

Table S1—Literature searches and keywords.

PubMed

Mesh Term: "Sleep Apnea Syndromes ", "Down Syndrome", "Polysomnography", "Dyssomnias"

Full Term: sleep apnea, OSA, sleep-disordered breathing, sleep disorders, apnea-hypopnea index, polygraphy, Down's syndrome, Trisomy 21, Mongolism, Mongoloid

Filter by humans, child: birth-18 years, infant: birth-23 months

(((((("Down Syndrome"[Mesh]) OR "Down's syndrome") OR "Trisomy 21") OR "Mongolism") OR "Mongoloid"))) AND
(((((((("polygraphy") OR "apnea-hypopnea index") OR "sleep disorders") OR "sleep-disordered breathing") OR "OSA") OR "sleep
apnea") OR "Dyssomnias"[Mesh]) OR "Polysomnography"[Mesh]) OR "Sleep Apnea Syndromes"[Mesh])

Medline

Mesh Term: "Sleep Apnea Syndromes ", "Down Syndrome", "Polysomnography", "Dyssomnias"

Full Term: sleep apnea, OSA, sleep-disordered breathing, sleep disorders, apnea-hypopnea index, polygraphy, Down's syndrome, Trisomy 21, Mongolism, Mongoloid

Filter by humans, all child: 0-18 years

((exp "Sleep Apnea Syndromes") OR (exp "Polysomnography") OR (exp "Dyssomnias") OR ("sleep apnea".mp.) OR ("OSA".mp.)
OR ("sleep-disordered breathing".mp.) OR ("sleep disorders".mp.) OR ("apnea-hypopnea index".mp.) OR ("polygraphy".mp.)) AND
((exp "Down Syndrome") OR ("Down's syndrome".mp.) OR ("Trisomy 21".mp.) OR ("Mongolism".mp.) OR ("Mongoloid".mp.))

EMBASE

Mesh Term: "Sleep Apnea Syndromes ", "Down Syndrome", "Polysomnography", "Dyssomnias"

Full Term: sleep apnea, OSA, sleep-disordered breathing, sleep disorders, apnea-hypopnea index, polygraphy, Down's syndrome, Trisomy 21, Mongolism, Mongoloid

Filter by humans, newborn: up to 1 month, infant: 1 to 12 months, child: 1 to 12 years or unspecified, preschool child: 1 to 6 years, school child: 7-12 years, adolescent: 13 to 17 years

(((((("Down Syndrome") OR "Down's syndrome") OR "Trisomy 21") OR "Mongolism") OR "Mongoloid"))) AND
((((((((("polygraphy") OR "apnea-hypopnea index") OR "sleep disorders") OR "sleep-disordered breathing") OR "OSA") OR "sleep apnea") OR "Dyssomnias") OR "Polysomnography") OR "Sleep Apnea Syndromes")

Cochrane library

Mesh Term: "Sleep Apnea Syndromes ", "Down Syndrome", "Polysomnography", "Dyssomnias"

Full Term: sleep apnea, OSA, sleep-disordered breathing, sleep disorders, apnea-hypopnea index, polygraphy, Down's syndrome, Trisomy 21, Mongolism, Mongoloid

(((((("Down Syndrome"[Mesh]) OR "Down's syndrome") OR "Trisomy 21") OR "Mongolism") OR "Mongoloid"))) AND
((((((((("polygraphy") OR "apnea-hypopnea index") OR "sleep disorders") OR "sleep-disordered breathing") OR "OSA") OR "sleep apnea") OR "dyssomnias"[Mesh]) OR "Polysomnography"[Mesh]) OR "Sleep Apnea Syndromes"[Mesh])

Data Source: PubMed, MEDLINE, EMBASE, and Cochrane; **Search date:** 2017.02.03.

Table S2—Detail of sleep studies of included studies.

| First author, year | Sleep study | Place | Interpreter | Scoring criteria | Channel |
|-----------------------------------|-------------|--------------|--|--|--|
| Ferri, 1997 ¹ | PSG | Lab | Detect by software and checked by visually examine | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, peripheral oxygen saturation, chest wall movement by thoracic impedance, oronasal airflow with thermistor |
| Levanon, 1999 ³ | PSG | Lab | Analyzed by computerized system, reviewed by a trained technician and 2 chest physicians | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, Nasal and buccal airflow by a thermistor, thoracic and abdominal movements by strain-gauge electrodes, and hemoglobin, oxygen saturation by pulse oximetry. Leg movements by a mechanical strain-gauge sensor. |
| de Miguel-Díez, 2003 ⁴ | Polygraphy | Hospital | Neurophysiologist, assisted by the computer | Validated portable ambulatory device (Apnoescreen II, Germany) | Oronasal airflow, tracheal sounds, chest and abdominal respiratory movements (inductance plethysmography), actigraphy using a wristband with activity sensor (movements of the upper extremities may help to quantify awakenings), electrocardiogram, and SaO ₂ (digital pulse oximetry) |
| Dyken, 2003 ⁵ | PSG | Lab | Technicians and physicians certified in sleep disorders medicine | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, airflow measurement by nasal and oral thermistors, chest wall movement, oximetry, snoring by microphone, audiovisual information by video camera |
| Ng, 2006 ⁶ | PSG | Lab | NR | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, one nasal cannula, one oral thermistor, one end-tidal CO ₂ monitor with pulse oximeter, one chest belt (Piezoelectric bands), one abdominal belt, and one microphone |
| Shott, 2006 ⁷ | PSG | Sleep center | Pulmonologists certified in sleep medicine | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, nasal/oral air flow through nasal pressure sensor; end-tidal carbon dioxide by infrared capnometry, oxygen saturation a pulse oximeter, oximeter pulse waveform, video monitoring using video camera and recorded on a videotape, and rib cage and abdominal volume changes with a computer-assisted respiratory inductance plethysmograph |
| Fitzgerald, 2007 ⁸ | PSG | Lab | NR | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, thoracic and abdominal plethysmographic bands, nasal airflow by a nasal cannula, mouth breathing via a thermistor, SpO ₂ , transcutaneous carbon dioxide, and a position sensor |

| | | | | | |
|-------------------------------|-----|----------|---|---|--|
| Shires, 2010 ⁹ | PSG | Lab | Certified technicians and board-certified sleep medicine specialist | NR | EEG, EOG, EMG, ECG, oxygen saturation (SaO ₂), oronasal airflow (thermistor), abdominal and chest wall movement, infra-red video camera |
| Rosen, 2010 ¹⁰ | PSG | Lab | NR | Before 2007: Rechtschaffen and Kales 1968 ² After 2007: 2007 AASM ¹¹ | EEG, EOG, EMG, ECG, end-tidal carbon dioxide, transcutaneous pulse oximetry, and chest and abdominal wall motion with sum channel (piezoelectric transducers). Nasal pressure was measured with a pressure transducer and oronasal airflow with a thermistor |
| Breslin, 2014 ¹² | PSG | Home | Registered polysomnographic technologist | 2007 AASM ¹¹ and American Sleep Disorders Association ¹³ | EEG, EOG, EMG, ECG, thoracic and abdominal displacement (inductive plethysmography bands), finger pulse oximeter, body position, ambient light, flow limitation by a nasal cannula |
| Lin, 2014 ¹⁴ | PSG | Lab | Trained technicians | American Thoracic Society ¹⁵ and 2007 AASM ¹¹ | EEG, EOG, EMG, ECG, oxygen saturation by pulse oximetry, thoracic and abdominal breathing movements by uncalibrated respiratory inductance plethysmography, transcutaneous carbon dioxide, airflow by nasal pressure and oronasal airflow |
| Austeng, 2014 ¹⁶ | PSG | Hospital | NR | 2007 AASM ¹¹ | EEG, EOG, EMG, ECG, ribcage and abdominal wall movements by respiratory inductance plethysmography, flow by nasal pressure transducer, arterial oxygen saturation by pulse oximetry, body position, video and audio recordings |
| Brooks, 2015 ¹⁷ | PSG | Lab | Trained technicians | Rechtschaffen and Kales 1968 ² | EEG, EOG, EMG, ECG, wall and abdomen by respiratory inductance plethysmography, airflow from the nose and mouth by thermocouples, oxyhemoglobin saturation by pulse oximetry |
| Goffinski, 2015 ¹⁸ | PSG | Hospital | Certified physician | 2007 AASM ¹¹ | EEG, EOG, EMG, ECG, end-tidal carbon dioxide, digital pulse oximetry, respiratory rates, limb movement, chest and abdominal movement with thoracic and abdominal impedance belts |
| Basil, 2016 ¹⁹ | PSG | Hospital | Pediatric pulmonologists | 2007 AASM ¹¹ | NR |
| Maris, 2016 ²⁰ | PSG | NR | Certified technicians | Update 2007 AASM ²¹ | EEG, EOG, EMG, ECG, Respiratory effort by respiratory inductance plethysmography, oxygen saturation by pulse oximeter, airflow by a nasal pressure cannula and thermistor, snoring by microphone at the suprasternal notch, and audiotape/videotape using an infrared camera |

| | | | | | |
|-------------------------------|------------|----------|--------------------------|--------------------------------|---|
| Brockmann, 2016 ²² | PSG | Home/Lab | NR | Update 2007 AASM ²¹ | EEG, EOG, EMG, ECG, chest and abdominal wall movements, nasal pressure transducer, snoring, pulse oximetry-derived arterial hemoglobin oxygen saturation and pulse waveform, heart rate, digital audio and video |
| Hill, 2016 ²³ | Polygraphy | Home/Lab | Experienced technologist | Update 2007 AASM ²¹ | Chest and abdominal respiratory inductance plethysmography, pulse oximetry yielding oxyhaemoglobin saturation (SpO ₂), plethysmography, and pulse signals, nasal pressure flow with integral snore sensor, body position sensor, and actigraphy |

AASM = American Academy of Sleep Medicine, ECG = electrocardiography, EEG = electroencephalography, EMG = electromyography, EOG = electrooculography, NR = not reported, PSG = polysomnography.

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|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| Breslin, 2014 ¹² | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Moderate |
| Lin, 2014 ¹⁴ | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Moderate |
| Goffinski, 2015 ¹⁸ | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Moderate |
| Brooks, 2015 ¹⁷ | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low |
| Hill, 2016 ²³ | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low |
| Maris, 2016 ²⁰ | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low |
| Basil, 2016 ¹⁹ | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Moderate |
| Brockmann, 2016 ²² | No | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Moderate |

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Figure S1—Prevalence of OSA based on **(A)** AHI > 1.5 and **(B)** AHI > 2 events/h in children with Down syndrome.

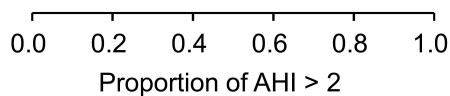
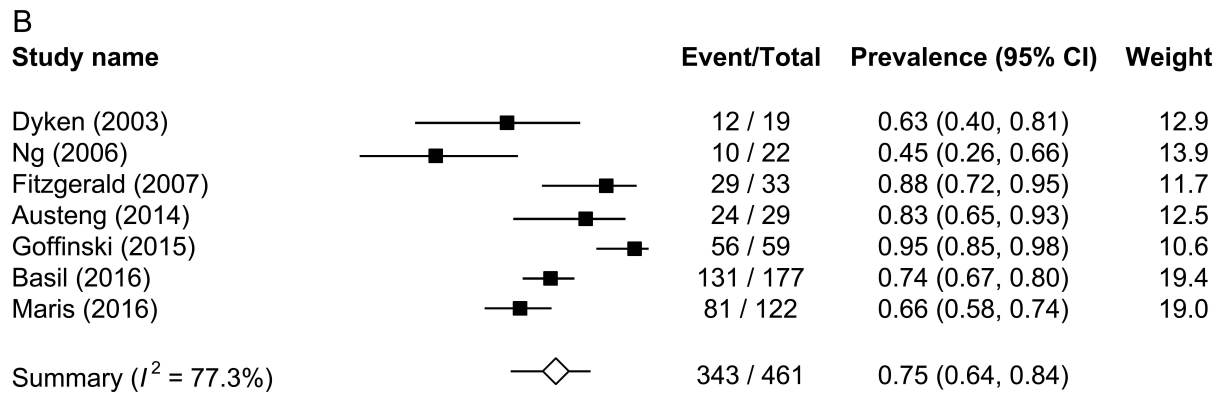
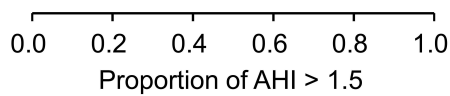
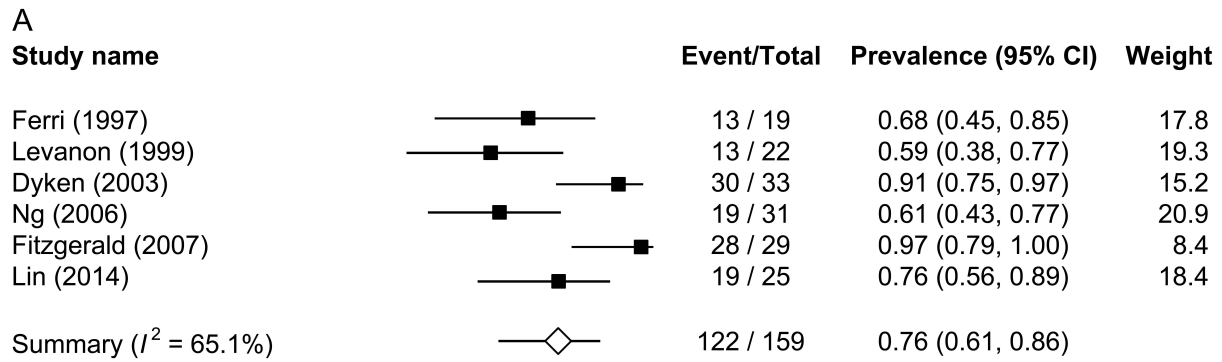


Figure S2—Prevalence of OSA based on AHI > 5 events/h in children with Down syndrome.

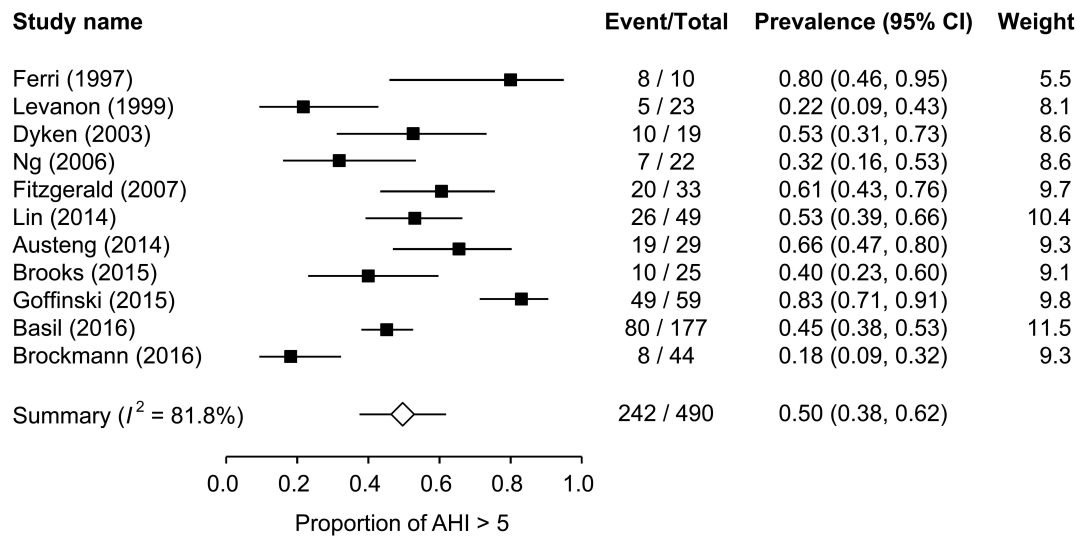


Figure S3—Prevalence of OSA based on AHI > 10 events/h in children with Down syndrome.

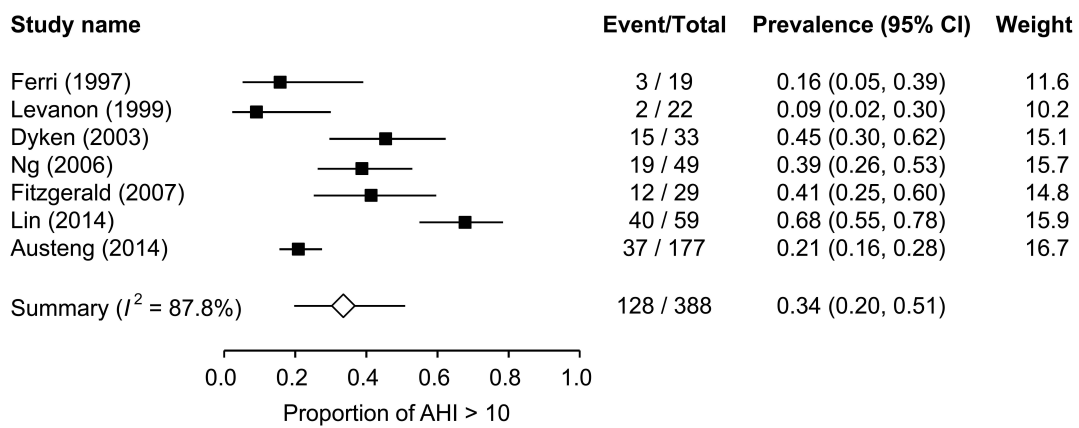


Figure S4—The prevalence of OSA between children underwent PSG and polygraphy.

