alterations, potentially influencing lung diffusing capacity (DLCO) and gas exchange. Techniques of measurement are complex and feasibility in children needs to be addressed.
Aims: To study repeatability of DLCO in children and young adults, and to compare results of subjects born EP and at term in two different decades.
Methods: Two area-based cohorts of subjects born at gestational age (GA) ≤ 28 weeks or with birth weight (BW) ≤ 1000 grams in the two periods 1991-1992 (n=35) and 1982-1985 (n=46) and matched controls born at term performed single-breath DLCO tests twice within two weeks. Mean ages (SD) were 10.6 (0.4) and 17.7 (1.2) years.
Results: The coefficient of variation for intersession measurements of DLCO for subjects born preterm and at term in the 1991-92 and 1982-85 birth-cohorts were 8.2 and 7.7%, and 9.5 and 7.6%, respectively. EP birth was associated with significantly reduced height adjusted DLCO and with lower KCO**. Deficits were similar in the two birth-cohorts (test of interaction, p = 0.410).

		1991-92 Birth-cohort	1982-85 Birth-cohort
SB-DLCO*	Preterm	4.3 (4.0, 4.6)	8.1 (7.5, 8.7)
	Control	5.3 (5.1, 5.5)	9.0 (8.4, 9.6)
KCO**	Preterm	1.63 (1.55, 1.71)	1.51 (1.45, 1.58)
	Control	1.79 (1.71, 1.87)	1.61 (1.54, 1.69)

Figures are group mean values (95% confidence intervals). *Single-breath DLCO, **SB-DLCO/effective alveolar volume.

Conclusions: Repeatability of DLCO was acceptable for all subgroups. Compared to controls born at term, lung diffusion capacity was significantly and similarly reduced for subjects born preterm in the two decades studied.

P1108
Effect of prenatal exposure to tobacco on lung function of infants born preterm
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Introduction: The exposure of foetus to tobacco during pregnancy, in otherwise healthy infants born at term, is associated to lower expiratory flows as measured both by means of the rapid thoracoabdominal compression technique (RTC) and by the raised-volume rapid thoracoabdominal compression technique (RVRTC). The aim of the present study is to measure lung function by RVRTC in healthy infants born preterm exposed or non-exposed to tobacco in pregnancy.
Methods: Forced vital capacity (FVC), forced expiratory flows at 50%, 75%, 85% 25-75% of FVC (FEF_{50}, FEF_{75}, FEF_{85}, FEF_{25-75}) and forced expiratory flow at 0.5 sec ($FEV_{0.5}$), were obtained by RVRTC in 44 healthy infants born preterm (26 males), without neonatal respiratory distress. A multivariate linear regression analysis adjusted for gender, gestational age, corrected age, length and prenatal tobacco exposure, was performed.
Results:

Table 1

	Non exposed Mean (SD)	Exposed Mean (SD)	p
Male gender (%)	60	60	0.86
Gestational age (wk)	30.16 (0.5)	30.78 (0.7)	0.49
Neonatal weight (gr)	1432 (99.8)	1453 (132.5)	0.90
Corrected age (mo)	6.6 (1.1)	7.1 (1.4)	0.79
Length (cm)	67 (1.9)	68.2 (2.1)	0.70

Table 2. Multivariate regression coefficients of lung function parameters of infants born preterm exposed to tobacco in pregnancy

	Coefficient	95% CI
FVC (mL)	–28.75	–55.41; –2.10
FEF50 (mL)	–20.67	–83.32; 41.98
FEF75 (mL)	–13.27	–58.22; 31.67
FEF 85 (mL)	–13.23	–52.45; 25.99
FEF25-75 (mL)	–12.27	–74.56; 50.02
FEV0.5 (mL)	–3.90	–34.10; 26.30
FEV0.5/FVC	–0.08	–0.167; 0.004

Conclusions: In infants born preterm, at a corrected age of ∼7 months, prenatal tobacco exposure is significantly associated to a lower FVC, but does not change forced expiratory flows.

109. New insights in paediatric respiratory physiology

P1107
Single-breath lung diffusion capacity for carbon monoxide in children and young adults born extremely preterm
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Introduction: Extreme preterm (EP) birth is associated with acinar developmental

P1109
Acetazolamide for severe hyperventilation and apnea in a child with Pitt-Hopkins syndrome
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Case report: We present the case of a 9 year old boy with Pitt-Hopkins syndrome

who had severe attacks of hyperventilation followed by apnea and syncope while awake. These episodes occurred on a daily basis. A magnetic resonance scan of the brain at the age of 4 years showed a normal aspect of the brain stem and cerebellum. Figure 1 shows serious oxygen desaturation and hypocapnia.

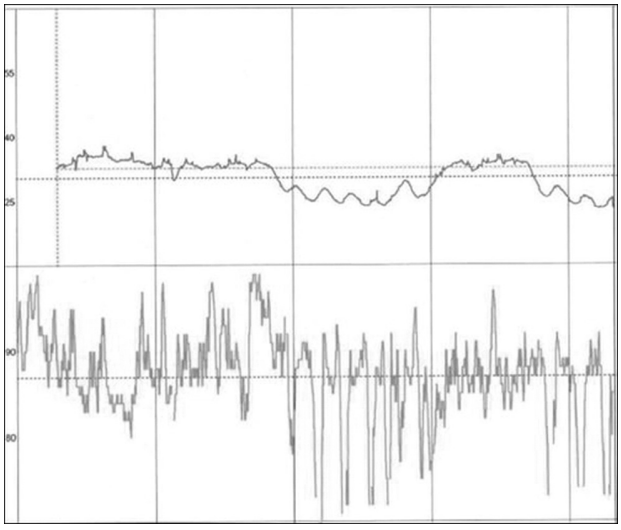

Figure 1

In view of the hyperventilation, we started the patient on 250 mg of acetazolamide once daily. The patient was reevaluated one and a half month later. The clinical picture was markedly improved: long lasting apneas and episodes of syncope were no longer observed. A blood gas showed a pH of 7.35 with a pCO_2 of 32.9 mmHg and a base excess of -6.5 mmol/L. Polygraphic monitoring showed the presence of several short central apneas but with preserved oxygen saturation and a more stable CO_2 curve.

Discussion: Pitt-Hopkins syndrome is due to de novo mutations at the TCF4 locus and is characterised by distinct facial features, mental retardation and episodic hyperventilation with apnea while awake. Both the pathogenesis of these hyperventilation episodes as its treatment are unknown. This is the first report on the positive effect of acetazolamide on daytime hyperventilation and apnea in this syndrome. In this view; it would also be interesting to study the effects of acetazolamide in patients with similar syndromes including Rett and Joubert syndrome.

P1110

Peripheral airway function versus spirometry in childhood asthma

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Background: Tests of peripheral airway function are rarely used in clinical studies of paediatric asthma. The relationships between FEV1 and indices of small airway function from inert gas washout and impulse oscillometry have not been directly compared and are largely unknown.

Methods: Scond and Sacin (inert gas indices of ventilation inhomogeneity in the conducting and acinar airway zones, respectively) were measured from mass spectrometer multiple breath SF6 washout. Frequency dependence of resistance (R5-R20Hz, a measure of small airway obstruction) was measured using impulse oscillometry (IOS). Both of these tests were performed prior to spirometry, both at baseline and post-bronchodilation (BD) (400 mcg salbutamol inhalation) in 58 subjects aged 8-18 yrs with stable asthma of mild to moderate severity. Reference values for Scond and Sacin were obtained from 45 healthy subjects and for R5-R20Hz from 169 age matched controls. Spirometric reference values were taken from Stanojevic et al 2009 [1]. Results were expressed as z-scores.

Results: FEV1 was normal (z score >-1.96) in 48/58 (83%) at baseline and 58/58 (100%) subjects post-BD.In those subjects with normal FEV1 abnormal (z-score >1.96) R5-R20Hz, Scond and Sacin were found in 38/48 (79%), 26/47 (55%), and 5/47 (11%) at baseline and 18/58 (31%), 15/56 (27%) and 4/56 (7%) of subjects post BD, respectively.

Conclusions: Peripheral airway dysfunction is common in school age asthmatics with normal FEV1. This abnormality persists in almost a third despite bronchodilation. The most sensitive indices to detect this peripheral abnormality are R5-R20Hz and Scond.

Reference:

[1] Stanojevic et al. Am J Respir Crit Care Med. 2009 Sep 15;180(6):547-52.

P1111

Vocal cord dysfunction in adolescents

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Background: Vocal cord dysfunction (VCD) often presents with dramatic and abrupt symptoms. To diagnose VCD, visualisation by direct laryngoscopy is required and usually a specific method to provoke VCD is needed.

Objectives: Adolescents with clinical suspicion of VCD were invited to participate. The first objective was to diagnose VCD, second objectives were changes of pulmonary function test (PFT) and predictors of VCD before and after methacholine challenge test (MCT).

Methods: After an initial PFT, a direct laryngoscopy was performed. This was followed by the MCT; the endpoint was the methacholine dose causing a 20% drop of the forced expiratory volume in one second ($PD_{20}FEV_1$). After that a second laryngoscopy was conducted. PFT changes before and after MCT were compared with the data of 14 healthy controls (HC).

Results: Thirty-five patients (8-19 years) were investigated. Three failed to have a significant reaction to methacholine and three showed anatomical alterations. Of the remaining 29 patients, 14 had VCD and 15 had bronchial hyperresponsiveness (non-VCD). $PD_{20}FEV_1$ methacholine was significant lower in VCD compared with non-VCD (VCD 0.24 mg ± 0.4, non-VCD 0.73 mg ± 0.73, p= 0.0006). VCD patients showed significantly lower PFT parameters after MCT; FEV_1: VCD 58.5% ± 20.1, non-VCD 77.8% ± 18.4, and HC 98.7% ± 16.6 (p< 0.0001); inspiratory vital capacity (IVC): VCD 61.3% ± 20.9, non-VCD 75.7% ± 14.8, and HC 101.1% ± 15.4 (p= 0.0004).

Conclusions: The combination of MCT and laryngoscopy may be able to differentiate between VCD and non-VCD patients. VCD patients showed a positive reaction at lower methacholine doses and had a higher airway obstruction. PFT and MCT do not replace direct laryngoscopy in the diagnosis of VCD in adolescents.

P1112

Evolution of lung function in preterm infants with or without bronchopulmonary dysplasia

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Introduction: Healthy preterm infants do no catch-up lung function (LF) during the first two years of life. The aim of study is to compare the evolution of LF in infants born preterm, with and without BPD.

Methods: Forced vital capacity (FVC), forced expiratory flows at 50%, 75%, 25-75% of FVC (FEF_{50}, FEF_{75}, FEF_{25-75}) and forced expiratory flow at 0.5 sec ($FEV_{0.5}$), was obtained by raised volume rapid torachoabdominal compression technique (RVRTC) in 14 (7 males) BDP+ and in 12 (6 males) infants born preterm BPD-. Measurements were repeated at 6 and 12 moths after baseline. A generalized estimating ecuations (GEE) adjusted for gestational age, length, corrected age and body mass index z-score (according OMS tables) was built for boys and girls separately.

Results:

Table 1. Characteristics of BPD+

	Male Mean (SD)	Female Mean (SD)	p
Gestational age (weeks)	26.6 (1.4)	25 (0.8)	0.025
Neonatal weight (grams)	900 (84.7)	764.3 (50.7)	0.19
Corrected age 1st measure (months)	4.7 (2.7)	5.4 (3.4)	0.67
Length (z-score)	–1.0 (0.6)	–0.42 (2.3)	0.52
BMI (z-score)	–0.69 (1.59)	–1.87 (0.85)	0.12
Oxigen dependency (days)	70.6 (14.3)	119.9 (81.4)	0.14

Table 2. GEE coefficients of LF parameters of infants born preterm BPD+ (base: BPD–)

	Male		Female	
	β	95% IC	β	95% IC
FVC (mL)	–76.1	–112.9; –39.3	20.3	–61.2; 101.7
FEF50 (mL/s)	–60.4	–178.4; 57.6	136.8	45.3; 228.3
FEF75 (mL/s)	–53.1	–107.5; 1.31	62.9	–2.4; 12.4
FEF25-75 (mL/s)	–94.8	–176.6; –13.1	137.6	35.6; 239.6
FEV0.5 (mL/s)	–50.0	–74.8; –25.2	37.0	–7.7; 81.8
FEV0.5/FVC	–0.02	–0.09; 0.05	0.07	0.0002; 0.14

Conclusions: FVC, FEF_{25-75} and $FEV_{0.5}$ decrease among male infants with BPD as compared to those without BPD; however in female infants they tend to be similar, and FEF_{50}, FEF_{25-75} and FEV0.5/FVC even improve.

P1113

Spirometric reference values for Italian children

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Introduction: Spirometry is the basic tool to evaluate pulmonary function both in adults and in children. The purpose of this study was to provide updated reference values and equations for healthy Italian children.
Subjects and methods: Two-hundred-seven healthy children (aged 6-14 yrs, mean ± SD: 9.4±1.9) attending a summer sport school in the North of Italy performed spirometry with a pneumotachograph (Koko Spirometer; Sensormedics, Milan, Italy) according to American Thoracic Society. Pulmonary function parameters included forced vital capacity (FVC), forced expiratory volume at 1st second (FEV_1), forced expiratory flow between 25% and 75% of FVC (FEF_{25-75}), and peak expiratory flow (PEF). After stratification by gender, descriptive statistics were determined for the primary outcome variables FVC, FEV_1, $FEF_{25–75}$, and PEF. Independent variables considered included age (A, in years), weight (W in kilograms), and height (Ht in meters). The independent predictors of these variables were determined using linear regression models. To define the lower limit of the normal ranges (LLNs), the fifth percentiles were determined. SPSS version 18 was used for the analyses.
Results: Reference equations for spirometry for girls (n=98) and boys (n=109) are reported in the table.

		Predicted value	LLN	R2
Girls	FVC	–3.91 + 4.58 Ht	3.97–5.19	0.69
	FEV_1	–3.68 + 4.29 Ht	3.70–4.87	0.69
	$FEF_{25–75}$	–3.72 + 4.80 Ht	3.77–5.82	0.47
	PEF	–5.50 + 7.46 Ht	6.07–8.85	0.54
Boys	FVC	–3.70 + 4.44 Ht	3.91–4.96	0.72
	FEV_1	–3.04 + 3.77 Ht	3.25–4.29	0.67
	$FEF_{25–75}$	0.29 + 0.25 A	0.18–0.32	0.32
	PEF	–0.06 + 0.52 A	0.44–0.60	0.60

Conclusions: Height and age were significant predictors of FEV1, FVC, $FEF_{25–75}$, and PEF in the gender-specific models. Further studies are requested to confirm these preliminary results.

P1114

Infant lung function and subsequent respiratory morbidity during the first year of life in preterm infants

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Compared to term-born infants, preterms reveal more respiratory symptoms and alterations in lung function. We aimed to investigate whether in preterms lung function parameters obtained near term correlate with respiratory morbidity during the first year of life.
Lung function (tidal breathing flow-volume loops, multiple-breath washout) was measured using an ultrasonic flowmeter in a cohort of N=263 unsedated preterm infants at mean±SD 44.9±0.2 weeks of gestational age during natural sleep according to latest ERS/ATS standards. The cohort included preterm infants (28% without, 22% with mild, 32% moderate, 16% severe bronchopulmonary dysplasia) selected randomly mainly due to logistic constraints. We retrospectively assessed respiratory morbidity in the first year of life (wheeze, rehospitalisation, inhalation and oxygen therapy) using a standardized questionnaire (recall rate 70%). We computed uni- and multivariable logistic regression adjusted for known confounders.
We found sporadic associations between lung function parameters and outcomes that reached statistical significance, but no clear overall relationship. The strongest association was found for TPTEF/TE e.g. with inhalation therapy: OR 0.92 CI 0.87-0.98.
In this cohort of preterm infants lung function tests performed without sedation do not result in additional benefit for the prediction of respiratory morbidity during the first year of life. Reasons for that might be the pre-selected cohort, the limitations of retrospective assessment of symptoms or the large variability of the lung function measurements reflecting the clinical status.

P1115

Stress tolerance evaluation in obese children

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Aims: To evaluate stress tolerance in obese children using a sub-maximal intensity field test and an ergospirometry with maximal stress on a treadmill and study the correlation between the principle variables of both tests.
Methods: It is a descriptive transversal study carried out amongst obese children from 6 to 14 years old with a control group of normal-weight children. A 6MWT and an ergospirometry on a treadmill with an incremental maximal stress protocol according to the ERS/ATS recommendations were carried out on the obese children. On the control group, the 6MWT was carried out.
Results: A total of 28 obese children (17 male,61%) were studied, with an average age of 10.90years old (±2.43) and a BMI of 27.61kg/m^2 (±3.46). The average 6MWD was 539.4metres (±44.60), which makes up 92.94% (±11.27) of the theoretical. The Hrmax in the 6MWT was 70.10% (±7.24) of the maximum and the perceived effort scale (PE) was 6.8 (±1.6). The VO_2peak was 35.64ml/kg/min (±5.86), placing itself at 83.21% (±5.86) of the theoretical. The Hrmax was 192.43bpm (±10.10) which makes up 92.05% (±5.17) of the maximum. The RER was 1.15 (±0.13) and the PE was 9.40 (± 0.84). The correlation between the 6MWD and the VO_2peak was not significant ($p>0.05$). In the group of normal-weight children, the 6MWD was 95.5% (±7.56) of the theoretical, the Hrmax% was 60.75% (±7.96) and the average on the PE was 5.1 (±3.2). Significant differences ($p\leq0.05$) were found between the PE and the Hrmax% reached between the group of normal-weight and the obese children.
Conclusions: The obese children are able to maintain the distance walked in the sub-maximal stress test at the expense of a greater maximal heart rate and a greater stress perception than the normal-weight children.

P1116

Respiratory impedance using forced oscillation technique in preschool children with a history of wheezing

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Background: This study aimed to assess respiratory impedance using the forced oscillation technique (FOT) in preschool children with a history of wheezing.
Methods: FOT respiratory resistance (Rrs) and reactance (Xrs) at 6, 8, 10 Hz, as well as resonant frequency (Fres), were measured in kindergartens. Children were labelled to have a history of wheezing (WZ) if, based on questionnaires, they had had a diagnosis of asthma, or >3 episodes of WZ ever, or WZ during the previous year. All children had no respiratory symptoms or signs at the time of testing. Post-bronchodilator (BD) impedance was assessed 15 min after administration of salbutamol 200 mcg via MDI and a spacer.
Results: A total of 165 healthy (H) children (82 female; median age 4.8 yr, range 2.9-6.1) and 64 WZ children (25 female, median age 4.6 yr, range 2.7-6.0) were evaluated. Mean (SD) Rrs, Xrs and Fres are reported in the table. Post-BD changes were not significantly different in the two groups.

	Baseline			Post-BD		
	H	WZ	p	H	WZ	p
Rrs6, hPa/L·s	8.47 (2.02)	8.77 (2.17)	0.33	7.42 (1.83)	7.59 (2.16)	0.56
Rrs8, hPa/L·s	8.46 (1.92)	8.61 (1.93)	0.61	7.43 (1.76)	7.49 (1.76)	0.82
Rrs10, hPa/L·s	8.14 (1.74)	8.27 (1.68)	0.60	7.24 (1.62)	7.29 (1.57)	0.82
Xrs6, hPa/L·s	–3.26 (1.06)	–4.22 (6.19)	0.24	–2.67 (0.88)	–3.64 (6.01)	0.22
Xrs8, hPa/L·s	–2.44 (1.02)	–3.18 (4.79)	0.23	–1.77 (0.85)	–2.49 (4.93)	0.27
Xrs10, hPa/L·s	–2.22 (1.04)	–2.83 (3.71)	0.21	–1.54 (0.89)	–2.10 (3.90)	0.27
Fres, Hz	25.37 (6.11)	24.86 (5.52)	0.56	21.30 (6.13)	20.91 (5.65)	0.67

Conclusions: Rrs, Xrs and Fres were not significantly different in asymptomatic preschool children with a history of WZ and in controls. Other indices, such as the area under the curve of Xrs, need to be investigated.

P1117

Detection of bronchodilator effect by spirometry in preschool asthmatic children

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Study objective: Measuring bronchodilator (BD) response in school children by spirometry is an integral part of asthma diagnosis and assessment. However, the applicability of the spirometry criteria to preschool age is questionable. We measured changes in forced spirometry indices to determine their ability to detect BD-response in asthmatic preschool children.
Patients and methods: Data of 288 children (aged 2.6–6.9y) were analyzed. Spirometry tests were carried out before and 15 minutes after BD-inhalation in 145 asthmatic children. Data was compared to that of 39 controls and to that after inhalations of saline (n=104 asthmatics)administrated similarly. An increase above 12% from baseline FEV1 after intervention was considered significant. Response of other spirometry indices were related to change in FEV1.

Results: The mean (±SD) Post-BD elevation in FEV1 was 16.1+13.6%baseline. 81/145 (56%) asthmatic children increased their FEV1 greater than 12% after BD-inhalation. Other indices increased by 23.4±24.8%; 27.4±26.7 and 48.3±35.6% in FEV0.5, PEF and FEF25-75 respectively (n=69%,70%, and 74% of the group; p<0.001 for all). The response of the control group to bronchodilators or to Saline was negligence.
Conclusions: Spirometry in preschool children can detect bronchodilator effect in asthmatic children similar to that in older populations. The best index to describe the response should be further explored. A larger prospective study comparing the bronchodilator effect in young healthy and asthmatic children is required to further support our results.
The study was funded by the J. Baum foundation of the Israeli Lung Association, Tel Aviv, Israel.

P1118
Where there's smoke there's fire! What is the function?
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Morbidity and mortality from smoke inhalation occurs in victims of fire. This study's purpose is to report infant pulmonary function (IPL) in children exposed to smoke from a building fire. The children received care in another facility and were referred to our center for IPL. IPL was performed on 45 children; 23 females, 22 males mean age of 114 weeks; range 50 to 173 wks at the time of testing. Time to testing after the fire was 8.4 months (range 3-17mos). Conscious sedation was used for raised volume thoracoabdominal compression as the IPL technique. Pre-bronchodilator results were obtained on 45 children.

Table 1

Mean %FVC	Mean %FEV0.5	Mean %FEF25-75	Mean %TLC	Mean %RV/TLC
84%±16%	92%±15%	112%±28%	80%±13%	107%±31%

Levalbuterol was given if the child remained sedated. 35 children had post bronchodilator IPL. There was no significant changed noted in FVC or $FEV_{.5}$ however the change in FEF_{25-75}(108.7% to 114.5%) was significant. IPL results were further divided into 2 groups based on Total Lung Capacity (TLC < 80%; TLC ≥ 80%).

Table 2

Group	Number & Gender	Age weeks weeks	Mean %TLC	Mean %FVC	Mean %FEV0.5	Mean %FEF25-75
TLC ≥80%	N=20; 10M/10F	109.4	92%	97%	103%	120%
TLC <80%	N=25; 12M/13F	120.3	70%	73%	84%	106%

The low TLC group also had significantly lower FVC and $FEV_{.5}$ than the normal TLC group. The results of 45 children showed low normal TLC and FVC. When the results compared abnormal TLC% versus normal TLC%, the low TLC% group also had significantly lower FVC and $FEV_{.5}$ than normal TLC% group. These findings are similar to the decline in FVC found in World Trade Center workers. Longitudinal lung function data will be important to obtain to determine future recovery or decline in lung function and to collect future respiratory infection risks and complications.

P1119
Longitudinal assessment of lung function in children and adolescents with sickle cell anaemia
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Aim: Lung function studies in children with sickle cell disease (SCD) have not identified consistent abnormalities. The results, however, of two cross-sectional studies suggest restrictive abnormalities become more prominent with increasing age. Our aim was, by undertaking serial comprehensive assessments in SCD children, to further characterize any changes in lung function with increasing age.
Methods: Two cohorts of SCD children were recruited. Cohort 1: 21 children, mean age at baseline 8.1 (range 2.9-12.0) years and mean length of follow-up 1.9 (1.7-2.1) years. Cohort 2: 28 children and adolescents, mean age at baseline 10.0 (6.0-15.5) years and mean length follow-up 9.0 (8.1-9.8) years. Lung function was assessed by spirometry and body plethysmography.
Results: Lung function declined significantly in both cohorts. The results are expressed as median (IQR) and percentage predicted for height.

Table 1. Lung function at baseline and follow-up for cohort 1

	Baseline	Follow-up	p
TLC	97.6 (91.6–109.9)	89.1 (79.7–100.3)	0.0043
RV	118.0 (94.4–134.0)	96.8 (69.5–112.1)	0.0044
FRC	94.7(71.4–107.7)	78.4 (72.9–84.1)	0.0035
VC	86.4 (75.5–100.0)	80.0 (72.9–97.0)	0.0261
FEV1	85.9 (75.8–99.5)	84.2 (74.5–99.9)	0.0291

Table 2. Lung function at baseline and follow-up for cohort 2

	Baseline	Follow-up	p
TLC	87.7 (82.0–102.0)	76.1 (70.8–81.9)	<0.0001
RV	98.0 (82.0–107.5)	81.9 (71.6–94.2)	0.0049
FRC	94.7 (84.1–107.0)	78.4 (69.9–84.3)	<0.0001
VC	86.4 (75.5–100.0)	76.9 (72.9–97.0)	<0.0001
FEV1	85.9 (75.8–99.5)	80.0 (74.5–99.9)	<0.0001

Comparison of the data from the two cohorts demonstrates a faster decline in cohort one.
Conclusion: Children and adolescents with SCD suffer deterioration in lung function with increasing age; the speed of decline is greatest in young children.

P1120
Pediatric pulmonary function testing in infants and toddlers with perinatal burden
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Methods of infant pulmonary function testing (IPFT) represent an important diagnostic tool for an assessment of chronic lung disease in infancy (CLDI). We assessed lung function in a cohort of children with a perinatal burden.
We tested 74 infants and toddlers (birth weight 1.47±1.11kg [mean±SD]; body length at birth 30.8±16.3cm with CLDI. Age at testing was 1.38±0.69 (median 1.35) yrs; body weight 9.0±2.2kg, body length 76.0±9.7cm. The whole-body plethysmography (to measure FRCp and sReff), tidal breathing analysis (tPTEF%tE), baby resistance/compliance (specific Crs) and rapid thoraco-abdominal compression method (VmaxFRC) were performed. MS Baby Body, VIASYS, USA was used. Standard protocols [1] and proper reference values [2] were used.
FRCp equals 115.3±41.2% pred (P<0.02), sReff reached 134.6±93.8% pred (P<0.005). A parameter of tPTEF%tE mildly decreased (23.5±10.6%). Specific compliance rs (Crs/kg) was 14.4±3.9 ml/kPa/kg; V'maxFRC reached 136±69 ml/sec.
In infants and toddlers with a perinatal burden peripheral and central airway obstruction with mild (secondary) hyperinflation was found. Mildly increased specific compliance of the respiratory system was also found. No restrictive pattern was detected. Serial IPFT assessments in our cohort is required to validate present data.
References:
[1] Hammer J, Eber E (eds). Pediatric Pulmonary Function Testing, 2005, Basel, Karger.
[2] Hulskamp G et al: Am J Respir Crit Care Med 2003;168:1003-9.
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P1121
Validity of volumetric vest respiratory measurements in preterm infants with changes in posture
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Respiratory measurements in unsedated infants are problematic: applying a face mask causes arousal and changes respiratory pattern. We have previously validated a volumetric vest system (FloRight) in normal newborn infants. However, other calibrated chest wall measurements (eg Respitrace) lose validity if posture or chest shape changes.
In order to assess whether this system remained valid with chest distortion and changes in posture, we measured tidal breathing in 11 preterm infants (median 30 weeks at birth) simultaneously by mask/ultrasonic flowmeter and Floright, both in supine (S) and randomised right or left lateral position (L). The following tidal breathing parameters were compared over 20 breaths of stable breathing in quiet sleep: tidal volume (Vt), timing of peak tidal expiratory flow (t_{PTEF}/t_E) and expiratory:inspiratory time ratio (t_E/t_I).
FloRight measurements were closely correlated with mask measurements in both S and L: Vt S r=0.99, L r=0.99; t_{PTEF}/t_E 0.94 and 0.96, t_E/t_I 0.97 and 0.96. FloRight Vt measurements were slightly but significantly higher than mask, both in S (+2ml, p=0.02) and L (+4ml, p=0.001) but t_{PTEF}/t_E and t_E/t_I measurements were not significantly different.
FloRight accurately measures tidal flow timing parameters in small preterm infants both in supine and lateral posture. Tidal volume measurements are highly correlated but slightly overestimated compared to mask, especially in lateral lying: this could be due to the vest not fully conforming to chest distortion.

P1122

Verification of the maximal oxygen consumption using a supra-maximal stress test on obese children

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Aims: To study the usefulness of a supra-maximal stress protocol to confirm the achievement of a maximal oxygen consumption in cardiopulmonary stress tests amongst obese children.
Methods: It is a descriptive transversal study carried out upon obese children from 6 to 14 years old. An ergospirometry is carried out on them using a treadmill with an incremental maximal stress protocol and after 15 minutes of rest the supra-maximal stress protocol is applied with 105% of the intensity previously obtained.
Results: A total of 24 obese children (15 male,62.5%) were studied, with an average age of 10.98 years old (±2.18) and an average BMI of 27.44 (±3.31). A plateau was not found for the oxygen consumption in any instance. A total of 19 (79.16%) children fulfilled the classic criteria of maximal stress. The average VO_2peak was 2.20 l/min (±0.57), RER 1.16 (±0.13), Hrmax% 91.95 (±5.18). In the supra-maximal test, the VO_2peak was 2.15 l/min (±0.54), RER 1.05 (±0.11) and Hrmax% 92.42 (±7.83). Seven cases were found with a VO_2peak greater in the supra-maximal test (an average difference of 0.08 l/min), ($p \leq 0.005$), despite two of them having fulfilled the classic criteria of maximal stress. Of those that did not fulfil the criteria of maximal stress, there were six cases where the supra-maximal peak of VO_2 did not surpass that of the maximal stress test.
Conclusions: The execution of a supra-maximal stress test after a period of rest after a maximal stress test is feasible amongst obese children. The classic criteria that define the success of the VO_2max can be inadequate for this group, thus, carrying out a supra-maximal stress test would be useful in order to verify it.

P1123

Prescription of physical exercise for obese children based on cardiopulmonary exercise tests

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Aims: To study the differences between the theoretical training zones and those obtained using a cardiopulmonary stress test for the prescription of slight-moderate intensity physical exercise amongst obese children.To correlate the exercise intensity in the anaerobic threshold with the degree of perceived effort.
Methods: It is a descriptive transversal study carried out amongst obese children from 6 to 14 years old. An ergospirometry was carried out on a treadmill with an incremental maximal stress protocol according to the ATS/ERS recommendations. The anaerobic threshold (AT) was calculated using the V-slope method, collecting the Hr reading at this point and assigning the perceived effort scale value (PCERT) obtained at that moment. The differences between the theoretical Hr at AT and the collected one were subsequently studied.
Results: A total of 28 obese children (17male,61%) were studied, with an average age of 10.90years old (±2.43) and a BMI of 27.61kg/m^2 (±3.46). The average HR at the AT was 117.45bpm (±15.67) which corresponds to 56.29% (±7.56) of the maximal. Theoretically, the threshold would be in a range around 75% of the maximum, which would make up an average difference of 48.96bpm (±15.29) ($p \leq 0.001$) with the actual anaerobic threshold. The perceived effort value was between 1 and 2.
Conclusions: The prescription of physical exercise for obese children with varied controlled intensities must be personally carried out and based on a cardiopulmonary exercise test given that there are significant differences with the theoretical training zones. These differences could mean using an energetic substrate which is different to that of the one desired and of a lower exercise tolerance.

P1124

Effects of oral breathing and cervical postural alteration in respiratory mechanics and exercise capacity

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Introduction: Although chronic and persistent mouth breathing has been associated with postural alterations, causing decreased muscle strength, reduction of thoracic expansion and pulmonary ventilation with consequences in exercise capacity, the relationship between these alterations have been little studied.
Objective: To evaluate exercise tolerance and respiratory muscle strength in relation to cervical posture and respiratory mode (oral breathing (OB) and nasal breathing (NB) children).
Method: An analytical cross-sectional study included 8-11 years old children with clinical otorhilaryngology diagnosis for OB. We excluded obese children, with asthma, chronic respiratory diseases, neurological and orthopedic disorders and cardiac patients. All participants underwent postural assessment, maximal respiratory pressures (maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP)) and six minute walk test (6MWT).
Results: There were 92 children (30 OB and 62 NB). In the OB group, there was no difference between the means of MIP, MEP and 6MWT between the group with posture alteration (severe and moderate) and normal cervical posture. In the RN group, the mean MIP (70.8±19.1 × 54.7±21.7 cmH_2O, p=0.003) and MEP (67.7±22.1 × 50.5±19.5 cmH_2O, p=0.004) were higher in the group with cervical postural alteration. The presence of OB determined the decrease of MIP, MEP and 6MWT. The presence of moderate cervical posture had positive relationship in MIP and MEP values.
Conclusion: Oral breathing affects negatively the respiratory biomechanics and exercise capacity. The head posture, altered moderately, acts as a compensation mechanism to improved respiratory muscle function.

P1125

Pulmonary function in Thai children and adolescents with obesity

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Morbid obesity is well recognized to be associated with reduced lung function. Unlike adults, studies in children and adolescents are limited and demonstrate conflicting results in regard to changes in lung volumes with obesity. This study aimed to examine whether obesity impaired pulmonary function in Thai children and adolescents. Thirty nine Thai aged 12- to 18-years were recruited. A Vitalograph 2120 Hand Held Storage Spirometer (Vitalograph Ltd, England) was used to measure pulmonary function. Out of 39 subjects, 49% (n=19) were normal weight with normal lung function, e.g. FEV1 ≥80% (Group A, BMI 20.2±1.6 kg/m^2), 36% (n=14) were obese with normal FEV1, e.g. FEV1 ≥80% (Group B, BMI 32.2±4.4 kg/m^2) and 15% (n=6) were obese with reduced FEV1, e.g. FEV1 < 80%, having a restrictive lung disease (Group C, BMI 36.8±5.9 kg/m^2). The age and height were not significantly different whereas the weight, BMI and the WHR were significantly different among the 3 groups ($p<0.001$). Furthermore, BMI was even significantly higher in Group C than Group B ($p<0.01$). Group B had comparable FEV1, FVC, MVV and FEV1/FVC ratio to A, whereas C had reduced FEV1 (73.8±3.6% predicted), FVC (77.5±4.5% predicted) and MVV (73.7±3.8% predicted) but normal FEV1/FVC (95.5±5.1% pred). All values except FEV1/FVC were lower than Group B (FEV1 94.7±9.5%; FVC 97.5±11.8%; MVV 94.8±9.4%) and Group A (FEV1 89.6±9.7%, FVC 89.6±7.6%, MVV 89.7±9.5%) ($p<0.001$).
This study demonstrates that only those with morbid obesity had a restrictive lung disease.

P1126

Nasal NO measurement in preschool children: Feasibility and validation of a novel tidal breathing technique

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Background: Screening for primary ciliary dyskinesia (PCD) in preschool children by measurement of nasal nitrite oxide (nNO) is difficult due to a lack of standardization and reference values. This study aimed to compare a conventional nNO measurement technique with a tidal breathing technique through a straw.
Methods: nNO was assessed by the Niox Flex system in children and adults with chronic rhino-sinusitis (CRS), confirmed PCD and in healthy controls. Measurements consisted of 2 tests with subjects holding their breath (BH), followed by 2 tests with tidal breathing through a straw (TB).
Results: 88 subjects were recruited. 71 (81%) or 77 (88%) subjects performed either a valid BH or a valid TB test, respectively. In the preschool age group (n=22), 19 subjects (86%) had a valid TB test with only 10 individuals (45%) performing a valid BH test. A high correlation between TB and BD values were observed ($r^2=0.954$, $p<0.001$). Bland-Altman analysis showed that both methods were comparable for PCD and CRS groups, while a bias towards higher nasal NO levels using the TB technique was observed in healthy control subjects. When controls were stratified for age (<6 yrs n=9, 6-15 yrs n=18, 16 ≥yrs n=21), there was a trend towards lower NO levels for younger children in the preschool age group ($r^2=0.341$, $p<0.1$).
Conclusion: Nasal NO measurement by TB with a straw is a feasible and valid method in all age groups. Results correlate well with nNO levels measured by conventional techniques. Almost all preschool children were able to perform a valid TB test. A larger study is on the way to determine reference values in preschool children using the established TB method with a straw.