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Longitudinal fat mass and visceral fat during the first 6 months after birth in healthy infants: support for a critical window for adiposity in early life

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Abstract

Introduction—Body composition in early life influences the development of obesity during childhood and beyond. It is, therefore, important to adequately determine longitudinal body composition during the first months of life.

Patients and methods—In 203 healthy term infants, we investigated longitudinal body composition, including fat mass percentage(FM%) and fat-free mass(FFM), by air-displacement plethysmography, at 1, 3 and 6 months of age, and abdominal visceral fat and abdominal subcutaneous fat, by ultrasound, at 3 and 6 months.

Results—We found a significant increase in FM% between 1 and 3 months, but not between 3 and 6 months ($p<0.001$, $p=0.098$, resp.). Girls had higher FM% than boys at 1 and 6 months ($p=0.05$, $p<0.001$ resp.) and less FFM than boys at 1, 3 and 6 months ($p=0.02$, $p=0.02$, $p<0.001$ resp.). There was a large variation in FM% at all ages, even between infants with similar weight SDS. Visceral fat and abdominal subcutaneous fat did not change between 3 and 6 months. FM% was highly correlated with abdominal subcutaneous fat, but not with visceral fat.

Conclusion—Changes in FM% occur mainly in the first 3 months of life, and FM%, visceral and abdominal subcutaneous fat do not change between 3 and 6 months, supporting the concept of a critical window for adiposity development in the first three months of life. In addition, our study provides longitudinal reference data of FM%, FFM, visceral fat and abdominal subcutaneous fat during the first 6 months of life.

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Conflict of interest statement

The authors have no disclosures or conflict of interest to declare.

Keywords

body composition; fat mass percentage; fat mass; infants; programming

Introduction

Childhood obesity is a significant public health problem in developed countries. In Dutch children aged 4 to 12 years, the prevalence increased from 7 to 12% over the last 20 years. [1] Childhood obesity is not only associated with short-term morbidity, but also with long-term morbidity, such as obesity, type 2 diabetes and cardiovascular disease in adulthood.[2–4] Increasing adiposity in the first 6 months of life is a major risk factor for these adult diseases, because it tracks into adulthood. [5, 6]

Consequently, it is crucial to accurately measure body composition and generate reference data for infant boys and girls. Differentiation in gender is important because differences in early life body composition in boys and girls will be present due to different sex hormones levels in early life. At birth, there is evidence that girls already have higher fat mass and lower fat free mass compared to boys, but there are very limited data on gender differences later in infancy. [7–9] Accurately measured body composition and reference data are currently scarce.

Relationships between growth and later health have been mainly studied in retrospective cohort studies, or during follow-up of intervention trials. [10, 11] Most studies have focused on weight, length, and other anthropometric measures as a proxy for adiposity in infancy, instead of accurate body composition, due to the lack of available methods. [12, 13] The Peapod, a device based on air-displacement plethysmography, can assess the body composition (i.e. fat and fat-free mass) of infants. [14, 15] This technique allows for safe and accurate body composition measurements, suitable for frequent studies during the first 6 months of life.[16–18] Few Peapod data are available on longitudinal infant body composition [19], as studies either focused on body composition at birth [20], at one time point after birth [21], in a limited number of subjects [22] or in low-income population.[23] No study combined longitudinal Peapod measurements with ultrasound measurements of subcutaneous and visceral fat.

Not only the total amount of fat, but also the location of fat accumulation is important. Increased visceral adipose tissue, is a major risk factor for future cardiovascular diseases (CVD). In obese children, greater abdominal adipose tissue is associated with an unfavorable metabolic profile.[24, 25] Ultrasound (US) is a non-invasive method to estimate abdominal adipose tissue distribution in infancy. US-visceral fat thickness and abdominal subcutaneous fat thickness are reliable and reproducible estimates of respectively internal-abdominal (visceral) adipose tissue and abdominal subcutaneous adipose tissue quantities. [26]

We hypothesized that FM% will gradually increase in the first 6 months of life and that girls will have more fat accrual than boys. We also hypothesized that subcutaneous and visceral fat thickness will also gradually increase, and that these measurements will correlate with

FM%. We, therefore, longitudinally measured body composition, by Peapod, in a large group of infants at 1, 3 and 6 months of age, separately in boys and girls. We also measured visceral fat thickness and abdominal subcutaneous fat thickness by ultrasound at 3 and 6 months of age and studied their relationship with body composition, measured by Peapod.

Material and Methods

Subjects

The study population consisted of 203 healthy term infants. The current study is part of a birth cohort study (Sophia Pluto Study) aiming to provide detailed data on body composition and growth in early life. Children born from January 2013 were recruited from several hospitals in and near Rotterdam, a large city in The Netherlands. All participants fulfilled the same inclusion criteria: 1) born term (> 37 weeks of gestation), 2) Age <28 days, 3) uncomplicated neonatal period without signs of severe asphyxia (defined as an Apgar score below three after five minutes), sepsis or long-term complication of respiratory ventilation. Exclusion criteria were known congenital or postnatal diseases that could interfere with body composition development, confirmed intra-uterine infection, maternal use of corticosteroids or significant maternal medical condition that could interfere with infant's body composition development (e.g. diabetes). The Medical Ethics Committee of Erasmus Medical Center approved the study. Written informed consent was obtained from both parents unless mother was single.

Data collection and measurements

Outpatient clinic visits were scheduled at 1, 3 and 6 months. Birth data were taken from midwife and hospital records. Trained pediatric nurses performed the measurements according to standard procedures.

Anthropometrics—Weight was measured to the nearest gram by using an electronic infant scale (Seca, Hanover, MD). Length was measured twice with the two-person technique to the nearest 0.1 cm using an Infantometer (Seca). Head circumference was measured to the nearest 0.1 cm using measuring tape (Seca, circumeter). Skinfolds (subscapular, biceps, triceps and suprailiacal) were measured to the nearest mm using a skinfold caliper (Slimguide C-120, Creative Health). Central skinfolds were calculated as the sum of subscapular and suprailiacal skinfolds and peripheral skinfolds as the sum of biceps and triceps skinfolds. [5]

Body composition—Whole-body composition was assessed using air-displacement plethysmography (Peapod, Infant Body Composition System, COSMED). A detailed description of the air-displacement plethysmography (ADP) system is provided elsewhere. [18] Briefly, this ADP system assesses fat mass (FM), fat mass percentage (FM%) and fat free mass (FFM) and fat-free mass percentage (FFM%) by direct measurements of body volume and body mass, based on the whole-body densitometric principle. Body mass was measured on the integrated electronic scale of the ADP system. Body volume was measured in the test chamber by applying pertinent gas laws that relate pressure changes to volumes of air in the enclosed chamber. Assessment of body volume lasted 2 min. Body density was

then computed from the study subject's measured mass and volume and then converted to %fat and fat-free mass using sex-specific equations by Fomon et al. [14] All measurements were obtained by experienced personnel, according to standardized protocol. The Peapod was calibrated every day, according to the protocol recommended by the supplier.

Abdominal fat thickness—Visceral and abdominal subcutaneous fat thickness were measured at 3 and 6 months using a Prosound 2 ultrasound, with a UST-9137 convex ultrasound transducer (both from Hitachi Aloka Medical, Switzerland). For both measures, the transducer was positioned where the xiphoid line intercepted the waist circumference measurement plane. Visceral fat thickness was measured of a longitudinal plane with a probe depth of 9 cm and was defined as the distance between the peritoneal boundary and the corpus of the lumbar vertebra. Subcutaneous abdominal fat thickness was measured at the same location, but on a transverse plane with a probe depth of 4 cm, and was defined as the distance between the cutaneous boundary and the linea alba.[26]

Statistical analysis

Based on literature, a power calculation was performed to calculate the sample size needed for determining a significant difference in percent body fat (95% confidence interval) between male and female infants at 6 months of age. Fields et al [19] showed that body fat percentage of female infants was 28.3% and 25.9% in male infants at 6 months. The reported difference can be determined with a power of 90% if each group consists of 81 infants. To take into account a possible drop-out of 30-40% overtime, we included 285 infants. SD-scores for birth length and birth weight were calculated to correct for gestational age and gender, SD-scores for length and weight at 1, 3 and 6 months were calculated to correct for age and gender.[27] All SD-scores were calculated using growth analyser software (<http://www.growthanalyser.org>).

All variables were normally distributed. Baseline characteristics are expressed as mean(standard deviation). Differences in clinical characteristics and anthropometrics between boys and girls were determined with an independent sample student's t-test. Differences in body composition measured by Peapod were determined using Estimated Marginal Means, with adjustment for length. The longitudinal changes in body composition were analyzed using repeated measures analysis. SPSS statistical package version 20.0 (SPSS Inc. Chicago, Illinois) was used. All statistical tests were performed two-sided and results were regarded statistically significant if the P-value was <0.05.

Results

Clinical characteristics of the subjects are presented in Table 1. The mean(sd) gestational age was 39.7(1.2) weeks and 59% of the infants were male and 87% were Caucasian. The mean(sd) age of the infants at follow-up was 30.1(3.4) days, 3.0(1.1) months and 6.0(0.2) months.

Age, anthropometrics, BMI, sum of skinfolds, Peapod measurements and ultrasound measurements of boys and girls at 1, 3 and 6 months are shown in Table 1.

Peapod measurements

Mean(sd) fat mass percentage (FM%), measured by Peapod, was at 1 month 16.8(4.8)%, at 3 months 22.8(5.3)% and at 6 months 24.0(5.3)%.

In the total group, there was a significant increase in FM% between 1 and 3 months, but not between 3 and 6 months ($p<0.001$, $p=0.098$, resp.). When girls and boys were analyzed separately, we observed the same pattern in boys ($p<0.001$, $p=0.55$, resp.), but girls showed significant increases in FM% during both age periods ($p<0.001$, $p<0.001$, resp.) although less in the second period. Girls had a higher FM% than boys at 1 and 6 months ($p=0.05$, $p<0.001$, resp.) (Table 1).

Table 3 shows the reference values for FM%, FFM%, FM and FFM. Figures 1 and 2 show the reference curves of FM%, FFM%, FM in kg and FFM in kg for boys and girls for ages 1 to 6 months. Data are presented as median $\pm$ 1 and 2 standard deviation scores.

Ultrasound measurements

Mean(sd) visceral fat thickness was 2.51(0.57) cm at 3 months and 2.48(0.64) cm at 6 months of age ($p=0.24$). Mean(sd) abdominal subcutaneous fat thickness was 0.43(0.12) cm at 3 months and 0.43(0.14) cm at 6 months. There was no difference between abdominal subcutaneous fat thickness at 3 and 6 months. Visceral fat thickness and abdominal subcutaneous fat thickness were weakly correlated at 6 months ($r=0.17$, $p=0.02$), but not at 3 months ($r=0.01$, $p=0.94$).

Reference values are presented in Table 3. Supplemental figure 2 shows the scatterplots of visceral fat thickness and subcutaneous fat thickness at 3 and 6 months.

Relationship between Peapod and ultrasound measurements

At the age of 3 and 6 months, FM% was unrelated to visceral fat thickness, but did correlate positively with abdominal subcutaneous fat thickness ($r=0.36$ $p<0.001$, $r=0.54$, $p<0.001$, resp.).

Relationship with other anthropometric measurements

In boys, FM% correlated with weight at the age of 3 and 6 months ($r=0.45$, $p<0.001$, $r=0.50$, $p<0.001$, resp.) (Table 2). In girls, FM% was also correlated with weight at 1, 3 and 6 months of age ($r=0.57$, $p<0.001$, $r=0.49$, $p<0.001$, $r=0.46$, $p<0.001$, resp.). FM% correlated also with BMI at all points in boys and girls (Table 2). Despite the correlation between FM% and weight, the variation in FM% was high, even between infants with a similar weight or BMI. For instance, in infants with a weight SDS of 1 at 1 month, the FM% ranged from 10 to 25% and this range remained wide at 3 and 6 months with a variation in FM% between 12 and 30% and 17 and 33% respectively (data not shown).

In boys, increase in FM% between 1 and 3 months, and between 3 and 6 months were correlated with increase in weight SDS and BMI SDS ($r=0.50$, $p<0.01$, $r=0.43$, $p<0.01$, $r=0.40$, $p<0.01$, $r=0.45$, $p<0.01$ resp.). In girls, the correlations between increase in FM%

and increase in weight SDS and BMI SDS between 1 and 3 months and between 3 and 6 months were similar ($r=0.41$, $p<0.01$, $r=0.56$, $p<0.01$, $r=0.34$, $p<0.01$, $r=0.49$, $p<0.01$, resp.)

The sum of central and peripheral skinfolds at 1, 3 and 6 months correlated significantly with FM%, both in boys and girls (Table 2).

The sum of central or peripheral skinfolds at 3 and 6 months did not correlate with the visceral fat thickness, but did correlate with the abdominal subcutaneous fat thickness by ultrasound, both in boys and girls (Table 2).

Discussion

This paper describes longitudinal reference data on fat mass percentage (FM%) and fat-free mass (FFM) measured by PEAPOD and subcutaneous and visceral fat thickness measured by ultrasound, in a cohort of 203 healthy term infants during the first 6 months of life. We revealed a significant increment in FM% during mainly the first 3 months of life, without a change between 3 and 6 months. When girls and boys were analyzed separately, we observed the same pattern in boys but girls showed also a significant increase in FM% between 3 and 6 months. Also visceral fat and abdominal subcutaneous fat thickness remained similar between 3 and 6 months. Girls had a significantly higher FM% and lower FFM at 1 and 6 months than in boys. FM% correlated with abdominal subcutaneous fat thickness, but not with visceral fat thickness.

Previous studies showed that the first months of life are important in the developmental programming of adiposity.[5, 11, 12] Thus data on accurate body composition in early life are essential. Our study is one of the first studies investigating longitudinal FM% and FFM by Peapod in a large group of healthy term infants.[19] Other studies investigated this in a smaller group or in infants in Ethiopia.[22, 23]

Our study shows that mainly the first 3 months of life are characterized by a rapid fat deposition followed by a very modest rate, supporting the concept of a critical window for adiposity development in the first 3 months of life.[5, 11, 12] In our study, the girls had a higher FM% at 1 and 6 months of age than the boys. Data on gender differences in body composition in the first months are limited, but in studies where body composition was measured at 6 months by dual energy x-ray absorptiometry, girls had also a higher FM% than boys.[28] Our study shows that at every time point, fat-free mass was higher in boys than girls. This gender difference could be attributed to the higher androgen levels in boys in the last trimester of fetal life and during mini-puberty in the first months of life, which increase lean body mass.[29]

Our study also presents normative longitudinal data of abdominal subcutaneous and visceral fat thickness by ultrasound in a large group of infants. We found that both subcutaneous and visceral fat do not significantly increase in the period between 3 and 6 months. Previous studies have consistently shown that particularly visceral obesity, compared to overall obesity, is a key factor in the pathogenesis of metabolic syndrome. [30, 31] Visceral fat is considered more metabolically active compared to subcutaneous fat depot. Through increased release of free fatty acids to the portal circulation, it may be involved in the

genesis of insulin resistance.[32] Furthermore, visceral adipocytes are known to produce vasoactive peptides and cytokines which may increase cardiovascular risk via direct effects on the vasculature.[33] Therefore, accurate measurement of visceral fat is highly relevant when assessing infant's risk for developing cardiovascular diseases later in life.

We observed a positive correlation between FM% measured by Peapod and abdominal subcutaneous fat thickness at 3 and 6 months, but not with visceral fat thickness, indicating that overall FM% could not predict the amount of visceral fat and therefore addition of ultrasound measurements is needed.

Although there was a strong correlation between weight SDS and FM%, the variation in FM% was high, even in infants with a similar weight, indicating the importance of accurate measurement of body composition, instead of only weight or weight for length. Our findings also show that BMI is not a good marker of body composition. BMI is based on an estimate of the infant's body weight and length and does not adequately capture the infant's fatness. For infants, body mass index can be especially misleading because the relationship of lean body mass to height changes as they become older. [34]

In the present study, we measured skinfolds in infants and demonstrated that skinfold measures are reasonable indicators of overall fatness in a study population. However, skinfolds give only information about subcutaneous fat, while Peapod measures total FM%. Although skinfolds did correlate with FM%, it cannot reliably indicate FM% in individual infants, because of the wide variation, and can therefore not replace Peapod measurements.

Our study population was a population born in a hospital, but our data were also generalizable to healthy term infants born at home, because all anthropometric data were within -2 SDS and + 2 SDS and all variables were normally distributed, illustrating a normal distribution in our population. US measures were not performed at 1 month because visceral and subcutaneous fat thickness is then very low and therefore unreliable to measure. In this study we did not include nutritional data to investigate the relationship between early nutrition and body composition in early life, which is a limitation of our study. Further studies are needed to investigate this relationship.

In conclusion, FM% increases mainly in the first 3 months of life and stabilizes after 3 months. Also visceral fat thickness remained stable in the period between 3 and 6 months. These data support the concept of a critical window for adiposity development in the first three months of life. Girls had a longer duration of fat mass accrual than boys. Our study provides longitudinal reference data on body composition (FM%, FFM, subcutaneous fat thickness and visceral fat thickness) during the first 6 months of life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What is already known about this topic

- Childhood obesity is a significant public health problem in developed countries
- Body composition in early life influences the development of obesity during childhood and beyond, but reference data on body composition, in combination with visceral and subcutaneous fat thickness, in early life are limited

What this study adds

- Changes in FM% occur mainly in the first 3 months of life, while FM%, visceral and abdominal subcutaneous fat thickness do not change between 3 and 6 months, supporting the concept of a critical window for programming of adiposity in the first three months of life
- Longitudinal reference data of FM%, FFM, in combination with reference data on visceral fat thickness and abdominal subcutaneous fat thickness during the first 6 months of life

Table 1
Body composition of the total group and comparison between boys and girls in first 6 months of life.

	Total group (n= 203)	Boys (n=119)	Girls (n=84)	p-value
Birth				
Gestational age (weeks)	39.7(1.2)	39.7	39.8	0.30
Birthweight (grams)	3.435(1.0)	3.356	3.254	0.27
Birthweight SDS	-0.34(1.1)	-0.36	-0.33	0.85
Birth length (cm)	50.0(2.5)	50.0	49.6	0.98
Birth length SDS	-0.19(1.3)	-0.33	0.02	0.14
Age 1 month				
Age (days)	30.1(3.4)	30.1	30.1	0.97
Weight (kg)	4.27(0.6)	4.39	4.15	0.02
Weight SDS	0.36(1.2)	0.36	0.35	0.94
Length (cm)	54.6(2.1)	54.9	54.1	0.006
Length SDS	0.11(0.9)	0.13	0.07	0.67
Body mass index (kg/m ²)	14.3(1.3)	14.4	14.1	0.14
Body mass index SDS	0.31(1.1)	0.30	0.33	0.87
Sum of peripheral skinfolds (mm)	12.0(2.0)	11.8	12.0	0.37
Sum of central skinfolds (mm)	11.1(2.4)	10.9	11.3	0.30
Fat mass (kg)	0.76(0.5)	0.71	0.82	0.16 [#]
Fat mass percentage (%)	16.8(4.8)	16.3	17.6	0.05
Fat-free mass (kg)	3.55(0.4)	3.64	3.42	0.02[#]
Age 3 months				
Age (months)	3.01(1.1)	2.93	3.14	0.21
Weight (kg)	6.01(0.7)	6.20	5.72	<0.001
Weight SDS	0.47(1.2)	0.58	0.31	0.11
Length (cm)	61.4(2.1)	62.1	60.4	<0.001
Length SDS	0.37(0.9)	0.48	0.23	0.06
Body mass index (kg/m ²)	15.9(1.4)	16.1	15.6	0.03
Body mass index SDS	0.22(1.1)	0.28	0.14	0.39
Sum of peripheral skinfolds (mm)	14.7(2.3)	14.9	14.4	0.23
Sum of central skinfolds (mm)*	13.2(3.1)	13.1	13.3	0.63
Fat mass(kg)	1.39(0.8)	1.40	1.36	0.50 [#]
Fat mass percentage (%)	22.8(5.3)	22.4	23.3	0.30
Fat-free mass (kg)	4.64(0.5)	4.80	4.41	0.02[#]
US-visceral fat thickness (cm)	2.51(0.6)	2.56	2.44	0.17
US-abdominal subcutaneous fat thickness (cm)	0.43(0.1)	0.44	0.42	0.54
Age 6 months				
Age (months)	6.03(0.2)	6.03	6.03	0.92
Weight (kg)	7.67(0.8)	7.87	7.37	<0.001

	Total group (n= 203)	Boys (n=119)	Girls (n=84)	p-value
Weight SDS	0.47(1.2)	0.25	0.13	0.95
Length (cm)	68.1(2.2)	68.8	67.0	0.006
Length SDS	0.23(0.9)	0.30	0.13	0.67
Body mass index (kg/m ²)	16.5(1.4)	16.6	16.4	0.28
Body mass index SDS	0.05(1.1)	0.07	0.01	0.71
Sum of peripheral skinfolds (mm)	16.0(3.2)	15.6	16.7	0.03
Sum of central skinfolds (mm)	13.4(3.7)	13.2	13.8	0.23
Fat mass (kg)	1.85(0.5)	1.80	1.92	0.04[#]
Fat mass percentage (%)	24.0(5.3)	22.7	25.8	<0.001
Fat-free mass (kg)	5.80(0.6)	6.05	5.47	<0.001[#]
US-visceral fat thickness (cm)	2.48(0.6)	2.50	2.45	0.57
US-abdominal subcutaneous fat thickness (cm)	0.44(0.1)	0.43	0.45	0.35

Significant P values are indicated in boldface

[#]
=corrected for length

Table 2
Linear correlation coefficients between anthropometric parameters, for boys and girls separately

Boys	1 month		3 months		6 months	
	FM%	FFM	FM%	FFM	FM%	FFM
Weight	0.28*	0.85*	0.45*	0.62*	0.50*	0.69*
Length	0.17 [^]	0.69*	0.01	0.51*	0.02	0.60*
BMI	0.29*	0.53*	0.55*	0.38*	0.58*	0.37*
Sum of central skinfolds	0.37*	0.36*	0.45*	-0.06	0.40*	0.18
Sum of peripheral skinfolds	0.21 [^]	0.34*	0.38*	0.16	0.47*	0.06
						0.28 [#]

Girls	1 month		3 months		6 months	
	FM%	FFM	FM%	FFM	FM%	FFM
Weight	0.57*	0.94*	0.49[#]	0.80*	0.46*	0.73*
Length	0.34[^]	0.82*	0.04	0.75*	-0.10	0.60*
BMI	0.61*	0.80*	0.62*	0.58*	0.61*	0.43*
Sum of central skinfolds	0.59*	0.46*	0.51*	0.43*	0.63*	-0.01
Sum of peripheral skinfolds	0.55*	0.54*	0.23	0.43*	0.33[#]	0.04
						0.08
						0.13

Correlation coefficients above 0.30 are indicated in boldface. P-values: * ≤ 0.001 ; [#] ≤ 0.01 ; [^] ≤ 0.05

FM%: fat mass percentage; FFM: fat free mass in kg; US-V: visceral fat thickness measured by ultrasound; US-S: abdominal subcutaneous fat thickness

Table 3

A. References values for FM%, FFM%, FM, FFM and visceral and abdominal subcutaneous fat thickness for boys

B. References values for FM%, FFM%, FM, FFM and visceral and abdominal subcutaneous fat thickness for girls

Boys						
Age		SDS				
		-2	-1	0	1	2
Peapod						
FM%						
	1 month	6.37	11.56	16.40	19.90	27.95
	3 months	11.89	17.10	22.40	26.45	35.64
	6 months	11.60	17.78	22.65	28.30	33.94
FFM%						
	1 month	72.05	80.10	83.60	88.44	93.73
	3 months	64.36	73.55	77.60	82.90	88.11
	6 months	66.06	71.70	77.35	82.22	88.40
FM (kg)						
	1 month	0.2497	0.4885	0.7229	0.924	1.299
	3 months	0.6167	0.9910	1.3533	1.771	2.535
	6 months	0.7557	1.3241	1.7622	2.266	3.157
FFM (kg)						
	1 month	2.6854	3.2753	3.6345	4.0653	4.3050
	3 months	3.7541	4.3639	4.7924	5.2230	5.6970
	6 months	4.9012	5.4888	6.0881	6.5558	6.9365
Ultrasound						
Visceral fat thickness (cm)						
	3 months	1.59	1.92	2.50	3.16	4.04
	6 months	1.37	1.74	2.38	3.23	4.16
Subcutaneous fat thickness (cm)						
	3 months	0.21	0.32	0.41	0.54	0.76
	6 months	0.25	0.32	0.41	0.55	0.67
Girls						
Age		SDS				
		-2	-1	0	1	2
Peapod						
FM%						
	1 month	9.85	13.16	17.00	22.69	27.05

Girls						
Age		SDS				
		-2	-1	0	1	2
FFM%	3 months	11.40	17.50	23.50	28.67	33.28
	6 months	13.89	20.46	26.15	31.10	33.52
	1 month	72.95	77.31	83.00	86.84	90.15
	3 months	66.72	71.33	76.50	82.50	88.60
	6 months	66.48	68.90	73.85	79.54	86.11
FM (kg)	1 month	0.2746	0.4574	0.7647	1.0299	1.9258
	3 months	0.5085	0.8874	1.3295	1.7581	2.5781
	6 months	1.0161	1.4090	1.9141	2.4858	2.9735
	1 month	2.3864	2.9109	3.4143	3.9085	4.3761
	3 months	3.1018	3.9399	4.4336	5.0084	5.3220
	6 months	4.4447	5.0346	5.4393	5.8724	6.5913
Ultrasound						
Visceral fat thickness (cm)						
	3 months	1.46	1.92	2.41	2.95	3.51
	6 months	1.39	1.83	2.39	3.03	3.64
Subcutaneous fat thickness (cm)						
	3 months	0.21	0.31	0.42	0.53	0.72
	6 months	0.26	0.31	0.45	0.56	0.81