability to concentrate<sup>3</sup> and retain information,<sup>4,5</sup> mood disorders,<sup>6</sup> impaired motor skills,<sup>7</sup> and poorer overall health and body's natural defense mechanism.<sup>8</sup>

Inadequate falling in sleep is characterized by sleep and wake difficulties resulting from "daily living activities that are inconsistent with the maintenance of quality sleep and normal daytime alertness".<sup>9</sup> These problems are common among adolescents and

children.<sup>10-14</sup> The National Sleep Foundation Scientific Advisory Council recommends 9-11 hours for school age children and 8-10 hours for teenagers.<sup>15</sup> The common reasons can be advocated for the delayed sleep are homework, hanging out with friends, late night television viewing,<sup>16</sup> video games<sup>17</sup> internet. Several other factors, like social and customs, cultural and climatic factors, appear to affect sleep duration in children.<sup>18,19</sup> Over the past decades, sleep duration in children and adolescents showed a trend in decrease of 0.75 min nightly per year.<sup>20</sup> It has been estimated that 15%-75% of school-aged children are not getting sufficient sleep.<sup>21</sup> In

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the light of increasing prevalence and negative consequences of insufficient sleep, there is paucity of literature regarding sleep habits and sleep hygiene among government school going children in India. Also, there is high inconsistency in socio economic status, culture and custom of urban and rural population in India. Therefore, the present study was conducted in government schools located in sub urban areas, where Midday Meal Scheme was implemented by the government to improve the nutritional status of children which is covered by nutritional food security act, 2013. This scheme encourages children of the under privilege section of society to attend school more regularly and to concentrate on class room activities.

In India Prosthodontist deals with sleep disorders such as obstructive sleep apnea in adults and children.

The primary aim of the present study was to determine the pre sleep habits, sleep pattern and sleep duration among children. The secondary aim was to investigate for association between pre sleep habits and practices that may affect the sleep hygiene of the child.

## Materials and methods

The present cross sectional study was approved by the institutional ethical committee (ECR/262/Inst/UP/2013). The study population comprised boys and girls attending regular government elementary schools in Lucknow, India. Four schools were randomly selected from the list of District inspector of Education. The objectives of the present study were explained to the local school authority and their permission was obtained to carry out the study.

All children of 4-15 years were asked to participate in the present study and were divided into three age groups: 4-5 years (Kindergarten), 6-10 years and 11-15 years of age. Children with illnesses such as asthma, sinusitis, chronic rhinitis, any other chronic systemic disorder that could have affected sleep patterns/parameters were excluded from the present study. A written informed consent

was obtained from the parents of the children included in the study. A questionnaire about demographical data, sleep problems and habits was prepared based on the literature. The questions addressing bedtime, wake up time, night time, sleep duration and daytime nap duration during both weekdays and weekends were assessed. Bed time and morning rise time of the child were assessed by direct questioning from parents. A pilot study was conducted on 50 students who were selected randomly. The questionnaire was repeated for the same sample population after two weeks. The test-retest reliability was 0.90 and internal reliability (Cronbach's alpha=0.90) were high and with an acceptable convergent construct validity ( $r=0.75$ ).

After following the instructions, parents were asked to fill in the questionnaire. In case of an illiterate parent accompanying the child, the questionnaires were completed by direct questioning from the parents. Out of 1,400 distributed questionnaires, 1,050 were completely filled and returned. The questionnaires returned half-filled were not included in the present study. The sleep parameters were calculated as; 1) Total Sleep Time (TST): Total sleep time minus sleep latency; 2) Sleep Debt: Recommended duration of sleep for an age minus total sleep time for that age. Statistical analysis was performed using SPSS Statistics for Windows, Version 20.0. (NY: IBM Corp). The proportions were calculated to determine baseline sleep habits and problems.

The mean scores were calculated for each question and the overall questionnaire. T-test was performed on the mean scores of each group. Descriptive statistic was calculated for all continuous variables and results are shown as mean (SD). Multivariate regression model was used to determine the correlation between sleep pattern and factors affecting sleep. The level of significance was set at the 0.05 to calculate P-value.

## Results

A total of 1,050 children with ages ranging from 4-15 years were included in the study. There were 665 (63.3%) boys and 385 (36.7%)

girls. Questionnaires were filled by mothers (71.9%), fathers (10.1%), and by others (18%).

The educational level of the children's parents was variable. Illiteracy rate was 34.3% among mothers and 7.0% among fathers. The percentage of mothers and fathers having primary education was, 26.5% and 42.0% respectively. Mother's occupations were as follows: housewives (38.5%), unskilled worker (23.9%), semiskilled worker (18.9%), and service (4.1%). The bedtimes, wakeup times, night time sleep duration (Total sleep time/TST) during weekdays and weekends for the whole group and different age groups (boys and girls), are listed in Table 1. Total percentage of children with daytime napping was 28.7%. Bedtime for the whole group was 9.9 (1.0) hours and wakeup time was 6.9 (1.1) hours. During weekdays, TST was 8.9 (1.2) hours. The bedtimes, wakeup times and TST during weekdays compared to weekends for

each age group is shown in Figs 1A-C.

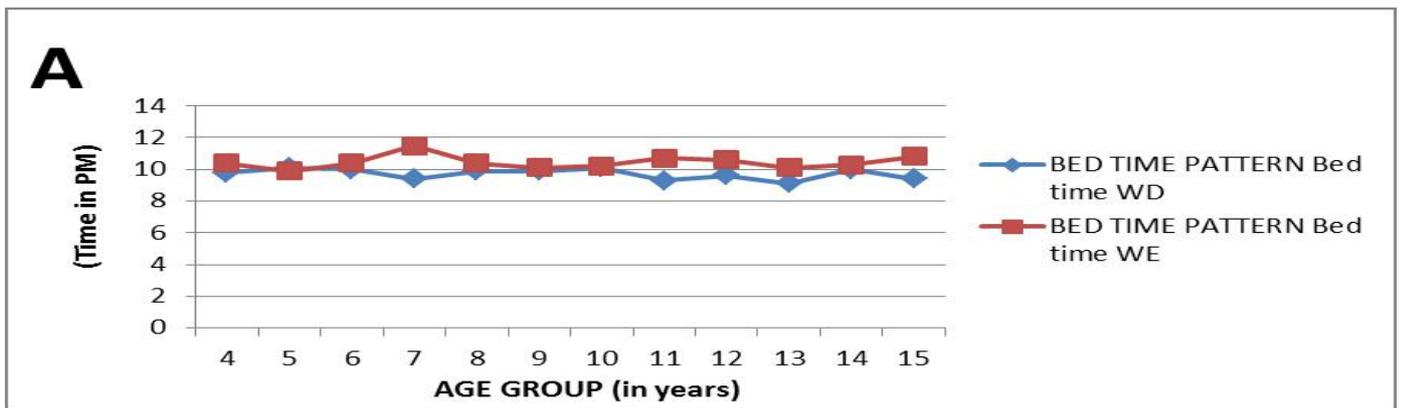
The present study found not much difference in bedtimes during weekdays and weekends but wakeup times were significantly delayed (Independent t-test) during weekends in all age groups ( $P < 0.05$ ). Moreover, TST increased significantly during weekends in all age groups ( $P < 0.05$ ).

Multivariate analysis shows that working mother, sharing bedroom, inadequate sleep, nightmares, poor concentration, failing in grades, being overweight and late night use of laptop/mobile significantly affected nighttime sleep duration/TST during weekdays (Table 2). Children of age group of 11-15 years and 6-10 years had more difficulty in waking up in morning during weekdays as shown in table 3 (34.3% and 34.2%, respectively). Total sleep time reported in the present study was in between, compared to the results reported from other countries.<sup>22-24</sup> (Table 4)

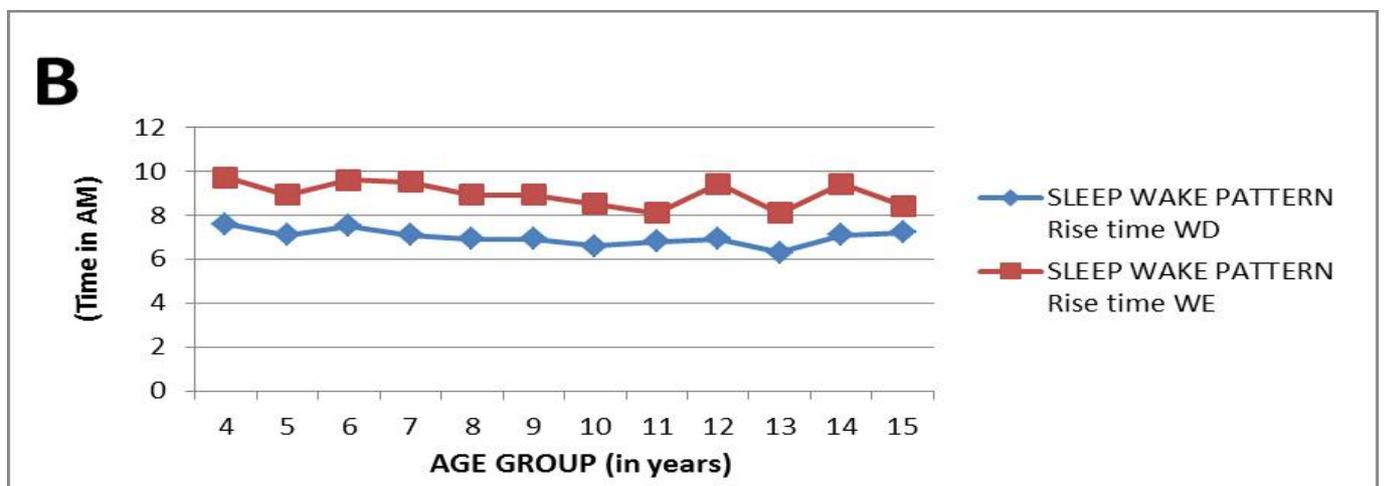
**Table 1.** Sleep pattern in the whole group and comparison between boys and girls of different age groups

Age group	Timing	Whole group Mean (SD)	Boys Mean (SD)	Girls Mean (SD)	P-value
<b>Whole group=1050, (boys=665), (girls=385)</b>					
	Bed time WD	9.9 (1.0)	10.0 (1.1)	9.9 (1.1)	0.63
	Wakeup time WD	6.9 (1.1)	6.9 (1.1)	6.8 (1.2)	0.19
	TST WD	8.9 (1.2)	8.9 (1.2)	8.9 (1.3)	0.51
	Bed time WE	10.2 (1.3)	10.2 (1.4)	10.3 (1.2)	0.14
	Wakeup time WE	8.9 (1.2)	9.0 (1.2)	8.9 (1.3)	0.36
	TST WE	10.7 (1.1)	10.8 (0.9)	10.6 (1.3)	0.03
<b>4-5 yrs=175, (boys=115), (girls=60)</b>					
	Bed time WD	9.6 (1.0)	10.0 (0.9)	9.9 (1.1)	0.38
	Wakeup time WD	7.1 (1.3)	7.0 (0.8)	7.4 (1.9)	0.18
	TST WD	9.2 (1.2)	9.1 (1.0)	9.5 (1.4)	0.03
	Bed time WE	10.0 (1.3)	10.0 (1.2)	10.0 (1.4)	0.90
	Wakeup time WE	9.2 (1.2)	9.1 (1.1)	9.4 (1.3)	0.11
	TST WE	11.2 (0.6)	11.1(0.5)	11.4(0.6)	0.003
<b>6-10 yrs=540, (boys=345), (girls=195)</b>					
	Bed time WD	9.9 (1.0)	9.9 (1.1)	9.9 (0.9)	0.64
	Wakeup time WD	6.9 (1.1)	7.0 (1.1)	6.6 (0.9)	<0.001
	TST WD	8.9 (1.1)	9.1 (1.1)	8.7 (1.1)	<0.001
	Bed time WE	10.5 (1.3)	10.6 (1.4)	10.4 (1.0)	0.06
	Wakeup time WE	8.9 (1.1)	9.1 (1.1)	8.7 (1.0)	<0.001
	TST WE	10.4 (1.1)	10.5 (0.9)	10.3 (1.4)	0.11
<b>11-15 yrs=335, (boys=205), (girls=130)</b>					
	Bed time WD	10.1 (1.1)	10.1 (1.0)	10.1 (1.3)	0.86
	Wakeup time WD	6.8 (1.1)	6.7 (1.1)	6.9 (1.0)	0.02
	TST WD	8.8 (1.3)	8.6 (1.2)	8.8 (1.3)	0.07
	Bed time WE	9.9 (1.2)	9.6 (1.0)	10.3 (1.4)	<0.001
	Wakeup time WE	8.7 (1.3)	8.6 (1.3)	8.9 (1.4)	0.08
	TST WE	10.9 (1.1)	10.9 (1.0)	10.6 (1.2)	0.006

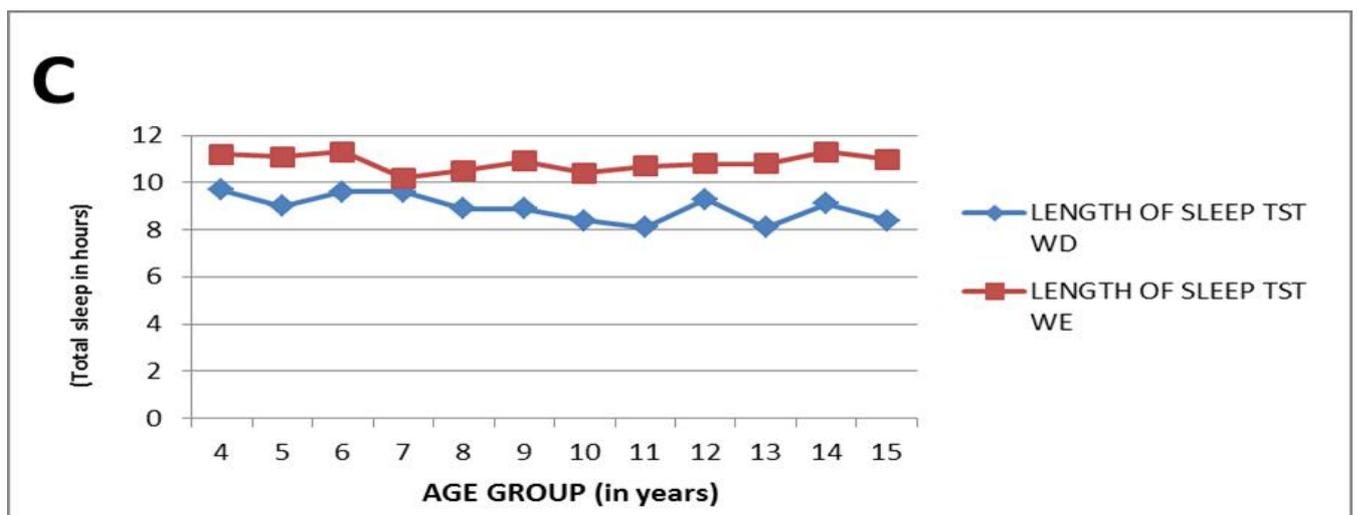
TST: Total Sleep Time, WD: Week Day, WE: Week End



**Figure 1A.** Graph depicting pattern of bed time for each age groups: No significant difference was observed in bedtime during weekdays and weekends



**Figure 1B.** Graph depicting pattern of wake up time for each age groups: A significant delay in wake up time was observed during weekends compared to weekdays.



**Figure 1C.** Graph depicting pattern of total sleep time for each age groups: Total sleep time was significantly more during weekends for all age groups compared to weekdays

**Table 2.** Multivariate analysis of factors that affect nighttime sleep duration (TST) during weekdays

Factors	Adjusted effects in hours	Effects in minutes	P-value	95% CI
Working mother	-0.12	-7.2	0.005	(-0.20, -0.03)
Sharing bedroom with parents	0.31	18.1	<0.001	(0.22, 0.40)
Inadequate sleep	-0.20	-12.0	0.007	(-0.34, -0.05)
Nightmare	-0.06	-3.6	<0.001	(-0.09, -0.03)
Sleepiness in day time	-0.001	-0.06	0.9	(-0.02, 0.02)
Having difficulty in completing tasks (poor concentration)	0.38	22.8	0.04	(0.002, 0.77)
Failing in grades	-0.17	-10.2	0.009	(-0.30, -0.04)
Overweight	0.02	1.2	<0.001	(0.01, 0.02)
Screen time	-0.006	-0.36	0.57	(-0.02, 0.01)
Physically inactive	0.03	1.8	0.06	(-0.002, 0.06)
Uses laptop/T.V after 8.00 pm	0.05	3.0	0.02	(0.02, 0.07)

**Table 3.** Sleep Latency in respective age groups

Age group	Difficulty (in waking %)	Sleep latency (in minutes)
4-5 years	17.1	22.00 (1.31)
6-10 years	34.2	22.31 (1.04)
11-15 years	34.3	18.43 (9.24)

**Table 4.** Comparison of nighttime sleep duration (TST in hours) in the present study and Western societies

Age group (in years)	Present study	Bahammam et al's study <sup>24</sup>	Iglowstein et al's study <sup>22</sup>	Ng et al's study <sup>23</sup>
4	9.8 (1.6)	-	-	-
5	9.0 (0.9)	-	-	-
6	9.6 (0.7)	8.8 (1.3)	10.9 (0.7)	9.1 (0.98)
7	9.6 (0.7)	8.7 (1.02)	10.7 (0.7)	8.9 (0.93)
8	8.9 (1.2)	8.6 (1.01)	10.4 (0.7)	8.87 (0.93)
9	8.9 (0.8)	8.5 (1.1)	10.2 (0.7)	8.8 (0.95)
10	8.4 (1.1)	8.4 (1.2)	9.9 (0.6)	8.72 (0.92)
11	8.1 (0.8)	8.2 (0.9)	9.6 (0.6)	8.55 (0.98)
12	9.2 (1.0)	8.0 (1.3)	9.3 (0.7)	8.6 (0.98)
13	8.1 (1.6)	7.9 (1.1)	9.0 (0.7)	-
14	9.1 (0.9)	-	-	-
15	8.4 (1.0)	-	-	-

The cells left blank were not reported by the respective authors for that specific age

## Discussion

Overall the TST in the present study was lower than recommended sleep hours for children. Carskadon, et al.,<sup>25</sup> and Yang, et al.,<sup>26</sup> reported decrease in TST with advancing school grades; transition point being the tenth class. They attributed it to the academic demands of higher grades. This was in agreement with the

findings of the present study. As in India school going children face the academic challenges as their grade advances, leading to mental stress among children resulting in inadequate sleep. Sleep duration in the present study was significantly more during the weekends. The usual bedtime in the present study was around 10 pm which was in agreement with the findings of other Asian

studies.<sup>27</sup> The wake up time shortened significantly during weekdays compared to weekends. The overview of literature showed that adolescents with advancing grades tend to go to bed later and woke up early in the morning.<sup>26</sup> This finding was in concurrence with the findings in the other countries.<sup>22-24</sup>

This lead to the inference that, school children may be sleep deprived during weekdays and had significant sleep debt. The sleepiness in day time during school and poor academic grades depicted that inadequate sleep can be the reason behind poor academic performance of a child. This concurs with the findings of the previous studies.<sup>28</sup> It was observed that the differences between sleep-wake patterns during the weekdays and weekends completely disappear during holidays, indicating that school going children are sleep deprived. Sleep problem could be a sleep pattern that is not acceptable or unsatisfactory to parents, child or clinician. The perception of sleep problem may vary from one society to another as the sleeping pattern appearing problematic to one group may appear normal to another. Studies from Japan<sup>29</sup> and Brazil<sup>30</sup> have revealed that gender may have an influence over the sleep. Girls have long sleep latency periods compared to boys. However, these findings are inconsistent and there were no gender influence on sleep in the present study and were in agreement with the findings of Gupta *et al.*<sup>31</sup> The reason behind variation may be, the possibility of underreporting could not be ruled out in Indian society and its cultural scenario. Parents might have been unaware or overlooking the behavioral problems and considering it as a normal phenomenon. The ongoing trends of urbanization and modernization have been consistently linked to sleep problems. The increase in nucleation of family, working of both the parents has altered the common childhood behavior problems including sleep.

Children of the working mothers showed inadequate/interrupted sleep in the present study. This was in concurrence with the finding of previous studies.<sup>32</sup> As it has been observed that longer maternal working hours

influences the family routine, prolong bed times and subsequently affecting child's sleep.<sup>33,34</sup> Co-sleeping was defined as sharing of the bed and the room by some other person, in addition to the index person.<sup>35</sup> In the present study co-sleeping with parents/sharing bedroom had significantly increased the quality and duration of sleep. The reasoning for this was psychological increased sense of security and reduced incidence of nightmares. The prevalence of co-sleeping was 67.4% in the present study. This was in agreement with findings of Asian population.<sup>36</sup>

However, on contradictory few studies suggested that co-sleeping could be the cause of nocturnal enuresis, sleep apnea and day time sleepiness.<sup>37,38</sup>

The introduction of media in bedrooms such as television, video games, internet, and mobile phones were largely held responsible for sleep debt. In the present study children playing games on mobile phones or computer after 8 pm showed significant reduction in total sleep time which was in agreement with the previous studies.<sup>39</sup> Studies have reported that watching television lately reduced the total sleep time, delayed bed time and children had difficulty in waking up.<sup>40</sup> In the present study the children older than 6 years of age and above had more difficulty in waking than their younger counterparts. The use of media for long duration at night might increase the activity level of the nervous system resulting in heightened alertness, physiological arousal, and difficulty falling asleep.<sup>41</sup> Also, the violent nature of games and television programs might lead to anxiety and difficulty in falling sleep.<sup>42</sup>

However, the optimal amount of sleep could be determined by "unconstrained sleeping" (i.e., letting children sleep as long as they felt necessary). Researchers also argued that sleep might be discretionary and sleeping longer did not indicate a need for more sleep, as in the same way that eating more did not indicate a need for more food.<sup>43</sup> Therefore, to determine sleep need, studies of sleep extension and sleep restriction should be undertaken followed by monitoring the relevant variables.

The limitation in present study was that questioning was restricted to parents only, leading to chances of underreporting of sleep problems in children where parents might be unaware. However, sleep durations obtained using parental reports have been shown to be correct.<sup>44</sup> We did not enquire about the socio economic conditions of the child/family which might have an influence on pre-sleep habits and sleep duration. In order to increase the sensitivity of screening children's sleep problems, both parents and children should be questioned in epidemiological settings followed by clinical assessments.

## Conclusion

Overall sleep durations of present study were lower than recommended sleep duration for children. Although the differences in sleep duration might appear relatively small, it might significantly affect physiological and cognitive development of child.<sup>45</sup> More studies should be conducted involving clinical trials as well as actinography and polysomnography to map the sleep pattern for each age group.

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## Ethical issues

None to be declared.

## Conflict of interest

The authors declare no conflict of interest in this study.

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