



## Original Article

## Impact of television on the quality of sleep in preschool children

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## ARTICLE INFO

## Article history:

Received 20 March 2015

Received in revised form 15 June 2015

Accepted 16 June 2015

Available online 25 June 2015

## Keywords:

Pediatric

Sleep apnea

Television

Electronic media

Sleep quality

## ABSTRACT

**Objectives:** We aimed to investigate the impact of different habits concerning television (TV) use and the time of day in which TV is watched on the sleep quality of young children.

**Methods:** Parents of 100 healthy children (58% boys, mean age of  $2.7 \pm 1.5$  years) attending a routine health check completed the Sleep Disturbance Scale for Children (SDSC) and a questionnaire concerning TV and electronic media use. Children were divided into those with a normal (SDSC-) or abnormal (SDSC+) questionnaire score. TV viewing habits were compared between groups.

**Results:** The total sleep time and total TV viewing time were not different between groups. A TV set was inside each child's bedroom in 51% of participants. Children with a TV in their bedroom showed significantly higher scores in the "sleep terrors," "nightmares," "sleep talking," and "tired when waking up" responses of the SDSC ( $P = 0.02, 0.01, 0.01, \text{ and } 0.01$ , respectively). Children with a TV in their room had an odds ratio (95% confidence interval) of 3.29 (1.08–9.99) for having an abnormal SDSC. Evening TV viewers had significantly higher SDSC scores compared with those who watched TV earlier during the day ( $P = 0.04$ ).

**Conclusions:** The presence of a TV set in the child's bedroom was associated with significant reductions in the quality of young children's sleep. Evening exposure to TV was associated with significantly worse sleep quality.

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## 1. Introduction

Television (TV), computers, smartphones, tablets, video game consoles, and other electronic media devices have become increasingly available for children and adolescents. Children and adolescents have also increased their exposure to media, raising the number of hours per day watching TV [1], surfing on the Internet, or playing video games [2]. In recent surveys, almost 100% of all adolescents in the US had at least one electronic device in their bedroom: 57% had a TV set, 28% a computer, 90% music players, and 64% cell phones [2,3]. Electronic devices have become more lightweight and portable; children can take a small tablet or smartphone everywhere with them, even to bed before going to sleep or during the night. Parental control seems to be far more difficult considering the omnipresence and small size of electronic devices [4].

The extent to which this sharp increase in the use of electronic media and TV may affect children's sleep has been demonstrated by several studies in older children and adolescents [5–7]. The use of multiple electronic devices and TV may even worsen the effect on the quality of sleep [8]. Furthermore, screen time has been associated with a decrease in the total hours of sleep time [9,10].

There are several possible mechanisms for linking sleep disruption to the use of TV. The most evident cause is the displacement of sleep initiation due to more and later use of TV viewing [2]. However, the exposure to the light emitted from TV screens or from other electronic devices may affect the natural circadian rhythm in children [2,11,12].

In toddlers and preschool children, TV viewing seems to be more consistently associated with emotional and peer relation problems than an e-game or computer use [13,14]. Despite findings that these young children are apparently spending even more time viewing TV than older children, there have been fewer studies on the impact of media use on sleep for this age group [4].

Considering that early childhood is a phase of progressive neuronal myelination and maturation of their cerebral cortex, the impact of TV on the quality of sleep is especially a concern. As sleep disorders have significant effects on the neurocognitive development

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of young children [15], the exposure to factors that may affect the normal circadian rhythm or sleep quality is of concern. Despite previously published evidence on the negative effects of TV and electronic media on the sleep quality of schoolchildren [16] and adolescents [2,17], there is still a lack of information on younger preschool children. In the present study, we aimed to investigate the impact of different habits concerning TV use and the time of the day when it is watched on sleep quality specifically in young children (ie, toddlers and preschoolers).

## 2. Methods

### 2.1. Subjects

Sampling consisted of healthy children aged 1–6 years who attended a health supervision check in the pediatric outpatient clinic of the Pontificia Universidad Católica de Chile in Santiago, Chile. Subjects were recruited from January 2013 to January 2014. The Chilean health supervision system is designed to provide routine health checks to all children on a regular schedule, that is, every month until the 6th month, then every two months until the first year, and subsequently every 3–4 months. Families were contacted in the waiting room before the health check. Parents completed two questionnaires before being called by their pediatrician. If the mother or father was not present, we accepted the grandmother having filled in the questionnaire if she was the primary carer for the child during most of the day. This was considered acceptable as in Chile it is quite usual for grandmothers to stay with their grandchildren while the parents are working, often until late in the evening. Grandparents frequently take the grandchildren to the doctor, feed them, and are aware of the child's habits. No randomization or preselection was intended. Children were included if (i) they were healthy, (ii) received no medication, and (iii) the parents consented and completed the study questionnaires. Children with any acute or chronic respiratory, cardiac, metabolic, or neurologic diseases were excluded.

Parental education was investigated separately for either parent. If the grandmother answered the questionnaire, we asked her to answer questions referring the education of the child's parents. The highest graduation level from school was scored on a four-point rating scale using "no graduation/primary school," "secondary school," "high school," and "college/university." The completed questionnaires were then returned to the investigator. The present study was approved by the ethical board of Pontificia Universidad Católica de Chile.

### 2.2. Sleep disturbance scale for children

The Sleep Disturbance Scale for Children (SDSC) is a 26-item questionnaire [18], with answers based on a Likert scale with values from 1 to 5. The SDSC consists of six subscales: disorders of initiating and maintaining sleep (DIMS), sleep-breathing disorders (SBD), disorders of arousal (DA), sleep-wake transition disorders (SWTD), disorders of excessive somnolence (DOES), and sleep hyperhidrosis (SHY).

The original version of the SDSC was validated in 1157 healthy children [18], and it has been used in several studies and for other ages [19–22]. The Spanish version [23] was adapted and applied to the parents of subjects participating in the current study. SDSC provides a total score that ranges from 26 to 130. A total SDSC score of >39 was considered abnormal [18]. Children were divided into those with an abnormal SDSC questionnaire score (SDSC+) and those with a normal score (SDSC–).

### 2.3. TV questionnaire

Parents were asked about the total hours of TV their children viewed, and also about their use of audiovisual media such as

smartphones, tablets, or computer games. In addition, they were asked about the quality and content of the programs watched by their children. There were 20 questions in total concerning the use of TV and audiovisual media. The types of TV programs were assessed and categorized as children's programs (educational, fairy tales, music shows), or action/violent content (eg, action, police movies, series, news, etc.). The number and location of TVs – inside or outside the child's room – were investigated as well.

The influence of the time of day at which TV was switched on and off was specifically investigated. Children were divided into three TV viewing groups depending on the times of day they typically watched: predominantly morning (06:00–13:00), afternoon (13:00–20:00), and evening (after 20:00).

### 2.4. Statistics

Descriptive statistics were used to outline subject characteristics, and the results of the questionnaire. Mean  $\pm$  standard deviation (SD) as well as median (minimum and maximum) were used to describe normally, and non-normally distributed variables, respectively.

Comparisons between SDSC+ and SDSC– were then made using the Student's *t*-test (for normally distributed variables) and the Mann-Whitney *U*-test (for non-normally distributed variables). Percentages were compared among the groups using chi-squared statistics.

In addition, correlations between each SDSC subscale's score and hours of watching TV were calculated using Spearman's rank correlation coefficient  $r_s$ .

Odds ratios (OR) and their 95% confidence intervals (CI) for having an abnormal SDSC score as the dependent variable were calculated using logistic regression analysis. The independent variable was the location of TV (ie, a TV set inside the child's room). The model was adjusted by age, gender, and maternal educational level.

Analysis of variance (ANOVA) was used in order to compare the SDSC total score and subscale scores between TV viewing groups. The Bonferroni test was used for multiple-comparison correction. A *P*-value of <0.05 was considered to be statistically significant. All analyses were performed using Statistical Package for Social Science (SPSS) Statistics 20.0.

## 3. Results

Of  $n = 110$  initially recruited children,  $n = 6$  had to be excluded from the study as they were using medication. Four of the completed questionnaires had to be excluded as they were not complete, leaving  $n = 100$  finally included subjects. All included children were from Hispanic origin.

Table 1 reports details on demographic characteristics of the study sample. Most questionnaires were answered by children's mothers (76%), only a few by their fathers (3%), with those completed by both parents (8%), or their grandmother (13%) making up the balance. Of the total sample, 58% were boys; their mean age was  $2.7 \pm 1.5$  years. Of the included children, 53% went to a kindergarten or school, and 73% of their mothers had a high educational level, that is, college/university. During weekdays, 6% of the children went to bed before 20:00, 27% between 21:00 and 22:00, 40% between 22:00 and 23:00, and 27% after 23:00. On weekends, corresponding figures were 7%, 11%, 32%, and 50%, respectively.

TV was switched on for an average of  $2.5 \pm 0.9$  h/day. There was only one family (1%) without a TV set in its household, whereas the majority (82%) had more than two TVs at home. A TV set was inside the child's bedroom in 51% of the included subjects. Sixty percent reported having used the TV as a sleep routine before going to bed. Video games were played by 7% of the children, and 11% used the parental smartphone for playing.

**Table 1**  
Demographic and clinical characteristics of the study sample.

	Total N = 100	SDSC- N = 57	SDSC+ N = 43	P-value
Age, mean ± SD*	2.7 ± 1.5	3.0 ± 1.7	2.4 ± 1.2	0.08
Males, n (%)	58 (58)	26 (60)	17 (40)	0.69
Maternal education, n (%) <sup>#</sup>				0.09
No graduation/primary school	0	0	0	
Secondary school	8 (8)	7 (12)	1 (2)	
High school	18 (18)	12 (21)	6 (14)	
University	73 (73)	37 (64)	36 (84)	
Abnormal SDSC, n (%)	43 (43)	0 (0)	43 (100)	<0.01
Score SDSC, mean ± SD*	39.1 ± 9.6	32.5 ± 4.5	47.9 ± 7.2	<0.01
Kindergarten or school attendance, n (%)	53 (53)	35 (61)	18 (42)	0.08

Abbreviations: SD, standard deviation; SDSC Sleep Disturbance Scale for children questionnaire. Comparisons were calculated using  $\chi^2$ , except for \* (Student's *t*-test). Data available for all included subjects, except for <sup>#</sup> (*n* = 1 missing answer).

**Table 2**  
Comparison of TV and media dichotomized by SDSC category.

	Total N = 100	SDSC- N = 57	SDSC+ N = 43	P-value
TV is in child's bedroom, n (%)	51(51)	16(33)	27(63)	<b>0.03</b>
No of TVs in household, mean ± SD*	2.5 ± 0.9	2.4 ± 0.9	2.7 ± 0.9	0.13
Hours watching TV, median (min–max)**	2.5 (0.5–11)	3.7 (0.5–11)	2.5 (0.5–6.5)	0.21
Watching TV after 13.00 h, n (%)	78 (78)	43 (75)	35 (81)	0.32
Watching TV after 20.00 h, n (%)	43 (43)	19 (33)	24 (55)	<b>0.02</b>
Children channel, n (%) <sup>#</sup>	48 (48)	25 (62)	23 (85)	<b>0.03</b>
Action/violent movies, n (%) <sup>##</sup>	8 (8)	6 (14)	2 (7)	0.35

Abbreviations: Max, maximum; min, minimum; SD, standard deviation; SDSC, Sleep Disturbance Scale for children questionnaire; TV, television. Comparisons were calculated using  $\chi^2$ , except for \* (Student's *t*-test), and \*\*Mann-Whitney *U*-test. Data available for all included subjects, except for <sup>#</sup> (*n* = 1 missing answer), and <sup>##</sup> (*n* = 2 missing answers).

Table 2 shows the results of the TV questionnaire. Time spent viewing TV was not significantly different between the SDSC groups. There was one subject who viewed 11 h of TV a day. Even after excluding this outlier from the analysis, the mean (SD) time spent watching TV was not significantly different between children with SDSC (+) versus those with SDSC (-): 2.4 ± 1.5 versus 2.8 ± 1.4, respectively (*P* = 0.25). Parents answered that they chose and restricted the contents of TV programs in 65% of children. In 7% of the questionnaires, parents answered that children themselves were allowed to decide which TV program they would like to view. Children's movies or series were viewed by the majority (81%), whereas action or violent movies were watched by 8% of the children. Parents described the TV program content as educational in 60% of the questionnaires. Parents felt that the TV program content their child watched was not appropriate for their age in 11% of cases.

The SDSC was abnormal in 43% of the included children. SDSC results categorized by groups who had a TV in the bedroom are presented in Table 3; the mean score was 39.1 ± 9.6. Internal reliability analysis showed a good Cronbach's  $\alpha$  of 0.76. Children with a TV set inside their bedroom showed significantly higher scores in the "sleep terrors," "nightmares," "sleep talking," and "tired when waking up" items of the SDSC (*P* = 0.02, 0.01, 0.02, and 0.01, respectively).

Table 4 shows the correlations between SDSC scores and total hours of watching TV. There was a significant correlation between the total hours of watching TV and the DIMS subscale score:  $r_s$  = 0.301

**Table 3**  
Comparison of SDSC items dichotomized by the presence of a TV in their room.

SDSC Item	TV in child's bedroom	No TV in child's bedroom	P-value
DIMS scale			
Sleep duration	1.3 ± 0.7	1.2 ± 0.7	0.26
Sleep latency	2.3 ± 1.2	1.9 ± 0.9	0.09
Going to bed reluctantly	1.4 ± 0.9	1.5 ± 0.9	0.24
Difficulty in falling asleep	1.9 ± 1.4	1.6 ± 1.1	0.46
Falling asleep anxiety	1.3 ± 0.9	1.3 ± 0.9	0.77
Night awakenings	1.9 ± 1.5	1.9 ± 1.3	0.16
Falling asleep after awakening	1.4 ± 0.9	1.4 ± 0.8	0.47
SBD scale			
Breathing problems	1.2 ± 0.6	1.1 ± 0.5	0.45
Sleep apnea	1.2 ± 0.7	1.1 ± 0.4	0.27
Snoring	1.7 ± 1.1	1.6 ± 1.1	0.85
DA scale			
Sleepwalking	1.0 ± 0.7	1.6 ± 1.1	0.33
Sleep terrors	1.6 ± 1.1	1.1 ± 0.5	<b>0.02</b>
Nightmares	1.3 ± 0.7	1.0 ± 0.2	<b>0.01</b>
SWTD scale			
Hypnic jerks	1.5 ± 1.0	1.3 ± 0.9	0.61
Rhythmic movement disorders	1.5 ± 0.9	1.7 ± 1.3	0.42
Hypnagogic hallucinations	1.4 ± 0.9	1.3 ± 0.7	0.35
Nocturnal hyperkinesia	1.8 ± 1.3	1.9 ± 1.5	0.72
Sleep talking	2.2 ± 1.4	1.5 ± 0.9	<b>0.02</b>
Bruxism	1.8 ± 1.4	1.4 ± 1.0	0.11
DOES scale			
Difficulty waking up	1.9 ± 1.5	1.4 ± 0.8	0.17
Tired when waking up	1.8 ± 1.3	1.2 ± 0.7	<b>0.01</b>
Sleep paralysis	1.3 ± 0.9	1.1 ± 0.6	0.42
Daytime somnolence	1.2 ± 0.7	1.2 ± 0.7	0.19
Sleep attacks	1.2 ± 0.4	1.4 ± 0.7	0.11
SHY scale			
Falling asleep sweating	2.0 ± 1.6	2.1 ± 1.6	0.62
Night sweating	1.8 ± 1.5	2.0 ± 1.6	0.31

Abbreviations: DA, disorders of arousal; DIMS, disorders of initiating and maintaining sleep; DOES, disorders of excessive somnolence; SBD, sleep-breathing disorder; SDSC, Sleep Disturbance Scale for children questionnaire; SHY, sleep hyperhidrosis; SWTD, sleep-wake transition disorders. All results are presented as mean ± standard deviation of each item. Comparisons were calculated using Student's *t*-test. Data available for all included subjects.

(*P* < 0.01). Logistic regression analysis demonstrated a significantly higher risk of having an abnormal SDSC in those children with a TV in their room: unadjusted OR (95% CI) was 3.29 (1.08–9.99), *P* < 0.01. The OR (95% CI) after adjusting for age, gender, and maternal education level was 2.28 (1.23–4.23), *P* = 0.02. The OR remained significant after additionally adjusting for kindergarten attendance: 2.33 (1.21–4.47), *P* = 0.03.

Table 5 reports the results for the comparison among the morning, afternoon, and evening TV viewer groups. Watching TV after 20:00 was more frequent in the SDSC + group than in those with a normal SDSC score, 55% versus 33%, respectively (*P* = 0.02). Evening TV

**Table 4**  
Correlations of SDSC scores with total TV time.

Score	$r_s$	P-value
Total SDSC	0.182	0.08
DIMS subscale	0.301	<0.01
SBD subscale	0.093	0.38
DA subscale	-0.011	0.92
SWTD subscale	0.109	0.29
SHY subscale	-0.008	0.94
DOES subscale	-0.061	0.56

Abbreviations: DA, disorders of arousal; DIMS, disorders of initiating and maintaining sleep; DOES, disorders of excessive somnolence; SBD, sleep-breathing disorder; SDSC, Sleep Disturbance Scale for children questionnaire; SHY, sleep hyperhidrosis; SWTD, sleep-wake transition disorders; TV, television. Correlations calculated using Spearman's  $r$  ( $r_s$ ). Data available for all included subjects.

**Table 5**  
Comparison among morning, afternoon, and evening TV viewers.

Score	Morning TV viewers	Afternoon TV viewers	Evening TV viewers	P-value
Total SDSC	34.4 ± 12.4 41 (26–59)	38.6 ± 9.2 38 (26–70)	40.9 ± 9.2 39 (26–70)	<b>0.04</b>
DIMS subscale	10.9 ± 3.9 10 (7–27)	11.5 ± 3.6 10.5 (7–22)	14.3 ± 6.9 12.5 (7–28)	<b>0.02</b>
SBD subscale	3.8 ± 1.7 3 (3–8)	3.9 ± 1.5 3 (3–9)	4.3 ± 1.7 3 (3–9)	<b>0.01</b>
DA subscale	3.7 ± 1.5 3 (3–6)	3.5 ± 1.6 3 (3–9)	3.6 ± 1.2 3 (3–9)	0.62
SWTD subscale	9.0 ± 4.3 6.5 (6–19)	9.8 ± 3.9 9 (6–23)	10.2 ± 4.0 9 (6–23)	0.59
SHY subscale	4.1 ± 3.5 2 (2–10)	3.9 ± 3.1 2 (2–10)	6.5 ± 4.2 5.5 (5–19)	0.71
DOES subscale	7.5 ± 6.5 5 (5–23)	6.4 ± 2.9 5 (5–19)	4.1 ± 3.2 2 (2–10)	0.62

Abbreviations: DA, disorders of arousal; DIMS, disorders of initiating and maintaining sleep; DOES, disorders of excessive somnolence; SDSC, Sleep Disturbance Scale for children questionnaire; SHY, sleep hyperhidrosis; SWTD, sleep-wake transition disorders; TV, television. Data available for all included subjects.

viewers had significantly higher scores in the DIMS, SBD, and SDSC total score compared with those who watched TV earlier during the day ( $P=0.02$ ,  $0.01$ , and  $0.04$ , respectively). Using Bonferroni correction, only DIMS remained significant between evening and afternoon TV viewers ( $P=0.02$ ). Due to the small number of children who used electronic devices, a time-of-day analysis was not possible regarding those devices.

#### 4. Discussion

The present study showed that the presence of a TV set inside the child's bedroom and the exposure to more hours of TV were associated with a significant reduction in young children's sleep quality. Sleep terrors, nightmares, sleep talking, and tiredness when waking up were all issues significantly affected by the exposure to TV. Interestingly, the evening exposure to TV showed a significant worsening of sleep quality; evening TV viewers had significantly more sleep problems.

These findings are in line with previous studies conducted in older children and adolescents [1,4]. In one of these studies, Owens et al. described several sleep problems in a sample of 495 schoolchildren (attending kindergarten to fourth grade) [1]. Similar to our results, in that study it was found that most TV viewing practices seemed to affect sleep adversely, especially in the "bedtime resistance" and "sleep-onset delay" domains [1]. In the present study, we found that TV exposure contributed to a significant delay in initiating sleep, and also to problems in maintaining sleep. Children exposed to a TV set in their bedroom also showed a significantly higher frequency of nightmares, sleep terrors, and sleep talking. It is interesting to stress that these younger children – similar to what has been observed in older children and adolescents – seem to be affected in several sleep domains by the exposure to TV. Paavonen et al. were able to demonstrate these negative effects on the quality of sleep in one study conducted in younger children [4]. The effect of different habits concerning TV on sleep was analyzed in 321 Finnish children aged 5–6 years using the same questionnaire (i.e., the SDSC) used in the present study. They found that TV viewing was related to different sleep difficulties [4]. Children having active exposure to adult programs, having the TV switched on when awakening, or subject to passive TV exposure (i.e., the child is not the one for whom the TV content is intended, and is not paying active attention to the TV program) had significantly higher ORs for sleep problems [4]. In line with that study [4], we were able to demonstrate a clear relationship between certain habits concerning TV

exposure (i.e., having a TV set in the child's bedroom) and sleep problems in different domains in younger children. The link observed between the exposure to TV and sleep problems in this younger population is novel and of concern.

In contrast to most of the previous studies [1,4,16] in the present study, almost 75% of the mothers had a high educational level. Although one may hypothesize the higher educational level as being a protective factor, several practices concerning exposure to TV were surprising in the present sample, in that nearly half of the children had a TV set in their own room. This fact is of concern, considering that the included children were very young, indicating that the exposure to TV seems to be starting very early in life. Comparing the present results with previous literature [24–26], it seems that this trend is increasing. Despite their heterogeneity, previous studies in children show a rise in the trend of having a TV set inside the child's bedroom: around 25% in 1999 [1], 28% in 2003 [24], and 39% in 2006 [5]. Our data show an extremely high presence of TVs inside young children's bedrooms. This frequency was higher than in previously published studies, such as one Chinese study of children that reported around 18% of elementary school children having a TV set inside their rooms, and another 18% a computer [27].

Despite the claim of included parents that they had a high control and restriction (65%) on the TV programs being watched by their son/daughter, we hypothesize that the presence of a TV set inside a child's bedroom may be affecting parental control. The presence of a poor parental limit setting may lead to an excessive exposure to TV and electronic media, and also to more irregular sleep habits. In a study conducted in older children (ie, schoolchildren) in Flanders, there was a significant association between TV viewing inside the child's bedroom with going to bed later and with less time spent in bed [16]. A TV set inside the child's bedroom may lead to an increase in the so-called passive TV viewing (ie, without the presence of the parents and/or an adult). The lack of a teaching or a social control seen during passive TV viewing may be harmful, and it may affect much more than sleep quality [4]. It is also interesting that despite their young age, our study found that the included children played video games and used parental smartphones regularly.

Despite the significant effect of TV exposure on sleep quality, parental concern for this practice seems to be low. In Owen's study, 89.9% of included parents reported that they felt TV had no significant effect on their child's sleep [1]. TV program content is also an issue of concern in children's education [28]. In the present study, parents described the TV program content as "educational" in most questionnaires. However, this contrasts with the fact that they felt the TV program content their child watched was not appropriate for their age in 11% of cases, and 8% of the programs were described as possibly violent. This fact is interesting, as previous studies have claimed that exposure to age-inappropriate TV such as that containing violence increases with age [29].

We found a significant difference in the DIMS subscale score in those children who watched TV later in the evening compared with those who watched earlier. This finding supports a possible interaction with the circadian rhythm as an important factor affecting the association between media exposure and sleep quality. The exposure to bright light emitted by TV and electronic devices may lead to the alteration of normal melatonin secretion, and [30,31] thus to increasing sleep-onset delay [32]. In this study, evening TV viewers showed the highest frequency of sleep problems concerning the total SDSC score. The negative effect of media consumption before going to bed or falling asleep has been described previously in older children and adolescents [1,4]. Bedtime TV viewing and using TV as a sleep aid seem to be consistently associated with a poorer sleep quality [4]. Fossum et al. showed a significant delay in circadian rhythm, daytime sleepiness, and morningness in a sample of students aged 18–39 years exposed to electronic media before falling

asleep [33]. The fact that this shift in circadian rhythm may be present at a very young age may be of special concern, and it should be investigated in future studies that analyze children's chronotype more accurately.

Despite the finding that TV had a significant impact on the sleep quality of younger children, there are some potential limitations of this study. First, the appreciation of many families that TV may have a negative effect on sleep may have led to biased answers in a questionnaire delivered before going to the pediatrician. This waiting room experience may potentially have led to "politically correct" answers that should be considered carefully. Underreporting of the hours watching TV, overstating the total sleep hours, and concealment of age-inappropriate viewing might have been present in this and in previous studies that used responses to questionnaires [1]. Although correlations between SDSC subscales and total hours of watching TV were significant,  $r_s$  values were in a weak range. This could be partially explained by the relatively small sample size and wide age range of the present study. Second, we were not able to confirm the total number of TV hours accurately with an electronic log or a device attached to the TV set. We hypothesize that the significant effects found in the present study may have been increased. Third, the SDSC may identify only a portion of the sleep problems experienced by the child. There are several questionnaires that might have been used [34]; we choose this questionnaire due to the simplicity of answering and the coverage of different sleep-quality domains.

## 5. Conclusions

The present study identified that having a TV set in the bedroom in particular seems to affect several sleep-quality domains. Young preschool children's exposure to TV and electronic media is associated with poor quality of sleep. The significant effect of evening TV viewing on sleep quality may be related to a circadian rhythm impact produced by this exposure.

## Conflict of interest

The authors declare no conflict of interest.

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: <http://dx.doi.org/10.1016/j.sleep.2015.06.005>.

## Acknowledgements

We would like to thank all the children and their parents who participated in the study. Furthermore, we thank FONDECYT project 11130573 for supporting the conduction of this study and analysis of data. We thank Mr. Richard Dewhirst and Mr. Alfred Brockmann for helping with the edition of this manuscript.

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