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Title: Non-Pharmacological Interventions to Lengthen Sleep Duration in Healthy Children

A Systematic Review and Meta-Analysis

Sub-title: Interventions to Lengthen Sleep Duration in Healthy Children

**Online Supplementary Materials:**

**eTable 1: Search strategy used in Medline**

**eTable 2: Detailed table of study characteristics**

**eTable 3: Spreadsheet of study estimates used**

## eTable 1: Search strategy used in Medline

### Ovid MEDLINE(R) ALL <1946 to November 04, 2019>

- 1 exp Child/
- 2 exp Pediatrics/
- 3 exp adolescent/
- 4 (paediatric\$ or pediatric\$ or child\$ or adolescen\$ or juvenile\$ or youth\$ or teen\$ or minor\$ or pubescen\$ or prepubescen\$ or boy\$ or girl\$).tw.
- 5 or/1-4
- 6 (sleep\$ adj5 (duration or quality or pattern\$ or improv\$ or increas\$)).tw.
- 7 exp Sleep/ and (duration or quality or pattern\$ or improv\$ or increas\$).tw.
- 8 sleep hygiene/
- 9 (bedtime\$ or bed time\$).tw.
- 10 time in bed.tw.
- 11 sleep time\$.tw.
- 12 or/6-11
- 13 (controlled clinical trial or randomized controlled trial).pt.
- 14 (randomized or randomised).ab,ti.
- 15 placebo.ab,ti.
- 16 dt.fs.
- 17 randomly.ab,ti.
- 18 trial.ab,ti.
- 19 groups.ab,ti.
- 20 or/13-19
- 21 Animals/
- 22 Humans/
- 23 21 not (21 and 22)
- 24 20 not 23
- 25 5 and 12 and 24

### Embase <1974 to 2019 Week 44>

- 1 exp Child/
- 2 exp Pediatrics/
- 3 exp adolescent/

4 (paediatric\$ or pediatric\$ or child\$ or adolescen\$ or juvenile\$ or youth\$ or teen\$ or minor\$ or pubescen\$ or prepubescen\$ or boy\$ or girl\$).tw.

5 or/1-4

6 (sleep\$ adj5 (duration or quality or pattern\$ or improv\$ or increas\$)).tw.

7 exp Sleep/ and (duration or quality or pattern\$ or improv\$ or increas\$).tw.

8 sleep parameters/ or sleep pattern/ or sleep quality/ or sleep time/

9 sleep hygiene/

10 (bedtime\$ or bed time\$).tw.

11 time in bed.tw.

12 sleep time\$.tw.

13 or/6-12

14 5 and 13

15 Randomized Controlled Trial/

16 randomization/

17 controlled clinical trial/

18 Double Blind Procedure/

19 Single Blind Procedure/

20 Crossover Procedure/

21 (clinica\$ adj3 trial\$).tw.

22 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj3 (mask\$ or blind\$ or method\$)).tw.

23 exp Placebo/

24 placebo\$.ti,ab.

25 random\$.ti,ab.

26 ((control\$ or prospectiv\$) adj3 (trial\$ or method\$ or stud\$)).tw.

27 (crossover\$ or cross-over\$).ti,ab.

28 or/15-27

29 exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/

30 human/ or normal human/ or human cell/

31 29 and 30

32 29 not 31

33 28 not 32

34 14 and 33

### PsycINFO <1967 to October Week 4 2019>

- 1 exp PEDIATRICS/
- 2 (paediatric\$ or pediatric\$ or child\$ or adolescen\$ or juvenile\$ or youth\$ or teen\$ or minor\$ or pubescen\$ or prepubescen\$ or boy\$ or girl\$).tw.
- 3 1 or 2
- 4 (sleep\$ adj5 (duration or quality or pattern\$ or improv\$ or increas\$)).tw.
- 5 exp Sleep/ and (duration or quality or pattern\$ or improv\$ or increas\$).tw.
- 6 (bedtime\$ or bed time\$).tw.
- 7 time in bed.tw.
- 8 sleep time\$.tw.
- 9 or/4-8
- 10 3 and 9
- 11 random\$.tw.
- 12 (clinical adj5 trial\$).tw.
- 13 (control\$ adj5 trial\$).tw.
- 14 ((clinical or control\$ or comparativ\$) adj5 (study or studies)).tw.
- 15 placebo\$.tw.
- 16 (single blind\$ or single-blind\$).tw.
- 17 (double blind\$ or double-blind\$).tw.
- 18 (triple blind\$ or triple-blind\$).tw.
- 19 or/11-18
- 20 10 and 19

### CENTRAL (The Cochrane Library Issue 10, 2019)

- #1 MeSH DESCRIPTOR Child Explode All AND CENTRAL:TARGET
- #2 MeSH DESCRIPTOR Pediatrics Explode All AND CENTRAL:TARGET
- #3 MeSH DESCRIPTOR Adolescent AND CENTRAL:TARGET
- #4 paediatric\* or pediatric\* or child\* or adolescen\* or juvenile\* or youth\* or teen\* or minor\* or pubescen\* or prepubescen\* AND CENTRAL:TARGET
- #5 {OR #1-#4}
- #6 (sleep\* NEAR5 (duration or quality or pattern\* or improve\* or increase\*)) AND CENTRAL:TARGET

- #7 MESH DESCRIPTOR Sleep EXPLODE ALL AND CENTRAL:TARGET
- #8 #7 AND (duration or quality or pattern\* or improve\* or increase\*)
- #9 #6 OR #8
- #10 #5 AND #9

### **Web of Science Core Collection**

- #1 TS=(paediatric\* or pediatric\* or child\* or adolescen\* or juvenile\* or youth\* or teen\* or minor\* or pubescen\* or prepubescen\*) OR TI=(paediatric\* or pediatric\* or child\* or adolescen\* or juvenile\* or youth\* or teen\* or minor\* or pubescen\* or prepubescen\*)
- #2 TS=(sleep\* NEAR (duration or quality or pattern\* or improve\* or increase\*)) OR TI=(sleep\* NEAR (duration or quality or pattern\* or improve\* or increase\*))
- #3 TS=(random\* or placebo\* or trial\* or groups) OR TI=(random\* or placebo\* or trial\* or groups)
- #4 #3 AND #2 AND #1

### **ClinicalTrials.gov**

Study type: interventional

Outcome measures: sleep duration

Limits: Child

### **WHO Trials Registry (<https://trialssearch.who.int/>)**

Search terms: sleep duration

Limits: Trials in children







**eTable 3: Spreadsheet of study estimates used**

Study name (citation)	Published sleep duration at follow-up (minutes)						Effect estimates (minutes)				
	Intervention group			Control group			Intervention Effect	Standard Error	Confidence interval		Estimation method
	Mean	SD	Total	Mean	SD	Total			Lower	Upper	
Bejamini 2012 <sup>51</sup>	411	67	10	422	50	11	-11.00	26.00	-61.97	39.97	1
Blake 2016 <sup>52</sup>	427.34	38.46	63	416.85	34.55	60	-3.97	5.72	-15.18	7.25	2
Bovi 2021 <sup>53</sup>			18			4	-20.69	60.13	-138.56	97.17	2
Bovi 2021 contrast 1	-34.8	99	9	0	0	2					
Bovi 2021 contrast 2	70.8	90	9	79.8	91.2	2					
Cain 2011 <sup>54</sup>	461.4	60	53	466.2	54	47	-4.80	11.40	-27.14	17.54	1
Cepni 2021 <sup>55</sup>	6.9		24	-18.2		26	-5.60	7.23	-19.80	8.53	2
Dewald-Kaufmann 2013 <sup>41</sup>	429	36	28	409	42	27	22.80	9.60	3.98	41.62	2
Dong 2019 <sup>56</sup>	436.63	58.15	89	430.57	60.63	87	-0.75	11.62	-23.52	22.02	2
Haines 2013 <sup>57</sup>	33.6	96	55	-11.4	120	56	45.00	21.12	3.60	86.40	2
Hammersley 2019 <sup>58</sup>	572.4	38.4	21	586.8	57.6	20	-33.00	15.00	-60.60	-1.80	2
Hammersley 2021 <sup>59</sup>			159			81	-6.00	7.13	-19.98	7.98	2
Hammersley contrast1	661.8	60.6	73	673.8	54.6	81	-6.00	10.10	-25.80	13.80	
Hammersley contrast2	664.8	51.6	86	673.8	54.6	81	-6.00	10.10	-25.80	13.80	
Hart 2017 <sup>43</sup>	35	28	38	-9	39	38	44.00	7.79	28.74	59.26	2
Hiscock 2019 <sup>61</sup>	624.1	43.9	140	627.1	44.2	157	-0.80	3.85	-8.30	6.80	2
Kalak 2012 <sup>62</sup>	434.89	45.1	27	406	56	24	28.89	14.35	0.76	57.02	1
Kira 2014 <sup>63</sup>	541	67	15	524	49	14	17.00	21.70	-25.53	59.53	1
Knebel 2020 <sup>64</sup>			351			246	-3.00	9.95	-22.80	16.20	2
Lin 2018 <sup>65</sup>	447	8.4	1385	391.2	12	1386	28.80	1.80	25.27	32.33	2
Lufi 2011 <sup>45</sup>	451	19	26	438	19	21	13.00	5.57	2.07	23.93	1
Marsh 2020 <sup>66</sup>	660	36	25	636	72	26	24.00	15.85	-7.07	55.07	1
Mindell 2009 <sup>67</sup>	612	51	133	612	52.2	67	0.00	8.43	-16.53	16.53	1
Mindell 2016 <sup>68</sup>	611.4	73.2	56	593.4	58.2	53	18.00	12.63	-6.76	42.76	1
Mitchell 2021 Study 1 <sup>69</sup>			14			8	26.53	11.96	3.09	49.96	2
Mitchell 2021 Study1 GF	510.6		6	489.6		4	33.00		-0.60	66.60	
Mitchell 2021 Study 1LF	523.6		8	489.6		4	20.40		-12.00	53.40	
Mitchell 2021 Study 2 <sup>69</sup>			28			9	-9.40	10.14	-11.09	29.11	2

Study name (citation)	Published sleep duration at follow-up (minutes)						Effect estimates (minutes)				
	Intervention group			Control group			Intervention Effect	Standard Error	Confidence interval		Estimation method
	Mean	SD	Total	Mean	SD	Total			Lower	Upper	
Mitchell Study2 LF			11			3	-13.20		-48.60	22.20	
Mitchell Study 2 LF + NFB			11			3	-13.80		-51.60	0.41	
Mitchell Study 2 NFB			11			3	-3.60		-34.80	27.00	
Moore 2019 Healthy Change <sup>70</sup>			118			60	0.23	3.83	-7.27	7.73	2
Moore 2019 System Change <sup>70</sup>			123			59	2.95	3.03	-2.99	8.88	2
Morell-Azanza 2019 <sup>71</sup>	526.42	72.53	79	516.62	141.58	27	9.80	28.44	-45.95	65.55	1
Moseley 2009 <sup>72</sup>	464.4	60	34	465.6	42	32	-1.20	12.69	-26.07	23.67	1
Moula 2020 <sup>73</sup>	489.79	46.02	28	464.4	71.6	28	25.39	16.09	-6.14	56.92	2
Mousarrezai 2020 <sup>74</sup>	564.86	35.44	47	528.96	52.2	45	29.14	8.44	12.59	45.69	2
Pablos 2018 <sup>75</sup>	570	42	82	582	42	76	-0.66	6.69	-13.20	12.00	2
Puder 2011 <sup>76</sup>	654	35.1289	333	653.88	35.1289	292	0.12	2.82	-5.40	5.64	2
Quach 2018 <sup>77</sup>	631.2	39.6	205	630	54	205	1.20	4.68	-7.97	10.37	1
Rigney 2015 <sup>78</sup>	475	60	88	474	64	87	1.00	9.38	-17.39	19.39	1
Santiago 2020 <sup>79</sup>	414	12	18	408	6	12	6.00	3.32	-0.50	12.50	1
Sousa 2013 <sup>80</sup>	436	73	18	425	95	16	11.00	29.33	-46.48	68.48	1
Sundgot-Borgen 2019 <sup>81</sup>			615			284	14.20	4.94	4.52	23.88	2
Sundot Borgen 2019 Boys Weekday	411	70.2069	182	384	72.81066	87	27.60	9.49	9.00	46.20	
Sundot Borgen 2019 Girls Weekday	406.8	63.69996	433	397.8	68.74613	197	9.00	5.82	-2.40	20.40	
Tamura 2014 <sup>82</sup>			72			76	13.77	6.87	0.31	27.24	1
Tamura 2014 Grade 4 Boys	522	51.3	13	514	15.5	15	8.00	14.78	-20.97	36.97	
Tamura 2014 Grade 4 Girls	526	19.8	13	512	39	11	14.00	12.98	-11.44	39.44	
Tamura 2014 Grade 5 Boys	483	57.4	10	477	36.6	11	6.00	21.24	-35.64	47.64	
Tamura 2014 Grade 5 Girls	505	48	11	474	31.5	14	31.00	16.74	-1.82	63.82	
Tamura 2014 Grade 6 Boys	506	28.9	17	482	74	13	24.00	21.69	-18.51	66.51	
Tamura 2014 Grade 6 Girls	491	47.9	8	492	29.9	12	-1.00	19.01	-38.25	36.25	
Tamura 2016 <sup>83</sup>	477.25	57.69	122	444.42	65.52	121	32.83	7.92	17.30	48.36	1
Taylor 2015 <sup>84</sup>	564	30.8847	89	564	30.8847	92	0.00	4.59	-9.00	9.00	2
Tomayko 2019 <sup>85</sup>	606	52.2	188	608.4	58.2	188	-2.40	5.70	-13.61	8.81	1

Study name (citation)	Published sleep duration at follow-up (minutes)						Effect estimates (minutes)				
	Intervention group			Control group			Intervention Effect	Standard Error	Confidence interval		Estimation method
	Mean	SD	Total	Mean	SD	Total			Lower	Upper	
Uhlig 2019 <sup>86</sup>	479.47	35.84	52	468.11	35.98	23	11.36	9.00	-6.28	29.00	1
Van Dyk 2017 <sup>42</sup>	442.2	24.9415	27	369.9	24.9415	27	72.30	6.79	59.00	85.60	1
Van Rijn 2020 <sup>87</sup>	359.4	45.6	97	358.8	47.4	108	0.60	6.50	-12.14	13.34	1
Walton 2015 <sup>88</sup>	744	25.2	27	744	34.2	21	-3.18	9.95	-22.80	16.20	2
Wilson 2014 <sup>89</sup>	660	54	45	624	54	42	36.00	11.59	13.29	58.71	2
Wing 2015 <sup>90</sup>	437		1545	434		2168	3.00	1.53	0.00	6.00	2
Wolfson 2015 <sup>91</sup>	13	58	73	-12	43	70	25.00	8.57	8.06	41.94	2
Yoong 2018 <sup>92</sup>	672	78	14	642	60	15	54.00	21.43	12.00	96.00	2

Footnotes

Estimation method code 1: intervention effect determined from differences at follow-up between intervention and control groups in RevMan using means, SDs and sample size for intervention and control groups

Estimation method code 2: intervention effect is obtained from published estimates reporting change in the intervention group adjusted for change in the control group that used ANCOVA/repeated measures ANOVA/mixed models/multilevel models

Subgroups within the same study (shaded rows) were combined first using fixed effects meta-analysis for pooling with other studies