Author, Year Country Study Design Sample Size	Population Intervention Outcome Measure	Results
(Singh et al., 2018) USA Observational N=26	**Population:** *Typically Developing (TD; N=14):* Age: 7±2 yr; Gender: males=6, females=8. *SCI (N=12):* Age 6±1 yr; Gender: males=7, females=5. Level of injury: C5=4, C8=1, T1-3=6, T12=1; Time since injury: 52±37 mo. **Intervention:** None. Measurements. **Outcome Measures:** Height, weight, Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV_1), Maximum Inspiratory Pressure (PI_{max}), Maximum Expiratory Pressures (PE_{max}).	*Pulmonary Function Test* 1. Compared to children with SCI, children in the TD group produced significantly greater FVC and FEV_1 ($p<0.01$). 2. TD children and those with SCI both showed a strong, positive correlation between age and FVC and FEV_1. 3. In TD children, a strong positive correlation was observed between FVC and height, and weight and between FEV_1 and height, and weight. 4. In the SCI group, height and weight did not significantly correlate to FVC or FEV_1 values. *Maximum Airway Pressure Measurements* 5. Children in the TD group generated significantly higher PE_{max} ($p<0.01$) than children in the SCI group. 6. No significant difference in PI_{max} was observed between the two groups. 7. For children in both groups, age was not significantly correlated to PE_{max} or PI_{max} values. 8. In TD children, height and weight were significantly correlated with PE_{max} and PI_{max} values ($p<0.05$); however, height and weight did not significantly correlate to PE_{max} or $PI_{max\ values}$ in children with SCI. *Surface Electromyography (sEMG)* 9. During PE_{max} assessment, children with SCI produced significantly lower ($p<0.05$) muscle activation of rectus abdominous and external oblique and significantly higher ($p<0.05$) activation for upper trapezius compared to children in the TD group. 10. No significant differences in muscle activation of pectoralis major, external intercostal, thoracic paraspinal, and lumbar paraspinal were found. 11. During PI_{max} measurement, no significant differences were found between sEMG activation of respiratory muscles obtained from children in the TD and children in SCI groups.
(Bergström et al., 2003) United Kingdom Observational N=12	**Population:** Mean age at measurement: 13 (10-17) yr; Mean age at injury: 5 (0-11) yr; Gender: males=9, females=3; Mean time since injury: 8 (4-13) yr; Level of injury: C8=1, T1-L1=11; Severity of injury: Frankel A=7, B=2, C=2, D=1. **Intervention:** None. Anthropometry. **Outcome Measures:** Height, arm span, Forced Expiratory Volume (FEV_1), Peak Expiratory Flow Rate (PEFR), Forced Vital Capacity (FVC), Total Lung Capacity (TLC), and Residual Volume (RV).	1. For all subjects, the arm span measurement was significantly greater than the height ($p<0.001$). 2. The predicted values for the lung function tests were calculated with height and arm span, respectively; they were significantly different ($p<0.001$). 3. Predicted lung function calculated by using height closely reflected the actual lung function; however, precited lung function calculated by using arm span overestimated the lung function by approximately 20%. 4. For individuals with lesion level C8-T9 lung test results indicated underperformance relative to both predicted values, but more so when predicted values were calculated using arm span ($p<0.05$). 5. For individuals with lesion level T10-L1 actual lung test results were below normal predicted values when calculated using arm span but were over normal values when using the height in the prediction calculation ($p<0.01$).

(Padman et al., 2003) USA Observation N=47	**Population:** Mean age: 11.4±.5.9 yr; Gender: males=36, females=12; Injury etiology: SCI only=34, SCI and brain injury=13; Level of injury: C1-2=24, C3-5=23. **Intervention:** None. Chart Review. **Outcome Measures:** Inspiratory force, tidal volume, oxygen saturation, end tidal CO_2, respiratory rate, heart rate, accessory muscle use and retractions, ventilator weaning success.	1. There was no significant difference in age, sex, or weight between the two injury groups (C1-2 versus C3-4). 2. Sixty-three percent of patients were successfully weaned from mechanical ventilation. 3. Patients with injuries C3-4 or lower and tidal volumes of 18 to 20 cm^2/kg were more successfully weaned from mechanical ventilation. 4. There was a significant difference between the two lesion groups for height (p=0.028) in that those successfully weaned from the ventilator before discharge were taller. 5. Patients who had complications such as atelectasis were ventilator dependent at discharge (p=0.001). 6. There were fewer patients with complications in the group that was successfully weaned before discharge. 7. The rate of weaning depended on a patient's ability to maintain the work of breathing without signs of fatigue and tachypnea, his or her ability to maintain normal oxygen saturations and eucapnia, and his or her ability to remain free of infections. 8. Thirty-six percent of patients initially required synchronized intermittent mechanical ventilation, with 22% managed in assist control mode: the average tidal volume delivered was 15 cm^2/kg, with a maximum of 22 cm^2/kg. 9. A Shiley tracheostomy tube was used in 52% of patients, a Portex tube in 10%, and a Bivona tube in 5%. 10. To maintain adequate caloric intake and support successful weaning, 30% of patients required enteral feeding. 11. Twelve patients experienced complications during weaning, which included tracheitis, atelectasis, and pneumonia. 12. Flexible fiber-optic bronchoscopy was performed prior to decannulation; thirty-four percent of patients required the removal of suprastomal granulation tissue prior to decannulation. 13. There were no deaths, and none of the patients required readmission to the hospital for late-onset respiratory failure after weaning from mechanical ventilation. 14. All patients were discharged to their homes. 15. Successful school re-entry or home school programs were achieved in all patients by 6 to 12 months post-discharge.
(Gilgoff et al., 1988) USA Pre-Post N=8	**Population:** Mean age: 7 yr 5 mo (3 yr-16 yr 3 mo); Level and severity of injury: C2 tetraplegia=8. Respiratory function: spontaneous respiration completely absent among all. **Intervention:** Neck accessory muscle strengthening program with a physiotherapist with gradual removal of respiratory assistance.	1. Seven of eight subjects learned the neck breathing technique, remaining disconnected between 20 min and 12 hr (mean=3.5 hr). 2. It took, on average, 18 to 454 days for the subject to achieve the confidence to be disconnected from the respirator for 20 minutes. 3. The patient who could not learn to neck breath had significantly decreased neck strength and required neck control while seated. 4. Follow-up information available for 3 subjects: • Subject 1: Patient 1 was studied seven hours after disconnection from respiratory equipment. End-tidal CO_2 values remained consistently 40 mmHg; vital capacity 410 mL,

	Outcomes Measures: End tidal CO_2, oxygen saturation, vital capacity	12% of predicted normal for age and height; respiratory rate 26; patient refused bloodwork. • Subject 5: Arterial blood gas values were as follows: "on" the respirator-pH 7.48, PO_2 102 mmHg, PCO_2 26 mm Hg, HCO_3 19 mEqJL, oxygen saturation 99%; "off" the respirator with neck breathing for one hour 45 minutes -pH 7.45, P02 95 mm Hg, PCO_2 28 mm Hg, HCO_3 19 mEq/L, oxygen saturation 98%. • Subject 4: "On" his respirator, end-tidal CO_2 value was 28 mm Hg, oxygen saturations 98% to 99%, heart rate 90 beats per minute, and respiratory rate set on the respirator at 14 breaths per minute. After neck breathing for 20 minutes, his end-tidal CO_2 measurement was 32 mm Hg, oxygen saturations 95% to 97%, heart rate 112 beats per minute, and respiratory rate 42 breaths per minute. • All patients had a tracheostomy which helped to facilitate speaking. • All 8 patients were discharged home; the 7 patients who learned to neck breath continued using this technique post discharge. • Four patients relayed that there were episodes of accidental disconnection of their equipment for which neck breathing saved their lives. • Six patients were still alive at follow-up and two had died of causes not related to neck breathing.