Healthy Children in Sound Communities-

Community Based Networking for Health Enhanced Physical Activities of Children in China and Germany

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Summary

English Version

'Healthy Children in Sound Communities' (HCSC) is an EU-based health enhanced physical activity intervention project. The objectives of this project are broadly in line with the numerous European-level recommendations of recent years from WHO Europe (cf. WHO, 2006, 2008), EU commissions and committees (cf. EU-Platform on Diet, Physical Activity, and Health 2005, EU 2008; EU DG EAC, 2012) as well as various federal and state ministries in Germany and China. The project's objectives also concur with current attempts by the North Rhine-Westphalia Ministries of School (Germany), Sport and Healthy Research Center of Tongji University (China), Ministries of Yangpu Schools (China), effectively to promote physical activity and health in physical education, school sport and extra-curricular sporting activities for children and adolescents. It looks at four key 'healthy lifestyle components' of school aged children: individual physical and sport activities/exercises, nutrition habits, sedentary leisure-time frequency spend on modern electronic media, and the social and geographical environment of living.

To implement healthy lifestyle components, HCSC had been carried out in a community based network of stakeholders with local collaborations between family, school, sports club and municipal offices for concerted action to provide children with age-appropriate education for a healthy lifestyle through curricular, cocurricular and extracurricular activities in HCSC schools. All the HCSC schools have three hours per week ordinary physical education, one hour per week general and social studies, two additional afternoon classes of movement, active school route and sports during break times, healthy eating and food preparation. Also, HCSC combine their single efforts and programs for a commonly agreed health-enhanced PE/PA-program for local children to promote and implement more opportunities for an active lifestyle to counteract physical inactivity and overweight or obesity.

Altogether there are 990 children from Germany (N = 693) and China (N = 297) participated. The German cohort includes327 girls and 366 boys, 25 schools from twelve cities, the Chinese cohort includes 143girlsand 154 boys, two schools from one municipality. The average age of the German children were 6.57 years old (SD = 0.62) and the average age of the Chinese children were 7.13 years old (SD = 0.34) when intervention started in September 2012 (t1). Therefore Chinese children are approximately 6 months older than German children. After intervention, the second measurement took place in November 2013 (t2), and the third measurement took place around November 2014 (t3). Each measurement has twelve months interval (depending on the communities and schools).Therefore when the intervention finished the average age of the German children were8.54 years old (SD = 0.62) and the average age of the Chinese children were 9.18 years old (SD = 0.42).

The two-year intervention had really achieved a lot in both countries. All children had significant increases in BMI which are correspond with normal effects of growth

(Chinese girlst1: BMI = 16.58 ± 2.65, t2: BMI = 16.81 ± 3.00, t3: BMI = 17.25 ±2.79;Chinese boys t1: BMI = 16.81 ± 2.31, t2: BMI = 17.38 ± 2.74, t3: BMI = 17.89 ± 2.85; German girls t1: BMI=16.07±2.02, t2: BMI=16.54± 2.31, t3: BMI=17.21±2.74; German boys t1: BMI=16.53±2.32, t2: BMI=16.92± 2.57, t3: BMI=17.52±2.89). But the BMI-Cole in both countries decreased (Chinese girls t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.1, t3: BMI-Cole = 2.8; Chinese boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 2.9, t3: BMI-Cole = 3.1; German girls t1: BMI-Cole = 3.2, t2: BMI-Cole = 3.1, t3: BMI-Cole = 3.1; Chinese boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.2, t3: BMI-Cole = 3.1).Also,HCSC project built six motor tests to improve students' physical abilities: coordination capacity (jump sideways), aerobic endurance capacity (6-minute run), endurance strength capacity (sit-ups), explosive strength capacity (standing broad jump),flexibility capacity (sit & reach) and agility capacity (20 m run). The German students significantly increased five motor skills except sit & reach. The Chinese students significantly increased five motor skills except6-minute run.

Comparing the BMI of the Chinese cohort and the German cohort, the results shows that the Chinese children had a higher mean BMI value than German children in both genders; there are more overweight and obese Chinese children than German children (overweight and obese rate China vs. Germany t1: 51.39% vs. 42.14%, t2: 56.03% vs. 45.08%, t3: 55.76% vs. 53.09%). In motor skills, Chinese children had better results in jump sideways (China vs. Germany in girls t1: 30.54 ± 5.97 vs. 22.87 ± 6.34, t2: 37.70 ± 6.98 vs. 28.46 ± 6.02, t3: 41.06 ± 7.46 vs. 33.05 ± 6.04; China vs. Germany in boys t1: 31.17 ± 6.55 vs. 22.02 ± 6.56, t2: 39.27 ± 7.61 vs. 27.84 ± 6.63, t3: 41.76 ± 8.51 vs. 32.29 ± 6.19), sit-ups (China vs. Germany in girls t1: 19.65 ± 4.87 vs. 13.63 ± 5.26, t2: 25.56 ± 6.37 vs. 17.63 ± 4.92, t3: 26.54 ± 6.07 vs. 19.29 ± 4.85; China vs. Germany in boys t1: 21.07±5.60 vs. 13.53 ± 5.76, t2: 24.73 ± 6.98 vs. 17.99 ± 5.79, t3: 26.49 ± 7.38 vs. 19.67 ± 5.34) and standing broad jump tests (China vs. Germany in girls t1: 124.49 ± 16.45 vs. 98.51 ± 18.31, t2: 133.68 ± 14.50 vs. 109.81 ± 16.19, t3: 141.39 ± 15.20 vs. 117.44 ± 16.59; China vs. Germany in boys t1: 135.05±16.53 vs. 103.78 ± 19.08, t2: 141.96 ± 18.00 vs. 115.52 ± 18.05, t3: 148.06 ± 17.32 vs. 123.12 ± 18.39) whereas German children had better 6-minute run tests (China vs. Germany in girls t1: 815.79 ± 127.34 vs. 836.17 ± 103.15, t2: 874.85 ± 153.28 vs. 880.49 ± 108.42, t3: 821.09 ± 162.31 vs. 919.99 ± 119.38; China vs. Germany in boys t1: 878.53± 161.36 vs. 886.29 ± 109.66, t2: 922.51 ± 179.95 vs. 951.58 ± 114.96, t3: 866.12 ± 180.87 vs. 993.78 ± 128.36), which means Chinese children had better coordination, endurance strength and explosive strength capacity than German children in both genders, while German children had better aerobic endurance than Chinese children in both genders.

Comparing the BMI results before and after the intervention in the Chinese cohort, we find that in both genders the Chinese children had significant increase in BMI. Even overweight and obese Chinese children did not lower their BMI from t1 to t3 significantly. However there were still less overweight and obese Chinese children after intervention. From t1 to t3, five out of twelve children with obesity dropped out of the group in girls, two out of the thirteen children with obesity dropped out of the group in boys. And BMI-Cole in Chinese girls [t1 = 3.3, t2 = 3.1, t3 = 2.8; F (2, 36) =

19.043, $p < 0.001$, $\eta^2 = 0.514$], in Chinese boys [t1 = 3.3, t2 = 2.9, t3 = 3.1; F (2, 38) = 5.899, $p < 0.006$, $\eta^2 = 0.237$], both had significantly decreased. And the motor tests results before and after intervention in Chinese cohort showed that Chinese children improved their results in jump sideways (girls t1 = 30.54 ± 5.97, t2 = 37.70 ± 6.98, t3 = 41.06 ± 7.46, boys t1 = 31.17 ± 6.55, t2 = 39.27 ± 7.61, t3 = 41.76 ± 8.51), sit-ups (girls t1 = 19.65 ± 4.87, t2 = 25.56 ± 6.37, t3 = 26.54 ± 6.07, boys t1 = 21.07 ± 5.60, t2 = 24.73 ± 6.98, t3 = 26.49 ± 7.38),standing broad jump (girls t1 = 124.49 ± 16.45, t2 = 133.68 ± 14.50, t3 = 141.39 ± 15.20, boys t1 = 135.05 ± 16.53, t2 =141.96 ± 18.00, t3 = 148.06 ± 17.32)and 20 m run tests (girls t1 = 4.82 ± 0.42, t2 = 4.61 ± 0.39, t3 = 4.44 ± 0.37, boys t1 = 4.61 ± 0.42, t2 = 4.44 ± 0.47, t3 = 4.31 ± 0.39), sit & reach in girls (t1 = 14.41 ± 3.87, t2 = 14.44 ± 4.03, t3 = 14.58 ± 9.23); but not in 6-minute run test (girls t1 = 815.79 ± 127.34, t2 = 874.85 ± 153.28, t3 = 821.09 ± 162.31, boys t1 = 878.53± 161.36, t2 = 922.51 ± 179.95, t3 = 866.12 ± 180.87), and a slightly drop boys 'sit & reach results (t1 = 10.83±4.01, t2 = 10.18 ± 4.41, t3 = 9.14 ± 5.38), which means Chinese students improved their coordination, endurance strength, flexibility, explosive strength and agility capacities, but aerobic endurance capacity needs more practice. Therefore the Chinese children benefited a lot from the intervention implemented. The HCSC program had succeeded in China.

Comparing the BMI results before and after intervention in the German cohort, we found that in both genders German children had a significant increase in BMI, overweight and obese German girls did not significantly lower their BMI-Cole from t1 to t3, however the BMI-Cole value still had decreased (t1 = 3.2, t2 = 3.1, t3 = 3.1; F (2,61) = 2.827, $p<0.067$,$\eta^2=0.085$).Overweight and obese German boys did lower their BMI from t1 to t3 (t1= 3.3, t2 = 3.2, t3= 3.1; F (2,75) = 4.742, $p<0.012$,$\eta^2=0.112$). German children also had good performances in motor tests and significantly improved in jump sideways (girls t1 = 22.87 ± 6.34, t2 = 28.46 ± 6.02, t3 = 33.05 ± 6.04, boys t1 = 22.02 ± 6.56, t2 = 27.84 ± 6.63, t3 = 32.29 ± 6.19); sit-ups (girls t1 = 13.63 ± 5.26, t2 = 17.63 ± 4.92, t3 = 19.29 ± 4.85), sit & reach (boys t1 = 13.53 ± 5.76, t2 = 17.99 ± 5.79, t3 = 19.67 ± 5.34); standing broad jump (girls t1 = 98.51 ± 18.31, t2 = 109.81 ± 16.19, t3 = 117.44 ± 16.59, boys t1 = 103.78 ± 19.08, t2 = 115.52 ± 18.05, t3 = 123.12 ± 18.39); 20 m run tests (girls t1 = 4.80 ± 0.41, t2 =4.54 ± 0.36, t3 = 4.40 ± 0.31, boys t1 = 4.66 ± 0.40, t2 = 4.44 ± 0.36, t3 = 4.31 ± 0.37), and 6-minute run test (girls t1 = 836.17 ± 103.15, t2 = 880.49 ± 108.42, t3 = 919.99 ± 119.38, boys t1 = 886.29 ± 109.66, t2 = 951.58 ± 114.96, t3 = 993.78 ± 128.36); but not in sit & reach (girls t1 = 4.99 ± 4.62, t2 =5.41 ± 5.14, t3 = 4.69 ± 5.71, boys t1 = 4.66 ± 0.40, t2 = 4.44 ± 0.36, t3 = 1.29±5.81), which mean German children had better coordination, endurance strength, explosive strength, agility capacities and aerobic endurance after intervention, but flexibility capability needs more practice. Therefore the Germany children benefited a lot from the intervention implemented. The HCSC program had succeeded in Germany as well.

My study had eight hypotheses of BMI and thirteen hypotheses of motor ability in the Chinese cohort and the German cohort. The hypotheses of BMI in my dissertation were not as expected, even though the Chinese overweight and obesity is a big problem nowadays but still lower evaluated this situation. The results showed

that more overweight and obese Chinese children than German children, which shocked both countries. For most scholars, China is a developing country and therefore will not have many overweight and obese children. Germany is a developed country with high overweight and obesity rate, but this result is an alarm more than a shock. The hypotheses of motor tests in my study, ten out of thirteen were correct, the exceptions are number ten (the results show that German children improved more in endurance strength than Chinese children), eleven (the results showed that Chinese girls had more explosive strength capacity then German girls) and twelve (the results showed that Chinese boys had better explosive strength capacity then German boys).I had higher evaluated the German children's explosive strength capacity, instead, Chinese children had better performance when the test is also in Chinese National Physical Fitness Test (NPFT).

The good performance in China could be attributed to NPFT, test dominated Chinese students always pay more attention on test but not really interested in physical activity. This is a traditional Chinese phenomenon. So when the motor test is not included in NPFT, the students were not interested to practice. Therefore the endurance capacity in our 2-year intervention did not have any improvement and instead falls down. Also, lack of endurance capacity training in Chinese physical education, schools not really pay attention on students' needs or helping students improve their physical abilities, under the study burden students lack of time participated in physical activity, parents not supporting and encourage their kids into sport. In addition air pollution limited the outdoor exercises. All these elements together led Chinese students' endurance capacity far behind their contemporaries. In general, the Chinese overweight and obese phenomenon can be described as no policy support, no facility guarantees, no interest in maintaining, an unhealthy diet and lack of exercise.

The good performance in Germany could be attributed to the sport system, abundant sports venues and facilities guaranteed everyone can engage in sport. And the flexible education system also persuades students into physical activity and everyone has his or her own sport. This is really beneficial for the students' health. However, the flexible education system neglects the students who are not interested in sports and usually in this group you will find overweight and obese children. Therefore, lack of exercise and an unhealthy diet result in overweight and obese. In general, the German overweight and obese phenomenon can be described to no-obligatory sport course, no uniform teaching method, an unhealthy diet and lack of exercise.

My study had proved school-based intervention influences the anthropometric modification obtained in children, significantly reduced BMI-Cole and improved sports capacity. This cross-country study could be a pilot study for future school-based longitudinal healthy enhanced physical activity study in children between China and Germany.

German Version

‚Gesunde Kinder in Gesunden Kommunen'(GKGK) ist ein europäisches HEPA-Interventionsprojekt. Die Aufgaben und Ziele dieses Projektes stimmen im hohen Maße mit den Empfehlungen der WHO Europe der letzten Jahre überein (cf. BHO, 2006, 2008). Das gilt sowohl für einige EU-Kommissionen und Komitees, wie zum Beispiel der EU Plattform on Diet, Physical Activity and Health 2005, den EU-Physical Activity Guidelines 2008 und EU EAC 2002, als auch für eine Reihe nationaler und förderaler Ministerien in der Bundesrepublik Deutschland und in der Volksrepublik China. Darüber hinaus können die Aufgaben und Ziele des Projektes ‚Gesunde Kinder in gesunden Kommunen' mit den Aufgaben und Zielen der Schulministerien in Nordrhein-.Westfalen und des Sport- und Gesundheitszentrums an der Tongji Universität in China und Ministerien in China und der Jampu-Schulen in der Provinz Shanghai China verglichen werden. Die schulpolitischen Zielsetzungen dieser Organisationen stimmen in hohem Maße darin überein, dass sie Physical Activity und Gesundheit im Rahmen des regulären Sportunterrichts, im Rahmen des Schulsports und anderer extra-curricularer Sportaktivitäten für Kinder und Jugendliche fördern wollen. Für das GKGK-Projekt gibt es vier übereinstimmende zentrale Faktoren, die als gesunde Lebensstilkomponenten im Rahmen des Projektes berücksichtigt werden: Individuelle körperliche und sportliche Aktivitäten, Ernährungsverhalten, bewegungsferne Freizeitaktivitäten, die oft verbunden sind mit einer zu hohen Frequenz an Fernseh- und Computerzeit, sowie die soziale Lage und örtlichen Umgebung, wo Kinder und Jugendliche wohnen und leben.

Um diese vier gesundheitsfördernden Lebensstilkomponenten zu fördern (mehr Bewegung, gesund essen, weniger Medienzeit und bessere Bewegungs- und Spielmöglichkeiten) hat sich das GKGK-Konzept als erstes die Einrichtung eines kommunalen Netzwerkes zur Aufgabe gemacht, um kommunale Stakeholder für die Zusammenarbeit zwischen Familien, Schulen, Sportvereinen und städtischen Kommunalämtern zu fördern. Dafür wurde ein Programm gewählt, das altersadäquate Gesundheitserziehung mit gesundheitsfördernden Maßnahmen durch curriculare, co-curriculare und extra-curriculare Aktivitäten im Kontext ihres Schulbesuchs verbindet. Alle 37 Grundschulen, die in Nordrhein Westfalen bisher das GKGK-Konzept umgesetzt haben, haben dafür drei Stunden regulären Sportunterricht, eine extra Stunde Sachunterricht über Lebensstil- und Ernährungskunde sowie zwei Nachmittagsstunden mit Bewegung, Spiel und Sport umgesetzt. Damit wurden konzeptionell drei Stunden curriculare und zwei Stunden extra-curriculare Sportstunden gewährleistet (tägliche Bewegungszeiten mit 60 bis 90 Minuten). Als weitere co-curriculare und extra-curriculare gesundheitsfördernde Angebote, um diese 60 bis 90 Minuten zu erreichen, kommen sowohl der aktive Schulweg (walking bus), als auch zahlreiche Sportangebote zwischen den Schulstunden und im Rahmen des üblichen Pausensports hinzu. Diese verschiedenen Angebote sollen Einzelmaßnahmen in ihrer Effektivität verbessern und ein gesamtes Kommunalprogramm in der Verbindung zwischen Schule, Sportverein und Kommunalverwaltung sichern für einen gesunden Lebensstil von Kindern und Jugendlichen, um Bewegungsarmut, Übergewicht und Adipositas zu verhindern.

An den empirischen Untersuchungen meiner Studie haben insgesamt 990 Kinder, davon 693 aus Deutschland und 297 aus China teilgenommen. Die deutsche Kohorte umfasst 327 Mädchen und 366 Jungen, insgesamt 25 Schulen aus 12 Kommunen. Die chinesische Kohorte umfasst insgesamt 143 Mädchen und 144 Jungen aus zwei Schulen einer Großstadt (Shanghai). Dass Durchschnittsalter der Deutschen Kinder beträgt 6,57 Jahre (SD = 0,62) und das Durchschnittsalter der chinesischen Kinder beträgt 7,13 Jahre (SD = 0,34). Das war das Durchschnittsalter, als die GKGK-Intervention startete im September 2012 (t1). Die chinesischen Kinder sind also ungefähr 6 Monate älter als die deutschen Kinder. Im November 2013 (t2), fand in Shanghai die zweite Messung statt. Die dritte Messung wurde dort im November 2014 (t3) durchgeführt. Zwischen den Messzeitpunkten gab es also immer circa zwölf-monatige Intervalle, je nach Kommune (DE/CN) und Schule leicht verschieden. Nach der letzten Intervention betrug das Alter der deutschen Kinder 8,54 (SD = 0,62) und das Durchschnittsalter der chinesischen Kinder 9,18 Jahre (SD = 0,42).

Im Rahmen dieser zweijährigen Interventionen hat sich bei allen Kindern in beiden Ländern viel verändert. Alle Kinder haben ihren BMI aufgrund ihres Wachstums erhöht, aber diese Effekte sind im Rahmen ihrer biologischen Entwicklung normal (Chinese girls t1: BMI = 16,58 ± 2.65, t2: BMI = 16,81 ± 3,00, t3: BMI = 17,25 ± 2,79; Chinese boys: t1: BMI = 16,81 ± 2.31, t2: BMI = 17,38 ± 2,74, t3: BMI = 17,89 ± 2,85; German girls: t1: BMI = 16,07 ± 2.02, t2: BMI = 16,54 ± 2,31, t3: BMI = 17,21 ± 2,74; German boys: t1: BMI = 16,53 ± 2,32, t2: BMI = 16,92 ± 2,57, t3: BMI = 17,52 ± 2,89). Aber BMI-Cole in beiden Ländern geb es am Ende der Interventionsmaßnahme reduzieren (Chinese girls t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.1, t3: BMI-Cole = 2.8; Chinese boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 2.9, t3: BMI-Cole = 3.1; German girls t1: BMI-Cole = 3.2, t2: BMI-Cole = 3.1, t3: BMI-Cole = 3.1; Chinese boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.2, t3: BMI-Cole = 3.1). Im GKGK-Projekt in Shanghai wurden sechs Items aus dem GKGK Motoriktest zur Überprüfung der motorischen Entwicklung eingesetzt: Koordination (seitwärts Hin- und Her-hüpfen), aerobe Ausdauerkapazität (Sechs-Minuten Lauf), Kraftausdauer (Sit-Ups), Schnellkraft (Standweitsprung), Flexibilität (Sit-and-reach) und Antrittsschnelligkeit (20m-Lauf). Die deutschen Schüler- und Schülerinnen verbesserten fünf motorischen Fähigkeiten im Rahmen ihrer Interventionaußer sit-and-reach. Die ChinesischenSchüler- und Schülerinnen verbesserten fünf motorischen Fähigkeiten im Rahmen ihrer Interventionaußer Sechs-Minuten Lauf.

Bei einem Vergleich der BMI Werte zwischen der chinesischen und der deutschen Kohorte zeigt sich, dass die chinesischen Kinder (altersbedingt nicht überraschend) einen höheren BMI-Wert hatten als die deutschen Kinder beiderlei Geschlechts. Unerwartet zeigte sich, dass es mehr übergewichtige und adipöse chinesische Kinder gab als deutsche Kinder (overweight and obese rate China vs. Germany t1: 51.39% vs. 42.14%, t2: 56.03% vs. 45.08%, t3: 55.76% vs. 53.09%). Bei den motorischen Fähigkeiten zeigten chinesische Kinder bessere Ergebnisse in der Koordination (China vs. Germany in girls t1: 30.54 ± 5.97 vs. 22.87 ± 6.34, t2: 37.70 ± 6.98 vs. 28.46 ± 6.02, t3: 41.06 ± 7.46 vs. 33.05 ± 6.04; China vs. Germany in boys t1: 31.17 ± 6.55 vs. 22.02 ± 6.56, t2: 39.27 ± 7.61 vs. 27.84 ± 6.63, t3: 41.76 ± 8.51 vs. 32.29 ± 6.19), in der Kraftausdauer (China vs. Germany in girls t1: 19.65 ± 4.87 vs. 13.63 ± 5.26, t2: 25.56

± 6.37 vs. 17.63 ± 4.92, t3: 26.54 ± 6.07 vs. 19.29 ± 4.85; China vs. Germany in boys t1: 21.07 ± 5.60 vs. 13.53 ± 5.76, t2: 24.73 ± 6.98 vs. 17.99 ± 5.79, t3: 26.49 ± 7.38 vs. 19.67 ± 5.34) und in der Schnellkraft (China vs. Germany in girls t1: 124.49 ± 16.45 vs. 98.51 ± 18.31, t2: 133.68 ± 14.50 vs. 109.81 ± 16.19, t3: 141.39 ± 15.20 vs. 117.44 ± 16.59; China vs. Germany in boys t1: 135.05 ± 16.53 vs. 103.78 ± 19.08, t2: 141.96 ± 18.00 vs. 115.52 ± 18.05, t3: 148.06 ± 17.32 vs. 123.12 ± 18.39) im Vergleich zu ihren deutschen Mitschülern, die wiederum bessere Ergebnisse im Sechs-Minuten Lauf (China vs. Germany in girls t1: 815.79 ± 127.34 vs. 836.17 ± 103.15, t2: 874.85 ± 153.28 vs. 880.49 ± 108.42, t3: 821.09 ± 162.31 vs. 919.99 ± 119.38; China vs. Germany in boys t1: 878.53 ± 161.36 vs. 886.29 ± 109.66, t2: 922.51 ± 179.95 vs. 951.58 ± 114.96, t3: 866.12 ± 180.87 vs. 993.78 ± 128.36), also der aeroben Ausdauer zeigten, als ihre chinesischen Altersgenossen.

Vergleicht man die BMI-Werte vor und nach der Intervention bei der chinesischen Kohorte, so zeigt sich für beide Geschlechter eine signifikante Steigerung im BMI. Übergewichtige und adipöse chinesische Kinder konnten ihren BMI Wert zwischen der ersten (t1) und dritten (t3) Messung nicht signifikant verändern. Gleichwohl gibt es aber weniger übergewichtige und adipöse chinesische Kinder nach der Interventionsmaßnahme GKGK. Zwischen der ersten (t1) und dritten (t3) Messung,fünf von zwölf Mädchen mit adipöse fiel aus der Gruppe, zwei der dreizehn Jungen mit übergewicht fiel aus der Gruppe. Die BMI-Cole der chinesischen Mädchen[t1 = 3.3, t2 = 3.1, t3 = 2.8; F (2,36) = 19.043, $p < 0.001$, $\eta^2 = 0.514$] und chinesischen Jungen[t1 = 3.3, t2 = 2.9, t3 = 3.1; F (2,38) = 5.899, $p < 0.006$, $\eta^2 = 0.237$]signifikantreduzieren. Vergleicht man die motorischen Testwerte vor und nach der Intervention in der chinesischen Kohorte, so konnten die chinesischen Kinder ihre Leistungen in der Koordination (girls t1 = 30.54 ± 5.97, t2 = 37.70 ± 6.98, t3 = 41.06 ± 7.46, boys t1 = 31.17 ± 6.55, t2 = 39.27 ± 7.61, t3 = 41.76 ± 8.51), der Kraftausdauer (girls t1 = 19.65 ± 4.87, t2 = 25.56 ± 6.37, t3 = 26.54 ± 6.07, boys t1 = 21.07 ± 5.60, t2 = 24.73 ± 6.98, t3 = 26.49 ± 7.38), der Schnellkraft (girls t1 = 124.49 ± 16.45, t2 = 133.68 ± 14.50, t3 = 141.39 ± 15.20, boys t1 = 135.05 ± 16.53, t2 =141.96 ± 18.00, t3 = 148.06 ± 17.32) und auch in der Antrittsschnelligkeit (girls t1 = 4.82 ± 0.42, t2 = 4.61 ± 0.39, t3 = 4.44 ± 0.37, boys t1 = 4.61 ± 0.42, t2 = 4.44 ± 0.47, t3 = 4.31 ± 0.39), der Flexibilität der Mädchen (t1 = 14.41 ± 3.87, t2 = 14.44 ± 4.03, t3 = 14.58 ± 9.23), deutlich verbessern, nicht aber in der aeroben Ausdauer (girls t1 = 815.79 ± 127.34, t2 = 874.85 ± 153.28, t3 = 821.09 ± 162.31, boys t1 = 878.53 ± 161.36, t2 = 922.51 ± 179.95, t3 = 866.12 ± 180.87), und der Flexibilität den Jungen (t1 = 10.83 ± 4.01, t2 = 10.18 ± 4.41, t3 = 9.14 ± 5.38). Bis auf die aerobe Ausdauerkapazität konnten alle motorischen Fähigkeiten verbessert werden. Insofern war das GKGK-Interventionsprogramm erfolgreich in beiden Shanghaier Schulen.

Vergleicht man die BMI Werte vor und nach der Intervention bei den deutschen Kindern, so haben auch Jungen und Mädchen aus der deutschen Gruppe ihren BMI signifikant erhöht. Übergewichtige und adipöse deutsche Mädchen konnten ihren BMI-Cole zwischen dem ersten (t1) und dritten (t3) Messzeitraum nicht signifikante reduzieren, aber immer noch verringert (t1 = 3.2, t2 = 3.1, t3 = 3.1; F (2,61) = 2.827, $p < 0.067$, $\eta^2 = 0.085$). Übergewichtige und adipöse deutsche Jungen ihren

BMI-Colezwischen dem ersten und dritten Messzeitpunkt reduzieren (t1= 3.3, t2 = 3.2, t3= 3.1; F (2,75) = 4.742, $p < 0.012$, $\eta^2 = 0.112$). Die deutsche Teilpopulation überwichtiger und adipöser Kinder war nach der Intervention in ihrer Anzahl verringert. Im Gegensatz zu der chinesischen Kohorte konnte die deutsche Kohorte ihre Leistungen deutlich steigern, in der Koordination (girls t1 = 22.87 ± 6.34, t2 = 28.46 ± 6.02, t3 = 33.05 ± 6.04, boys t1 = 22.02 ± 6.56, t2 = 27.84 ± 6.63, t3 = 32.29 ± 6.19), der Kraftausdauer (girls t1 = 13.63 ± 5.26, t2 = 17.63 ± 4.92, t3 = 19.29 ± 4.85), der Schnellkraft (girls t1 = 98.51 ± 18.31, t2 = 109.81 ± 16.19, t3 = 117.44 ± 16.59, boys t1 = 103.78 ± 19.08, t2 = 115.52 ± 18.05, t3 = 123.12 ± 18.39), der Antrittsschnelligkeit (girls t1 = 4.80 ± 0.41, t2 =4.54 ± 0.36, t3 = 4.40 ± 0.31, boys t1 = 4.66 ± 0.40, t2 = 4.44 ± 0.36, t3 = 4.31 ± 0.37), und auch der aeroben Ausdauerkapazität(girls t1 = 836.17 ± 103.15, t2 = 880.49 ± 108.42, t3 = 919.99 ± 119.38, boys t1 = 886.29 ± 109.66, t2 = 951.58 ± 114.96, t3 = 993.78 ± 128.36). Aber nicht der Flexibilität (girls t1 = 4.99 ± 4.62, t2 =5.41 ± 5.14, t3 = 4.69 ± 5.71, boys t1 = 4.66 ± 0.40, t2 = 4.44 ± 0.36, t3 = 1.29±5.81). Wie die chinesischen Kinder, so haben auch die deutschen Jungen und Mädchen vom Interventionsprogramm GKGK an ihren Schulen profitiert.

Meine Dissertation umfasste acht Hypothesen zur BMI Entwicklung und dreizehn Hypothesen zur Entwicklung der motorischen Fähigkeiten in der chinesischen und deutschen Kohorte. Meine Hypothesen zur BMI-Entwicklung musste ich verwerfen. Heute ist das Problem von übergewichtigen und adipösen Jungen und Mädchen im Grundschulalter in China auf einem fast gleich hohen Niveau wie in westlichen Gesellschaften. Meine Resultate zeigten sogar, dass in unserer chinesischen Kohorte mehr übergewichtige und adipöse Kinder mitwirkten als in der deutschen Kohorte, was im Gegensatz zur gängigen und meiner eigenen Literaturanalyse als ein besonders alarmierendes Ergebnis bezeichnet werden muss. Aus Sicht vieler internationaler Wissenschaftler erscheint China immer noch als ein Entwicklungsland und man vermutet, dass der Anteil an übergewichtigen und adipösen Kindern im Durchschnitt geringer ist als in westlichen Gesellschaften. Das trifft aber heute für die meisten Großstädte in China, wie meine Ergebnisse in Shanghai zeigen, nicht mehr zu. Auch Deutschland hat als entwickeltes Land eine hohe Rate an übergewichtigen und adipösen Kindern. Diese Rate, je nach Studie zwischen 15 und 20 Prozent, ist zwar alarmierend, wird aber dennoch nicht als Kulturschock wahrgenommen wie in meinem Heimatland China.

Im Rahmen der motorischen Testverfahren in meiner Dissertation konnten immerhin zehn von 13 Hypothesen verifiziert werden, mit Ausnahmen der Hypothesen No. zehn, elf und zwölf. Im Gegensatz zur Hypothese zehn, zeigten deutsche Kinder eine bessere Entwicklung in ihrer aeroben Ausdauerkapazität als chinesische Kinder. Bei der Hypothese elf war es genau umgekehrt. Die Ergebnisse zeigen, dass chinesische Mädchen eine bessere Schnellkraftentwicklung zeigten gegenüber den deutschen Mädchen. Ebenso musste die Hypothese zwölf verworfen werden, da die Resultate zeigten, dass auch die chinesischen Jungen über eine bessere Schnellkraft verfügten als die deutschen Jungen. Die besseren Schnellkraftleistungen der chinesischen Kinder (Standweitsprung) werden auch in Form der Referenzwerte aus dem ‚Chinese National Physical Fitess Test' (NPFT) bestätigt.

Es kann nicht ausgeschlossen werden, dass die chinesischen Kinder hier (Schnellkraft-Test) bessere motorische Leistungen zeigten, weil der NPFT auch dieses Item umfasst und diese Kinder mit der Testaufgabe besser vertraut waren, als ihre deutschen Mitschüler- und Mitschülerinnen, für die solche Tests noch relativ neu sind. Das könnte umgekehrt auch die Erklärung dafür sein, wieso die chinesische Population in ihrer aeroben Ausdauerfähigkeit schlechter abgeschnitten hat als die deutsche, denn ein solches Test-Item ist im NPFT nicht zu finden. Der leichte Rückschritt in der Ausdauerleistung der chinesischen Kinder kann auch auf einen zweiten Faktor zurückgeführt werden: Aerobe Ausdauer hat im chinesischen Sportunterricht keinen hohen Stellenwert, und die äußeren Umweltverhältnisse in Shanghai, sind so (Umweltbelastung), dass auch Kinder in ihrer Freizeit wenig Aktivitäten zeigen, die eine gute aerobe Ausdauerleistung verlangen. Diese Erklärungen müssen heran gezogen werden, um die besonderen Unterschiede der Ausdauerleistung beider Kohorten erklären zu können. Ebenso muss festgestellt werden, dass bis heute insgesamt die übergewichtigen und adipösen Kinder in China weniger Aufmerksamkeit geschenkt bekommen durch staatliche Gesundheits- und Förderpolitik und die neuen Essgewohnheiten dort mit Fast Food nach westlichen Vorbild auf einem starken Vormarsch sind.

Das deutsche Schul- und Sportsystem für Kinder und Jugendliche fördert mehr die Alltagsbewegung von Kindern und Jugendlichen als in China. Davon profitieren deutsche Kinder und Jugendliche mehr als ihre chinesischen Mitschüler-und Mitschülerinnen. Auch in Deutschland wird der besonderen Problemgruppe von übergewichtigen und adipösen Schulkindern noch nicht die große Aufmerksamkeit gewidmet, um mit gesunder Ernährung und mehr Bewegung die Zahl der übergewichtigen und adipösen Schulkinder nachhaltig zu reduzieren.

Die Ergebnisse meiner Dissertation belegen, dass schulbezogene Interventionsprojekte die anthropometrische Entwicklung positiv beeinflussen kann, der Anteil der Kinder mit einem hohen BMI für Übergewicht und Adipositas in Teilen nach einem Interventionsprogramm reduziert werden kann und die motorische Entwicklung auf breiter Front in beiden Kohorten gefördert werden konnte. Als Schwäche unserer Untersuchung muss allerdings genannt werden, dass wir auf der einen Seite nur Großstadtkinder (Shanghai) in unserer Studie hatten, und weniger Großstadtkinder aus deutschen Kommunen, sodass auch hier ein erhöhter Effekt für chinesische Kinder auf ungleiche Proportionen in der Auswahl der Kohorten zurückgeführt werden könnte. In der Zukunft sind weitere kulturvergleichende Untersuchungen in der gesundheitlichen und motorischen Entwicklung von chinesischen und deutschen Schulkindern erforderlich, auch über einen längeren Zeitraum als zwei Jahre, um nachhaltige Veränderungen insbesondere bei übergewichtigen und adipösen Kindern zu erzielen und noch besser erklären zu können.

Introduction

My study of *"Healthy Children in Sound Communities – Community Based Networking for Health Enhanced Physical Activities of Children in China and Germany"* is divided into five parts. Part A includes two literature review chapters: a Chinese literature review and German literature review; Part B also includes two chapters: international comparable studies and healthy children in sound communities (HCSC) investigation; Part C includes two chapters as well: reviews and hypotheses between China and Germany, and data and analysis of HCSC-CN-DE; Part D includes three chapters: a discussion and comparisons of German data, a discussion and comparisons of Chinese data, and the conclusion; Part E includes all the studies, references, appendix and documents.

In part A there are seven subchapters under chapter one (Chinese literature review) and four subchapters under chapter two (German literature review). The Chinese literature review chapter contains Chinese sport development in physical activity and promotion (1.1); public health status of people in China (1.2); Chinese nutrition and diet report (1.3); Chinese media and screen time report (1.4); Chinese transportation report (1.5); Chinese physical health standards (1.6);and the outcomes of Shanghai studies after 2005 (1.7).The German literature review chapter contains German sport and health reports at national levels (2.1); German sport and health report on regional levels (2.2); German nutrition and diet report (2.3);and German media and screen time report (2.4).

Part B highlighted 67 international school-based physical activity and health studies in chapter three, and addressed the investigation of the HCSC project in chapter four. All studies compared by geography (3.1) and different parameters. Parameter of body shape and physical activity (3.2), parameter of body shape, physical activity and nutrition (3.3) and parameter of body shape, physical activity, nutrition and motor test (3.4) will be presented. Subchapter 3.5 and 3.6summarize the comparable studies in China and Germany. The concept and strategy of HCSC will be described in subchapter 4.1, the organization and construction of HCSC in subchapter 4.2, arrangements and implements of HCSC in subchapter 4.3, evaluation and supervision of HCSC in subchapter 4.4, the record of HCSC in Germany and Europe in subchapter 4.5, and the record of HCSC in China in subchapter 4.6.

Part C reviews the hypotheses between China and Germany in chapter five, data and an analysis of HCSC-CN-DE in chapter six. The Chinese results and outcome of being overweight and obese are presented in subchapter 5.1, the Chinese results and outcome of motor development in subchapter 5.2;the German results and outcome of being overweight and obese in subchapter 5.3, the German results and outcome of motor development in subchapter 5.4;eighthypotheses of mean BMI value and thirteen physical development hypotheses in subchapter 5.5.The research parameter of HCSC-CN-DE can read in subchapter 6.1, the method of HCSC-CN-DE in subchapter 6.2, the HCSC-CN-DE data and analysis of BMI value will be in subchapter 6.3, the HCSC-CN-DE data and analysis of motor tests will be in subchapter 6.4, and there will also be a short conclusion of this chapter(6.5).

Part D includes an evaluation and outcome of Germany in chapter seven, and an evaluation and outcome of China in chapter eight. The mean BMI value and motor test results before and after intervention of HCSC had been compared.

Finally, part E shows all the studies in chapter ten. These studies are formed of an introduction, results, contribution and limitation four parts; these studies serve as references compared in the literature review part. Chapter eleven cites all the references, and chapter twelve shows Chinese standards of physical activity, which influences on the design, methods of investigations, and provides reference norms or intervals for evaluation of my study.

Part A

1 Literature review from China

China, located in East Asia, with 9.6 million square kilometers of land, 56 ethnic groups, 1.35 billion population of inhabits, approximately seven million people added annually. It is one of the most population countries in the world. In the last three decades, China has undergone a remarkable economic transformation. It became the second-largest global economy in terms of GDP; it joined the upper-middle-income country group in 2010, with GDP per capita income of $ 4628 (cf. National Bureau of Statistics of the People's Republic of China, 2011). With major increases in economic development and wealth (cf. WB, 2010), Chinese modernization era developed very dramatically, as has been seen in low-and middle-income countries around the globe, economic development is soon followed by obesity, Pedwith disparities by socioeconomic status (SES) (cf. Monteiro, et al. 2004; Ezzati, et al. 2005). This also happened in China, it presents a unique model for weight change, as the country has experienced a transition from a history of under nutrition to a very rapid increase in obese (cf. Popkin, et al. 2008; Van de Poel, et al. 2007). Many researchers have documented increases in body mass index (BMI) and overweight across China (cf. Xi, et al. 2012; Dearth-Wesley, et al. 2008; Wildman, et al. 2008; Wang, et al. 2007), over one-fifth of adults are overweight and inactive and consume high quantities of caloric sweeteners, animal-source foods, and edible oils (cf. Popkin, et al. 2002; 2003; 2006; 2009; 2010; 2012; Du, et al. 2004;). There is considerable geographic and temporal heterogeneity in the timing of the transition from underweight to overweight across the country, thus providing variation in weight change by age, by area, and over time (cf. Jones-Smith, et al. 2011; Doak, et al. 2000; 2002; Wang, et al. 2002; Mendez et al. 2005). Patterns of adult and pediatric obesity in China now closely mirror similar patterns with western countries.

1.1 Chinese Sport Development in Physical Activity and Promotion

1.1.1 Four Stages of Chinese Sport Development

Since China shift from an agriculture background to a service based economy system, China's transition to a more urbanized and technological society, this would likely to impact transportation and leisure time activity, without substitutions of alternative forms of energy expenditure will increase the numbers of overweight and obese individuals. China's sport policy is strongly affected by the Chinese policy and social economic development transformation, so reviewing four stages of state policy in Chinese sport history, would easier to understand the Chinese sport development.

First stage, abandoned American physical education system, established "Health Firs" Sovietisation Socialist Construction (1949-1966):
After established People's Republic of China (PRC) in 1949, China had recognized by the Soviet Union but not most Western countries which led by USA, therefore Chinese government had to build a stable regime to strength new sport and physical

education policy in order to sever national defense and people's health (cf. Zhu 1949).So the pre-1949 education philosophy which is more influenced by United States was critical as "capitalist product" denied by PRC. China established "new Sport" that regarded Soviet physical education philosophy and practice as being based on Marxist theory, aimed to strengthen students' physique and cultivate communist ethics and ideology in order to serve socialist construction and national defense (cf. Gu 2006). This is the first All-China sport and physical education, and also the Soviet Labor and Defense System (SLDS) first into Chinese schools. The main work is strengthening physique to overcome the shameful nickname of "Sick man of East Asia". In schools, it had principle of "health first, academic knowledge second", the main train work is engaged into systematic sports and physical activities in order to enhance physical strength, endurance, speed and flexibility.

Second stage, re-establish Chair Mao leadership, military sport and training took as school sport during Cultural Revolution (1966-1976):
This is the special time in Chinese history, because it launched ten years Culture Revolution, and Primary and secondary schools were almost shut down nationwide, both modern western sports and traditional Chinese sports were abandoned, and military training replaced. It published military physical education textbook, the principle in schools are cultivate students' spirit of revolution and proletarian politics; enhance students 'sense of organsational discipline; increase awareness of class struggle; equip students with basic knowledge and skills of military training, as well as production skills (cf. Fu 2008).The main training work is engaged into Chair Mao's "Little Red Book" that more focus on upper body exercise such as up limb, chest and head. Meanwhile, in some provinces and municipalities, published new physical education textbook as the first school teaching material, physical education classes conducted as PE curriculum, basketball, football and table tennis are included.

Third stage, remove militarization in schools, emphasized Physical Education and Health, "one hour exercise per day and two PE classes per week" policy build (1977-1985):
This is a new era for physical education as a new sport culture, militarization sport continued but only a small part. Two years later it disappeared, government more focus on improving students 'physical fitness levels (cf. NSC, 1978).It announced "primary and secondary schools should have two hours of PE classes within their curricula and two hours for extracurricular sport activities. In addition, colleges and universities should also include PE classes in their curriculum from 1978" (cf. CME et al. 1978). This is very profound and lasting policy in the whole Chinese sport history, the following reforms all based on this curriculum. In early 1980s, the nation first time investigated the students' health condition, later made some requirements for Chinese students who need pass the health test can go to Universities and colleges (cf. Shen et al. 2012). More documents stated during this period to emphases Chinese physical education in schools. Schools began to have teaching programmers, morning exercise and class-break exercise, the teaching way is more concerned about students' psychological and physiological characteristics, schools also established the physical examination system (cf. Ministry of Education, National Sport Committee and Ministry of Health. 1982), more achievements in this stage.

Forth stage, Multi-Objectives and the All-round development of physical activities and promotions (1986-2015):

This is the biggest physical education reform era, there are many new policies made, many nationalized health and physical activity tested for adults and children and adolescents, and health enhanced physical activity launched in different levels through the whole China. All these activities could divide into two different systems, one is Elite Sport System (ESS) (see Figure 1), and another is Mass Sport System (MSS). ESS has National Games (NG) and National Sport Torments (NTS) two parts, both from city-province-nation this low to high ladder structure, both organized by General Administration of Sport of China (GASC). NG held every four years with all kinds of sport items only for elite athletes, NST held every two years for single sport item for both professional players and sports enthusiasts. Both of them are elite athletes' selection system, which evaluate the good players to the top team in China. MSS is for sport enthusiasts, to improve the national physique and health level, CSC promulgated the "National Fitness Program Outline" to further development of fitness, develop a nationwide fitness campaign (cf.CSC. 1995).

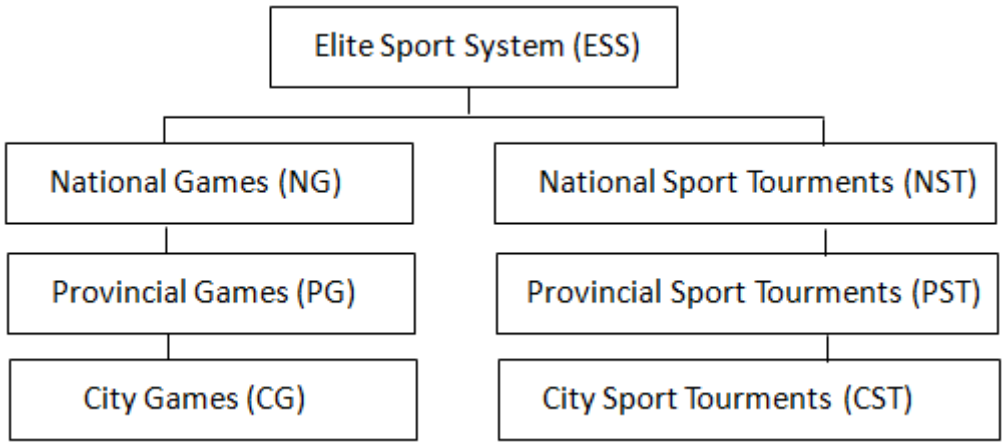


Figure 1 - Chinese elite sport system

To fully implement the "health first" ideology in whole nation, in early 20th century, General Administration of Sport of China(GASC), Chinese Ministry of Education (CME), Ministry of Science and Technology of the People's Republic of China (MSTC), State Ethnic Affairs Commission (SEAC), Ministry of Civil Affairs of the People's Republic of China (MCAC), Ministry of Finance of the People's Republic of China (MFC), Ministry of Agriculture of the People's Republic of China (MAC), National Health and Family Planning Commission of China (NHFPCC),National Bureau of Statistics of the People's Republic of China (NBSC), All-China Federation of Labor (ACFL),these ten departments joint together launched National Physical Fitness Test (NPFT) in 31 provinces(autonomous regions and municipalities), once every five years. It uses "National Physical Fitness Test Standard (NPFTS)"For the group 3-6-year-old and group 20-65-year-old, and use "National Student Physical and Health Standard (NSPHS)" for the group 7-19-year-old, to know the individual body shape, evaluate the physical performance and test the body function and quality.

Review the Chinese sport development, we found that, policy on physical education in China developed with a traditionally Chinese Character which is relative with the political and culture. Before the Cultural Revolution, physical education is more aimed to cultivate and train a fit, obedient and disciplined workforce for Communist China; during the Cultural Revolution, physical education was permeated by militarization and politicization; after Cultural Revolution, along with the economic and social development transfer into fitness first, strengthening physical education in schools, and encourage the citizen to move, and keep a healthy lifestyle.

1.1.2 Chinese Physical Activity and Promotion in Schools

1.1.2.1 Chinese Physical Activity and Promotion in Schools (1980s)

Due to the poor health condition of students conducted in 1979, only 11.86% of 3,053 students in Beijing were up to the standard (cf.NSC.1979) and 13,924out of 48,580 students failed to pass the health requirements for entrance to universities and colleges in Guangdong (cf.NSC.1979).The Chinese government pays more attention on students' health in early 1980s, here are the documents stated by different Chinese official institute with different purposes, see Table 1.

Table 1 - Chinese school physical activity and promotion in schools (1980s)

Time	Organization	Physical Activity and Promotion policy and content
05.1979	CME,CMS,CMH	physical education classes must be conducted according to a teaching programmed and student psychological and physiological characteristics; school classes should spend one hour per day in physical exercise, including morning exercise and class-break exercise; a spare-time sports training system should be established and improved; and a physical examination system should be established in schools(cf.CME et al. 1979)
1980	CMS	Physical education is the basis of national sport and it directly determines national physique and performance in elite sport (cf. NSC.1980)
06.1982	CME	Notification on Ensuring one Hour of Sport Activities per Day in Schools, morning exercise and class break exercise should be scheduled every day in addition to one hour of exercise per day and two classes of physical education per week (cf.CMS. 1983)
1982	CMS	Publish "sixth version of the Broadcast Gymnastics of Young Students" to promote sport exercise participation in schools (cf. CMS. 1983)
08.1982	CSC	New National Standard of Physical Training, in which schools were required to encourage students to regularly participate in sports exercise(cf. CMS. 1983)

12.1982	CME,CMS,CMH, SEAC	Plan on Further Establishing and Improving the Physical Health Card(cf. Chen et al.1999)
05.1983	CMS	"On Further Strengthening Physical Education "document which to improve the physical fitness level of the younger generation (cf. NSC.1983)
10.1983	CSC	"Further Creating New Environment for Physical Education and Sports" document which take physical education and spare-time sports school training to the National Sixth Five-Year Plan(1980-1985)(cf. CSC. 1986)
03.10.1983	CME,CMS,CMH, SEAC	Health Investigation of 900,000 students aged from seven to 22,involving 29 ethnic groups distributed in 29 provinces and cities(cf. CME. 1984)
07.1985	BACPE,BASPE	Workshop on Physical Education reform (cf. Yi. 1985)
08.1986	CME,CMS	Multi-Objective Physical Education Reform: (1) To strengthen students' physique, and promote students' all-round development; (2) To inspire students' interest and enthusiasm to take part in sport and provide students with knowledge and methods of physical exercise; (3) To build up students' will and strengthen students' psychological ability and personality; (4) To cultivate students' collective spirit, strengthen student discipline and improve students' communist ideology and morality; (5) To improve students' sports skills; (6) To cultivate outstanding athletes to improve elite sports performance (cf. Li. 2009)
1987	CME	Publish "Teaching Plans of Physical Education for Primary Schools and Secondary Schools" to guide school PE (cf. Wang 1987)

Remark: CME=Chinese Ministry of Education; CMS=Chinese Ministry of Sport; CMH=Chinese Ministry of Health; CSC=Chinese State Council; SEAC=State Ethnic Affairs Commission; BACPE=Beijing Academy of Physical Education; BASPE=Beijing Association of Physical Education

In 1980s, China launched many policies to implement physical education to train Chinese students' physique and health, but under the pressure of academic exams, more and more sport classes in some schools were arbitrarily replaced by other courses, even cancelled in the senior classes due to extra tutoring for academic exams. Students' health, therefore, has been in decline due to lack of well organized PE classes and sports activities (cf.CMS. 1983).

1.1.2.2 Chinese Physical Activity and Promotion in Schools (1990s)

In 1993, CME and CMS added spare-time school sports competition system into regular school sport, further to promote their health, teach students basic knowledge and skills of physical exercise and sports, provide them with ideological and moral education (cf. DPEH et al. 1993; Wang. 1995). Three years later, the whole China had physical education curriculum reform, aimed to transform the single physical education curriculum to a new curriculum system with two parts, one part is skills learning and another is ability developing(cf. Jiang. 1994).During this period, China experienced education reform, which exam-oriented education transfer into quality-oriented education, with the influence physical education regards as one important part in this reform, unfortunately, PE still not implement into action.

But large-scale research work of students' physique reported. One of the biggest national level investigations called "National Student Physical and Health Test (NSPHT)". It first started in year 1950, but only with small amount of survey and the data cannot fully representative of the characteristics of Chinese students in physical development (cf. Zhang. 2007). Then in 1979, 16 provinces joined this nationwide physical fitness testing in 7-22-year-old students, the data had a preliminary understanding of children's body shape, body function and current physique situation (cf. Ji et al.1996). Until 1985, CME, GASC, NHFPCC, SEAC, MSTC, MFC joint launched the second nationwide student physical and health test. This survey tested 28 ethnic from 29 provinces, autonomous regions and municipalities. There are 90, 2337 students with age 7-22-year-olds participated. This is a very important national survey, first time included minority students. Since then, every five years (in year 1990,1995,2000,2005, 2010) respectively the test in 7-22-year-old students of 30 provinces and cities. Even through, most students did not pay particular attention and most school lack of diversity teaching materials and teachers have less chance to update the teaching methods, PE still cannot compare with the other subjects in the education system.

1.1.2.3 Chinese Physical Activity and Promotion in Schools (21 Century)

The NSPH shows us, that the Chinese Youth increase of overweight and obesity number, decrease in Physical ability, especially continues decline in endurance, strength, speed and other health relative index in the last 22 years. How could after years reforms of Chinese education and physical education, the health of Chinese youth getting worse, this phenomenon has aroused the whole society's attention. The physical education curriculum replaced by other subjects, students' physical activity cannot be guaranteed, the parents not pay attention to sports etc., all these elements lead to the decline of health, so ensure sport activities for students, help them get better health, CME immediately addressed many official documents one after another, see Table 2.

Table 2 - Promotion of Chinese school physical activity in 21 century

Time	Organization	Physical Activity and Promotion policy and content
09.2001	CMS	Build “Physical Education and Health Curriculum Standard (PEHCS) ” (cf. Ji.2001)
09.2002	CMS	Build “New Physical Education curriculum”, (cf.Ji.2002)
2002	CMS	Establish "National Student Physical and Health Monitoring Network"
2002	CME, SSGA	Establish “National Student Physical Health Standard” (cf. CME & SSGA, 2002)
2005	CME	Issue central authority2005, NO.10 files
2005	CMS	Establish “Students' Fitness Network”
05.2007	CC,CSC	“Sunny Physical Education “activity and “Sport for Hundreds of Millions of Students”
05.2007	CC,CSC	Issue central authority2007, NO.7 files
09.2010	CME,CMS	Investigation of National Student Fitness (cf. CMS. 2010)
03.2011	CME	Issue central authority2011, NO.2 files
10.2012	OSC	Issue central authority2012, NO.53 files

Remark: CMS=Chinese Ministry of Sport; CME=Chinese Ministry of Education; SSGA= State Sport General Administration; CC=Central Committee; CSC=Chinese State Council; OSC= Office of the State Council

The “Physical Education and Health Curriculum Standard (PEHCS)” is a guide to build Chinese school PE curriculum, it requires reduce the athletics element and highlight the principle of health-oriented education, to pay close attention to individual differences and different needs, cultivate students’ sporting interest, develop students’ life-long physical exercise and raise students’ social awareness and ability to adapt(cf. Ji.2001). After one year, new physical education curriculum established, it included sport participation, sports skills, physical fitness, mental health and social adaptability five major elements (cf.Ji.2002). With the help of CME and SSGA, the “National Student Physical Health Standard (NSPHS)”and "National Student Physical and Health Monitoring Network (NSPHMN)" established in the same year 2002 (cf. CME &SSGA, 2002).

Then to 2005, CME issued the document "Implementation of physical activity every day to ensure the students’ sport time (central authority2005, NO.10 files)” (cf. CME, 2005), announced everyday one hour physical activity should be as compulsory course in schools, at the same time “Students' Fitness Network (SFN)” established to report data, provides physical health counseling, student health assessments and other columns for all students.

Another two years later, April 2007, nationwide program “Sunny Physical Education” and “Sport for Hundreds of Millions of Students”(cf. CC et al. 2007;Hu. 2007)started, it advocated reducing the workload of students ‘homework, ensuring one hour of sports exercise per day and improving sports facilities in schools(cf. Xinhua News Agency. 2007). The “Sunny Physical Education “set up “Sunny Sport” physical

activities series for the youth. It has own slogan" Health, Sports, Sunny, Future", explore the spirit of youth sport, formed a healthy happy sunny sport concept, strengthen the youth sports, enhance comprehensive development of youth sport. The "Sunny Physical Education" arranged by each province administer of education department and physical education department, implement in all Chinese schools and colleges, ensure all the students have one hour physical activity, see the content in different schools, see Table 3.

Table 3 - Chinese school physical activity content

School Level	Content Per Week
Primary school	3 PE classes and 3 sport activities, each unit has 35 minutes
Junior high school	2 PE classes and 3 sport activities, each unit has 45 minutes
Senior high school	2 PE classes and 3 sport activities, each unit has 45 minutes
College or University	1 PE classes and 4 sport activities, each unit has 90 minutes

Along with the sunny physical activity, there are series sports competitions also come into being. Every semester will have school level matches, good players can participate city level or national level competitions. This school-city-nation selection system plays a really important role in Chinese sport field. It not only helps the national guidance implement in Chinese schools, provides schools basis for structure their own physical education curriculum, pass on basic sport skills for students, cultivate them a healthy lifestyle; but also a platform for the same interests students play together, improve their sport technique, make friends and communicate each other. Meanwhile another document named "Central Committee and Chinese State Council (CCCSC) about strengthening youth sport activity and enhance youth physical ability's opinion (central authority2007, NO.7 files)"(cf. CC&CSC, 2007) issued to supplement the youth physical activity.

Until 2010, CME and CMS reported the youth health from National Student Fitness Investigation (NSFI) result, that Chinese students' explosive strength, endurance strength remained unchanged. Soon, March 2011, government work report announced "Guarantee students one hour per day of physical exercise (central authority2011, NO.2 files)"(cf. CME, 2011). To October 2012,the Office of the State Council (OSC) forwarded the CME released "several opinions about further strengthening physical education(central authority2012, NO.53 files)"(cf. OSC, 2012), requiring that all areas regulate their schooling practice, ease students' academic burden, and ensure one hour of physical activity everyday in school. Since then, school sports had more guaranteed.

Chinese physical education in a long time was embedded in the context of social transformation which involved a wide range of economic, cultural and educational reforms, it plays a critical role in promoting students' enthusiasm for sport participation, but neglect students' needs, so most students only attempted to meet the standard or pass exams. Especially to 21 century, physical education influenced by the thought of "emphasis on mental work, look down on physical work", school

has compulsory course in curriculum, but has not really been implemented, the continuous health decline and lack of physical ability, government had to pick it up again. So student-oriented all-round PE system rebuild, PE has been embarked on the right path.

1.2 Public Health Status of China

1.2.1 Public Health Status of Chinese Adults

Along with the rapid overweight and obese rate grows in China, there are many organization and scholars did investigate or survey in different level, including World Health Organization (WHO),Chinese Center for Disease Control and Prevention (CCDCP),General Administration of Sport of China (GASC), National Health and Family Planning Commission of China (NHFPCC) and some University-based research centers, here we will see some reports about the public health status of Chinese adults from 2002 to 2014.

- General Report about Overweight and Obesity

Table 4 - Nationwide report about overweight and obese

Time	Origin of the Report	Content of the Report
2002	CNNHS (cf.CNHS,2002)	In 2002, nearly 300 million people are overweight and obese, the Chinese adults over 18 years old, overweight rate was 22.8% and obesity rate was 7.1%;
2010	CCDCP(cf. CCDCP, 2013)	In 2010,about 30.6% of overweight and 12.0%obesity in the age 18 years and above; 18 to 59 years overweight rate reached 30.3%, the obesity rate reached 11.8%; 60 years old and above, the overweight rate is 32.3%, obesity rate is 12.5%.
2012	Paul French et al. 2012	Urban man is 63.5cmin 1985 and 76.2cm in 2010; 20 to 30-year-old males' WC increased by 0.1 cm, 30 to 40-year-old males' WC increased by 5 cm, 40 to 50-year-old males' WC increased by 7.9 cm,
2013	WHO (cf. WHO, 2013)	The proportion of overweight and obese adults from 25 % in 2002 to 38.5 % in 2010;
2014	Dalia Stern et al. 2014	BMI at 18.5 kg/m^2 males in 1993 had a 2.8 cm larger WC than their counterparts at the 2009 visit; BMI at 28 kg/m^2 females in 1993 had a 2.9 cm larger WC than their counterparts at the 2009 visit.
2014	Yang et al. 2014	In 2006, males' ECOR was 22.5%; females' ECOR was 21.7%;

		In 2011, males' ECOR was 18.3%, but CORreached 30.4%; females' ECOR was18.9%, but CORreached 28.1%,
2014	Gordon-Larsen et al. 2014	Adultsaged 18 to 65 from 1991 to 2011,using the WHO reference (cf. WHO. 1995) overweightprevalence rose from 10.4% in 1991 to 18.1% in 2000 and to 26.0% in 2011; using theChina-specific reference (cf. Zhou et al. 2002) comparable overweight prevalence was 24.7% in 1991, 36.1% in2000, and 44.0% in 2011.

Remark: China Nutrition and Health Survey=CNHS; Chinese Center for Disease Control and Prevention =CCDCP; World Health Organization=WHO; Waist Circumference =WC; Early Central Obesity Rate=ECOR; Central Obesity Rate=COR

From China National Knowledge Infrastructure (CNKI) databank there are over 9,188 academic articles about Chinese adults' overweight and obesity from year 2000-2015, but most are focused on one city or one province, the above seven articles are more representative, we can clearly to see the fast growth trends of overweight and obesity in the past 15 years, and China is already in danger.

- 2010 National Physical Fitness Test (NPFT)

Here are the results of 2010 National Physical Fitness Test (http://www.sport.gov.cn). The cluster sample 459,184 people from 31 provinces (autonomous regions and municipalities). It is including 51,159 children aged three to six years old; 227,259 children and adolescents (students) aged seven to 19years old; 155,054 adults aged 20 to 59 years old; 25,712 older from 60 to 69 years old. Compare the results 2005 and 2010 from Figure 2, there are more achieved "qualified" in 2010 in all age groups, especially the elder, with the conscious of "healthy body healthy life" in these five years, more people improved their healthy status. See Figure 2.

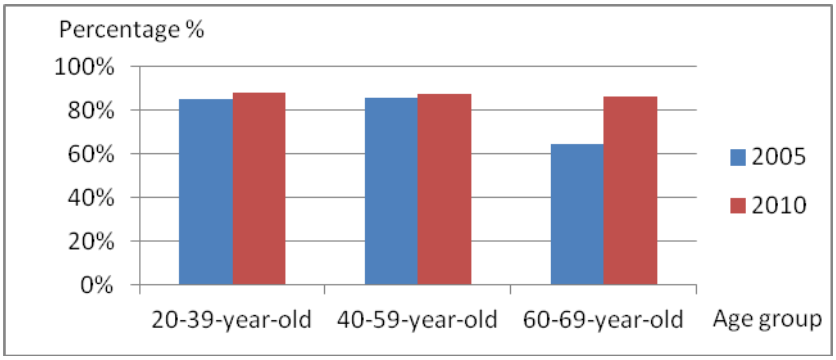


Figure 2 - Percentage as "qualified" of NPFTS in each group

Still, compare 2005 and 2010 (see Figure 3), from the body shape we can see Chinese adults and the elder gained more in weight, showing a sustained growth rate of overweight and obesity, especially the adults' overweight rate almost reached 40%, obesity rate over 10%, which means, among the sample, 62,022 adults (in 20-59-year-old group) are overweight and 2571 are obesity, in whole China with 1,339,724,852 Chinese citizen (cf. NBSC. 2011), with this same distribution can

estimate round174,725,980 Chinese adults are overweight and over 58,815,261 adults are obesity in 2010 China, this is really huge number for the whole world.

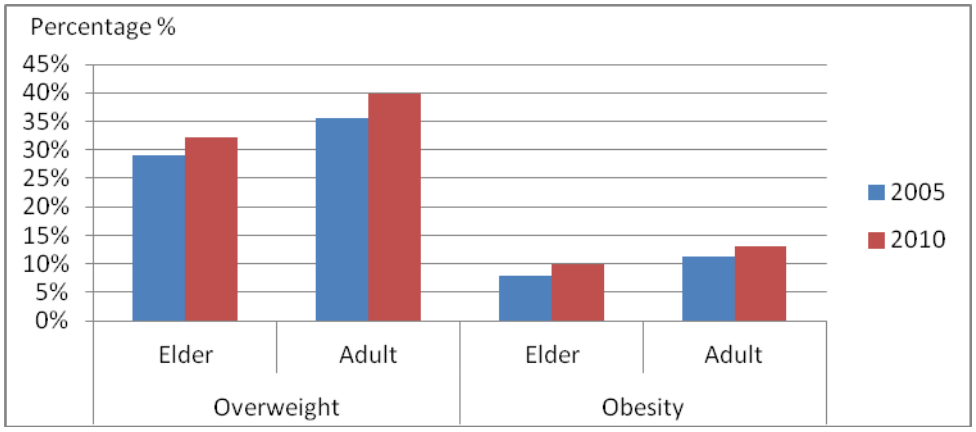


Figure 3 - Body shape for elder and adults

The body function and quality for the Chinese adults from 2005 to 2010, also changed a lot, in Figure 4 and Figure 5, we take 2005's data as base "0", if 2010's data higher than 2005's, the figure will appear on the right side, otherwise will appear on the left side, here will take 20-39-year-old male and 40-59-year-old female as examples. The average results of 20-39-year-oldmale's height, weight, chest circumference, waist circumference, hip circumference, skin fold thickness (upper arm and abdomen), vital capacity, systolic blood pressure, diastolic blood pressure, back strength and push-ups, all have improved, and the enhance range between 0.2% to 5.2%. Choice reaction time, heart rate, skin fold thickness of shoulder, grip, vertical jump, and one foot with eyes closed standing, sit and reach had0.1%-9.1%decrease. The average results of 40-59-year-old female's height, weight, hip circumference, vital capacity, chest circumference, waist circumference, systolic blood pressure, diastolic blood pressure, all had improved, and the enhance range between 0.1% to 2.3%.But skin fold thickness (upper arm, shoulder and abdomen), sit and reach, grip, heart rate, choice reaction time, one foot with eyes closed standing, had 0.3% to 9.9% decreased. So we can figure out, the Chinese adults had a continuous increase in body shape (height, weight, hip circumference, chest circumference, waist circumference) and heart and lung function (vital capacity, systolic blood pressure, diastolic blood pressure), but worse in physical performances (grip, back strength, sit and research, choice reaction time, one foot with eyes closed standing).It is the same situation in 60-69-year-old group people.

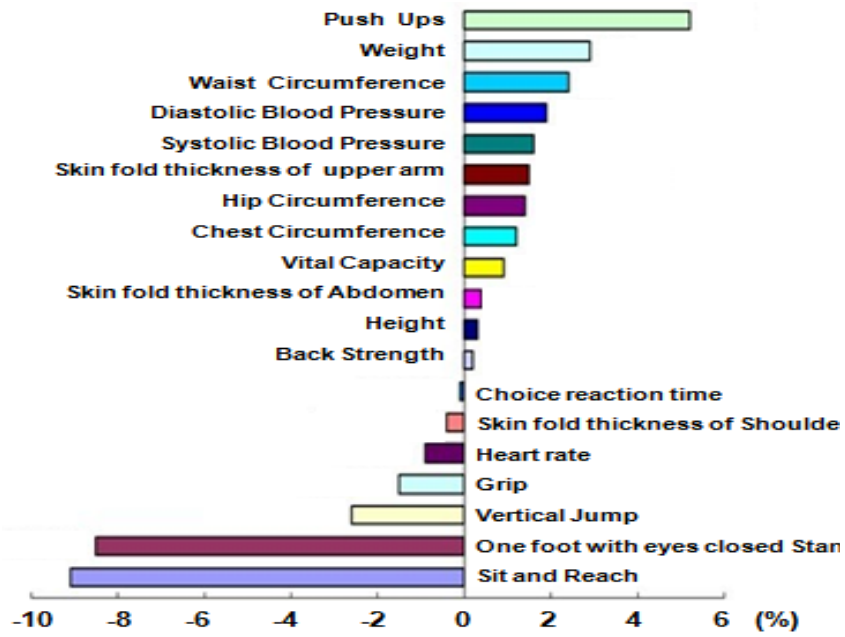


Figure 4 - Percentage changes in male 20-39-year-old in 2010 and 2005

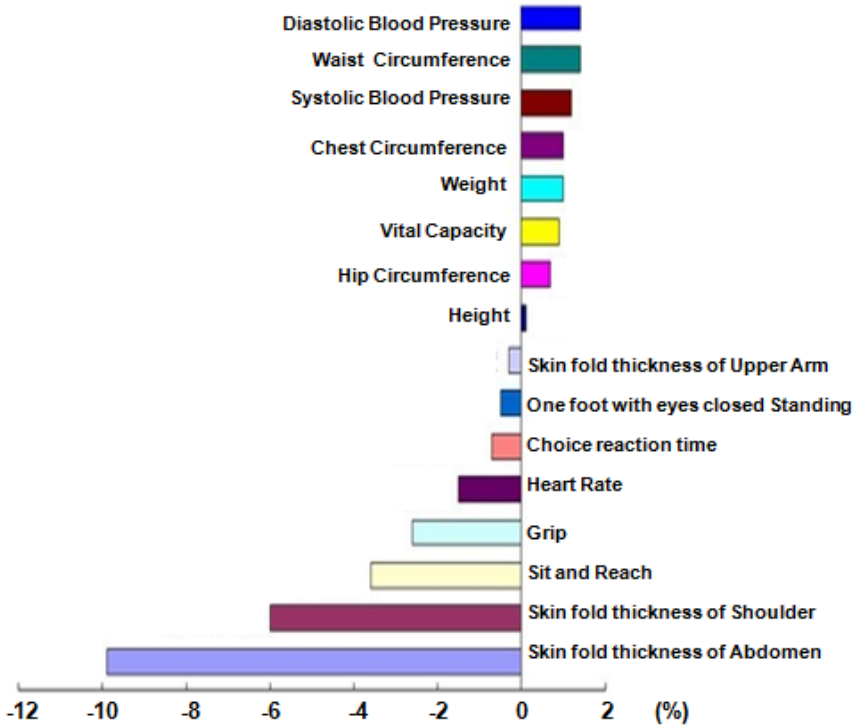


Figure 5 - Percentage changes in female 40-59-year-old in 2010 and 2005

- Physical Activity (PA)calculated by Metabolic Equivalent of Task (MET)

There are two studies reported the Chinese adult PA level by MET, one is by Du Haidong et al. (2013) which reported Physical Activity and Sedentary Leisure Time (PASLT) by different category see Table 5; and another research measured the occupational activity and home activity by Shu Wen Ng et al. (2009) reported the Chinese adults' physical activity level see Table 6;

Table 5 - Physical activity and sedentary leisure time (PASLT)

Category		Content of the Report
Gender	Women	medianwas17.4MET-h/d, interquartile range (IQR)was 11.2-28.9 MET-h/d, the mean 6SD was 20.9±12.8,divided between 10.9±12.5 for occupational activities and10.0±4.6 for non-occupational activities;
	Men	median was 19.9MET-h/d, interquartile range (IQR)was 10.8-33.2 MET-h/d, the mean 6SD was 22.8±15.1,representing the sum of 17.3±14.9 for occupational activities and5.5±4.1 for other activities
Region	Urban	Those who lived in the rural areas on average had 20% greater physical activity and5% less sedentary leisure time;
	Rural	
Work Type	Physical	Factory workers had the highest average level of PA, men had 30.0 MET-h/d and women had 31.3 MET-h/d, which in both genders was 50% greater than that for professionals and administrators
	Mental	

Table 6 - Occupational activity and home activity level (OAHAL)

	One Point Increase in		
	Education Facility	Housing or Sanitation	Community's Economic Wellbeing
Men	decreases 13 MET-hours PA/week;	decreases8 to 10 MET-hours PA/week;	decreases 6 to 7 MET-hours PA/week
Women	decreases 16 to 17 MET-hours/ week	Decreases6 to 10 MET-hours /week	Decreases9 MET-hours/week

From these two tables, we can see the average weeklyPA for Chinese adults are deeply decline and people are more sedentary due to technologicaladvancements in the work environment, as well as via changing labor opportunities.Physicaldemands of home activities vary depending on technological advances, such as the availabilityand growing afford ability of microwaves or washing machines. Transportation activitiesheavily depend on the built environment, accessibility and reliability of public transportation,as well as ownership and use of motorized vehicles. The Chinese adults have less and less activity in moden life.

While obesity-relatednoncommunicable diseases, such as diabetes, have recently increased, and those diseases arenow the leading causes of morbidity, disability, and mortality in China (cf. Popkin, 2008; He, et al. 2005). Estimates from the 2001 Inter-ASIA survey indicate that 28.2% of the adult Chinese population had hypertension (cf. Gu, et al., 2003), the prevalence of type two diabetes in China has more than doubled over the past two decades from approximately 3% in 1994 to 7–10% in 2008 (cf. Yoon, et al. 2006; Yang, et al. 2010), the high cholesterol levels was 32.8%(cf. Reynolds, et al.2003). The growing prevalence of such chronic diseases will negatively affect economic productivity and implies that greater financial

resources are being spent on health care needs. According to the survey conducted by the CCDCP, the direct economic burden of hypertension was 8.97 billion yuan, diabetes was2.55 billion Yuan, coronary heart disease was 2.26 billion Yuan and stroke was 7.33 billion Yuan in China. And attributable to overweight and obesity direct economic burden up to 21.11 billion Yuan, accounting for 25.5% in total of these four disease burden of disease. And it grows too fast, one year later, 2004 the direct health costs of diabetes in China has reached 57.469 billion Yuan, accounting for 7.57 % in the total cost of the national health expense, this proportion is nearly the same level as in developed countries. It is estimated that the cost of overweight and related diseases will be almost 9% of China's gross national product (CGNP) by 2025 (Popkin et al., 2006).

Lack of PA among Chinese may translate to a very high prevalence of chronic None Communicate Disease (NCD), which will be a large burden on future generations and will have serious implications for the Chinese and world economies. So it is urgent for Chinese government to make some policy to support the public sport, encourage the whole nation move on.

1.2.2 Public Health Status of Chinese Children and Adolescent

- China Health andNutrition Survey (CHNS)

Gordon-Larsen et al. (2014) based on the China Health andNutrition Survey (CHNS), more than 34,000 individuals in 288 communities throughoutChina, across eight surveys from 1991 to 2011, examined trends in BMI, overweight, andwaist circumference (WC) over time. He uses WHO overweight BMI cut point, BMI ≥ 25 kilograms per square meter (kg/m^2); Asian overweight BMI cut point, BMI ≥ 23 kg/m^2, andthe Chinese overweight BMIcut point, BMI ≥ 24 kg/m^2 for adults(cf. COTF.2004); and use theInternational Obesity Task Force (IOTF) cut points, which provide age-and sex-specificoverweight classification at the BMI ≥ 25 kg/m^2 equivalent(cf. Cole et al.2000).Standards of children and adolecent from age 2-18 years old in Table 7.

There is a similarly overweight rose steadily for children in the CHNS whether defined using the IOTFor the Chinese-specific cut points for overweight. 5.1% of the pediatric cohort becameoverweight between 1991 and 2000, whereas 14.5% became overweight between 2000 and2011. Among boys, overweight prevalence wascomparatively higher in the younger age groups (2-6-year old and 6-11-year old) in the earlier studyyears (1991 and 1993) and then became more comparable in 2011. Among girls, overweightwas consistently higher in the younger age groups (2-6-year old and 6-11-year old) than in the older agegroup (11-18-year old). While overweight prevalence was similar in boys and girls 2 to 18years old at baseline, prevalence by sex started to diverge in 1993, with boys havingcontinuously higher prevalence at all follow-up exams. So overweight incidence was considerably higher in boys than in girls across all agegroups.

Table 7 - Boys aged 2-18-year old in the CHNS cohort across survey years

	1991	1993	1997	2000	2004	2006	2009	2011
2-6 years old	n=554	n=405	n=238	n=206	n=186	n=185	n=201	n=211
WC (cm)	-	50.5±0.4	51.0±0.3	51.0±0.4	50.7±0.4	-	-	-
BMI (kg/m^2)	15.7±0.1	15.9±0	15.7±0.1	15.7±0.1	16.1±0.2	15.9±0.2	15.6±0.1	16.9±0.4
IOTF	8.9±1.3	16.1±2.0	9.8±2.1	10.9±2.3	18.3±3.3	14.9±3.2	6.7±1.7	15.5±2.9
6-11 years old	n=593	n=636	n=587	n=403	n=281	n=290	n=286	n=273
WC (cm)	-	56.2±0.5	56.9±0.3	57.4±0.3	58.3±0.5	57.2±0.6	59.1±0.6	60.1±0.9
BMI (kg/m^2)	15.8±0.1	15.8±0.1	16.2±0.1	16.5±0.1	16.6±0.2	16.6±0.2	16.7±0.2	17.2±0.3
IOTF	6.4±1.2	6.7±1.2	8.5±1.2	10.2±1.7	13.6±2.5	16.1±2.6	17.0±2.6	18.2±3.1
China-Specific	7.9±1.3	8.6±1.3	10.7±1.4	13.9±1.9	16.5±2.7	19.7±2.8	19.8±2.7	20.5±3.2
11-18 years old	n=800	n=724	n=724	n=854	n=537	n=358	n=336	n=279
WC (cm)	-	65.5±0.3	66.1±0.3	67.3±0.3	68.4±0.4	69.6±0.5	69.1±0.5	71.3±0.7
BMI (kg/m^2)	18.2±0.0	18.4±0.1	18.5±0.1	18.7±0.1	18.9±0.1	19.0±0.1	19.1±0.2	19.7±0.7
IOTF	3.1±0.6	4.5±0.8	4.2±0.8	6.5±0.9	7.4±1.1	8.2±1.5	11.4±1.7	15.8±2.4
China-Specific	3.6±0.7	5.5±0.9	6.5±0.9	7.6±1.0	8.9±1.2	9.8±1.6	12.6±1.8	19.3±2.5

Table 8 - Girls aged 2-18-year old in the CHNS cohort across survey years

	1991	1993	1997	2000	2004	2006	2009	2011
2-6 years old	n=473	n=354	n=176	n=191	n=142	n=152	n=201	n=211
WC (cm)	-	49.4±0.6	49.7±0.5	49.6±0.5	49.4±0.7	-	-	-
BMI (kg/m^2)	15.4±0.1	15.6±0.1	15.6±0.1	15.3±0.1	15.6±0.1	15.3±0.2	15.9±0.2	16.4±0.4
IOTF	9.6±1.6	12.4±1.9	11.3±2.7	11.8±2.6	13.7±3.3	8.9±2.1	20.6±3.6	19.0±3.6
6-11 years old	n=534	n=542	n=521	n=379	n=259	n=235	n=221	n=248
WC (cm)	-	54.9±0.5	55.5±0.3	56.0±0.3	55.7±0.5	55.2±0.6	56.2±0.6	56.9±0.8
BMI (kg/m^2)	15.4±0.1	15.6±0.1	15.8±0.1	16.0±0.1	16.2±0.2	16.3±0.2	16.2±0.3	16.0±0.3

IOTF	4.9±1.0	6.5±1.3	7.7±1.4	9.4±1.7	14.4±2.6	13.1±2.7	15.1±3.1	10.4±1.9
China-Specific	7.2±1.2	7.7±1.3	10.7±1.6	11.7±1.8	16.8±2.7	16.8±2.9	16.3±3.1	12.5±2.0
11-18 years old	n=785	n=678	n=663	n=723	n=468	n=339	n=282	n=254
WC (cm)	-	64.8±0.3	65.0±0.3	65.3±0.3	66.0±0.4	65.4±0.4	66.3±0.5	68.2±0.6
BMI (kg/m^2)	18.7±0.1	18.5±0.1	18.7±0.1	18.7±0.1	18.9±0.1	18.6±0.1	19.1±0.2	19.3±0.2
IOTF	3.5±1.0	3.1±1.0	3.5±0.7	3.5±0.7	4.5±1.0	5.3±1.3	7.8±1.7	9.3±1.9
China-Specific	5.3±0.8	3.9±0.8	5.0±0.9	4.5±0.8	7.1±1.2	6.3±1.3	8.5±1.8	11.7±2.1

Remark: IOTF age- and sex-specific BMI ≥ 25 kg/m2 equivalent (cf. Cole et al.2000); Chinese age- and sex-specific cut points for Chinese children aged 6–18 years (cf. COTF.2004), Chinese cut points are not produced for children < 6 years of age.

- 2010 National Physical Fitness Test (NPFT)

In 2010 NPFT, 51,159 children aged 3 to 6 years old achieved "qualified" ratio more than 92.9%, compare with 2005 NPFT, it had3.0 percentage points increased. Still take Figure 6 and Figure 7 to demonstration this age group's health status. Like in Figure 4 and Figure 5, we take 2005's data as base "0", if 2010's data higher than 2005's, the figure will appear on the right side, otherwise will appear on the left side. Children in 3-6-year-old group, the average body shape index (height, weight, sitting height, chest circumference) had significant annual increase compare with year 2005, and skin fold thickness (upper arm, shoulder and abdomen) and heart rate decreased, which means they had small improvement as well. And the physical performance of speed (10m shuttle run), low limb strength (standing board jump and continuously jumping), balance (walk on balance beam) also better than before, but the flexibility (sit and reach) and upper body strength (tennis throw) had decreased, a reduction in boys between 0.9% to 6.7%, in girls between 0.1% to 7.4%. But we still can see the general results had sustained growth, with a rapid development stage.

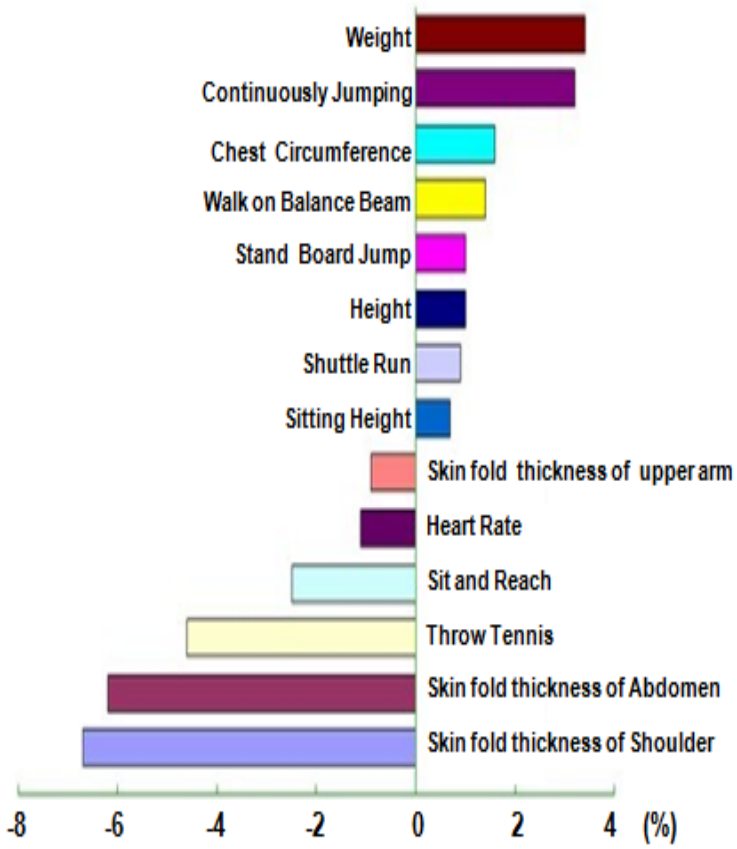


Figure 6 - Percentage changes in boys3-6-year-old in 2010 and 2005

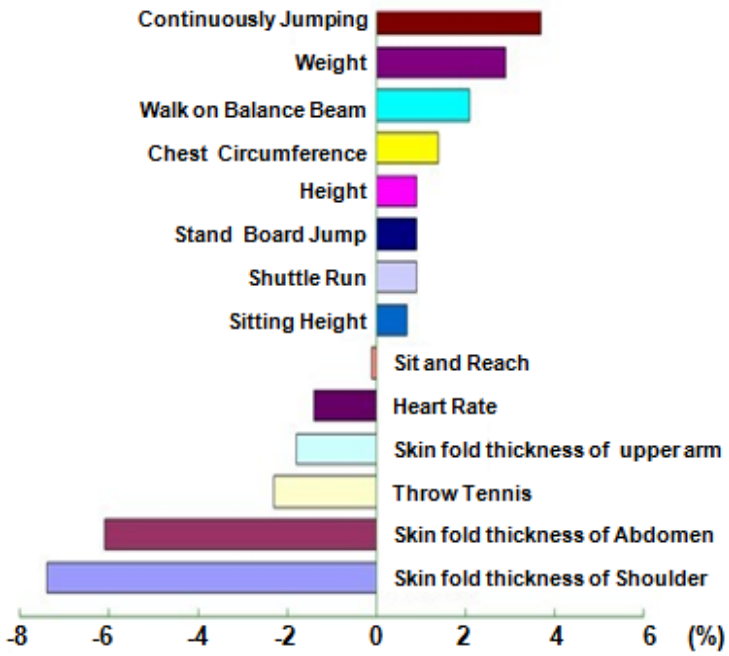


Figure 7 - Percentage changes in girls 3-6-year-old in 2010 and 2005

- 2010 National Student Physical and Health Test (NSPHT)

The health status of adolescent we can see the results of 2010 National Student Physical and Health Test (NSPHT). The test involves 31 provinces, autonomous regions and municipalities, 27 ethnic groups, 995 schools, 348,495 people, 7-22 years old Han students 262,878, other 26 ethnic students 85,617.Figure 8 and Figure 9 are China maps about the BMI value of 8-year-old boys in each province, Figure 10and Figure 11 are China map about the BMI value of 10-year-old girls in each province, colors from light to dark which compare with the China mean.

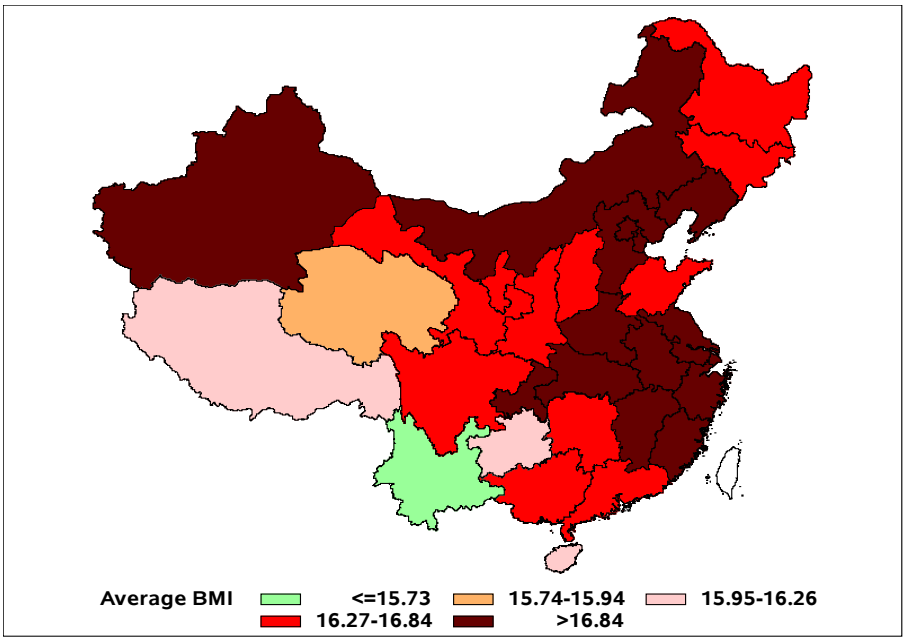


Figure 8 - BMI value of 8-year-old urban boys in 2010 China

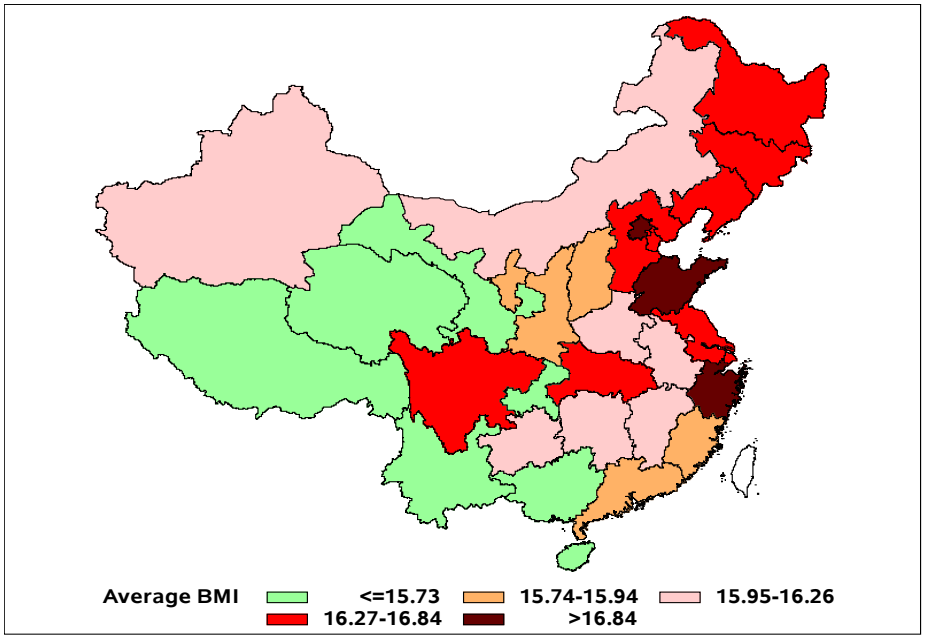


Figure 9 - BMI value of 8-year-old rural boys in 2010 China

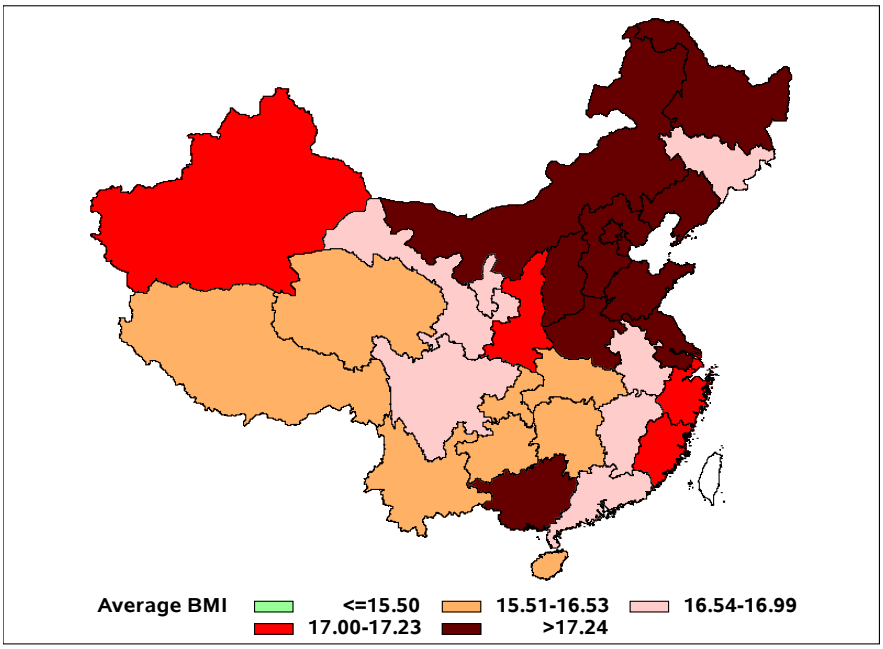


Figure 10 - BMI value of 10-year-old urban girls in 2010 China

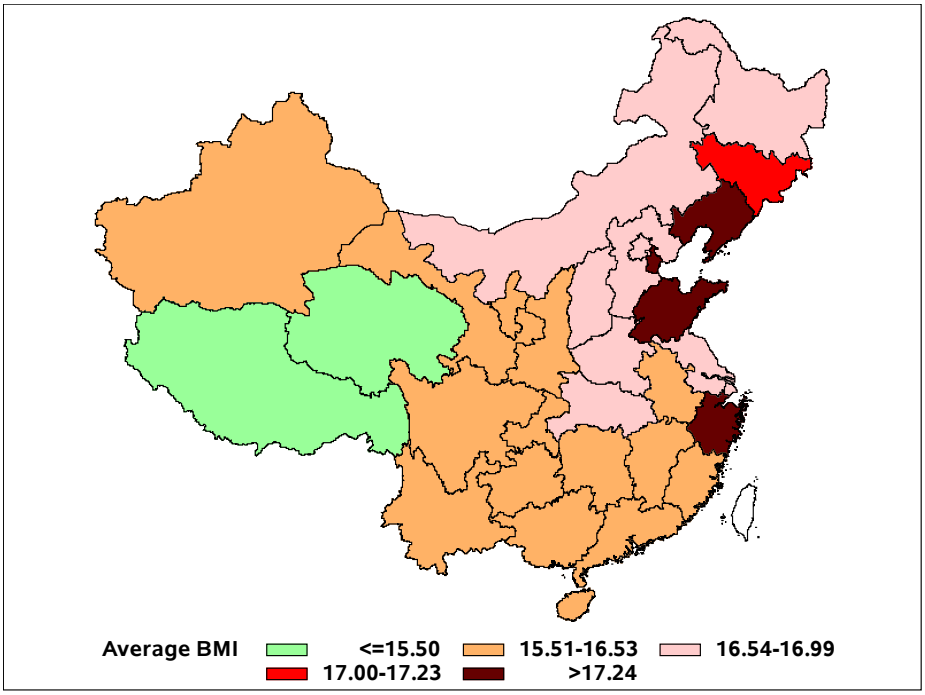


Figure 11 - BMI value of 10-year-old rural girls in 2010 China

Table 9 shows all the age 7-20 years old students test results; it includes the body shape and physical fitness. Compared the body shape results 2005 and 2010 (Table 10), take 2005's results as base, "↑"means increase, "↓"means decrease, we found that, whatever the region, all students in both gender had a development of height, weight, and both mild malnutrition detection rate and low weight detection rate declined, which means students do have good health; but meanwhile we found overweight and obesity rate had rapid increase in all regions both genders.

About the physical fitness test, see Table 11, also take 2005's results as base, "↑"means increase, "↓"means decrease, "-" the same. Students' explosive quality (standing long jump),flexibility ability (sit and reach), and endurance quality (both 7-12-year-old boys and girls test 50m×8shuttle run, 13-22-year-old boys test 1000m run and girls have 800 meters run test)had improved lot, had not continued to decline only some parts keep the same level as before.

Table 9 - 2010 National student physical and health test results

Gender	Age	Height (Cm)	Weight (Kg)	Grip (Kg)	BLJ (Times/min)	TCU (Times)	CU (Times)	Sit-ups (Times)	50M×8 (Second)	1000M (Second)	800M (Second)	S&R (Cm)	50M Run (Second)
Boys	7	125.5	25.5	10.3	126.2	23.3		-	135.6	-	-	6.7	11.1
	8	130.7	28.5	12.0	137.2	24.4		-	130.4	-	-	6.5	10.5
	9	135.8	31.8	13.9	145.2	25.9		-	126.8	-	-	5.8	10.1
	10	140.9	35.5	16.0	153.9	26.8		-	122.9	-	-	5.5	9.8
	11	146.2	39.6	18.6	161.7	28.4		-	118.9	-	-	5.3	9.5
	12	152.4	44.0	22.4	173.0	28.3		-	114.9	-	-	5.5	9.1
	13	159.9	49.4	28.3	188.5	-	2.4	-	-	297.5	-	5.9	8.6
	14	165.3	53.8	33.3	201.7	-	3.1	-	-	281.9	-	8.2	8.2
	15	168.8	57.2	37.4	213.0	-	3.8	-	-	271.2	-	9.6	8.0
	16	170.5	59.2	40.5	223.1	-	4.4	-	-	262.7	-	11.1	7.7
	17	171.4	61.0	42.1	227.1	-	4.9	-	-	259.8	-	11.6	7.6
	18	171.4	61.5	43.1	229.2	-	5.3	-	-	256.9	-	12.1	7.6
	19	172.1	62.6	43.0	226.9	-	4.8	-	-	255.1	-	11.7	7.6
Girls	7	124.1	23.8	9.0	117.0	-	-	17.9	139.1	-	-	10.4	11.7
	8	129.4	26.5	10.5		-	-	20.1	134.8	-	-	10.1	11.0
	9	135.0	29.7	12.2		-	-	22.5	131.0	-	-	9.5	10.6
	10	141.3	33.8	14.5		-	-	24.2	126.6	-	-	9.4	10.2
	11	147.2	38.2	17.0		-	-	25.3	122.9	-	-	9.5	10.0
	12	152.0	42.3	19.5		-	-	25.5	121.1	-	-	9.7	9.8
	13	156.0	46.2	22.1	158.8	-	-	26.2	-	-	269.3	10.5	9.7
	14	157.8	48.6	23.5	160.8	-	-	27.2	-	-	263.4	11.3	9.7
	15	158.5	50.1	24.7	163.3	-	-	28.3	-	-	259.9	12.0	9.7
	16	159.0	51.1	25.5	166.0	-	-	28.7	-	-	257.3	12.9	9.7
	17	159.3	51.7	26.2	167.4	-	-	29.1	-	-	258.5	13.3	9.6
	18	159.2	51.7	26.5	167.8	-	-	28.9	-	-	256.8	13.5	9.6
	19	160.1	51.9	26.3	166.4	-	-	28.3	-	-	253.5	14.1	9.6

Remark: BLJ=Board Long Jump, TCU=Tilt Chin up; CU=Chin up; Sit-ups=1 min Sit-ups; 50m×8=50m×8 Shuttle Run; S&R= Sit and Reach

Table 10 - National student physical and health test (NSPHT) 2005 vs. 2010 in body shape

	Height (cm)	Weight (kg)	Mild Malnutrition Detection Rates (%)	Low Weight Detection Rate (%)	Obesity Rate (%)	Overweight Rate (%)
Urban Boys	1.01 ↑	1.35 ↑	0.02 ↓	1.40 ↓	1.94 ↑	1.56 ↑
Urban Girls	0.79 ↑	0.80 ↑	0.21 ↓	0.78 ↓	0.63 ↑	1.20 ↑
Rural Boys	1.55 ↑	2.02 ↑	0.27 ↓	2.80 ↓	2.76 ↑	2.59 ↑
Rural Girls	1.12 ↑	1.15 ↑	0.27 ↓	1.35 ↓	1.15 ↑	3.42 ↑

Table 11- National student physical and health test (NSPHT) 2005 vs. 2010 in physical fitness

	Long Jump (cm)	Sit and Reach (cm)	7-12-year-old boys and girls(seconds)	13-15-year-old boys (seconds)	13-15-year-old girls(seconds)	16-18-year-old boys and girls (seconds)
Urban Boys	1.12 ↑	-	-	3.03 ↓		0.48 ↓
Urban Girls	1.03 ↑	0.49 ↑	0.05 ↓		3.58 ↓	0.46 ↓
Rural Boys	0.76 ↑	0.04 ↑	-	-		0.34 ↓
Rural Girls	-	0.53 ↑	0.20 ↓		-	0.91 ↓

In moden China, we found one typical Chinese modenlization phenomenon is children and adolescents living in high Socioeconomic Status (SES) and urban areas had higher BMI and higher odds of overweight and obesity than those living in lower SES and rural areas(cf. Chen et al. 2011).Data from the China Center for Disease Control and Prevention (CCDCP) 2012shows that in China the obese population age below 18 has reached 120 million. It also pointed out that China has 12 percent of children are overweight; the proportion of young people suffering from diabetes in China is equivalent to four times the US peers (cf.CCDCP, 2013). Prof. Barry M. Popkin, from University of North Carolina, with his Interdisciplinary Obesity Research Center (IORC) and CCDCP, had a 22 years follow-up study on physical activity and nutrition intake in China, with 2.9 million people in 300 communities in China. The data published in "Obesity Review" magazine, shows that China has 12 percent children and adolescents under 17 years of age are overweight, and one third of children had at least a cardiovascular risk factor. China from the age 12-18-year-old with diabetes of 1.9%, equivalent to US peers (0.5%) four times, China has 1.7 million young people suffering from diabetes, 2,770 people are diagnosed to early-diabetic. In addition, 14.9% of Chinese children and adolescents showing early symptoms of diabetes, such as elevated blood sugar levels, and may have caused long-term damage to the heart and circulatory system. The study also found that 12.1% of Chinese youth inflammation incidence, which is the main factor leading to cardiovascular disease. But in United States, only 8.5% of teenagers in this case, so this is really an alarm for China.

1.3 Chinese Nutrition and Diet Report

China’s food consumption patterns and eating and cooking behaviors changed dramatically in the last 20 years. Before 1987, China had a food rationing system, small, open, fresh markets sold limited amounts of products and animal-source foods in towns and cities. Though still a few stores could purchase foreign products, such as Coca Cola, which was viewed as a luxury item served at select banquets. Since the first western fast food restaurant, Kentucky Fried Chicken (KFC)opened in 1987 in Beijing, 1990 the first McDonalds opened in Shenzhen, 1992the first 7-Elevenopening in Shenzhen, all these small convenience stores experienced a rapidly growth after mid-1990s (cf. Reardon et al. 2012; 2003;Gómez et al. 2013). Later the first Wal-Mart Supercenter and Sam’s Club opened in Shenzhen in 1996, the same year that Carrefour opened its first supercenter in Shanghai and Shenzhen. Soon the rationing system disappeared, private sector open markets became dominant and state stores closed and a modern food system began to take shape. Meanwhile this modem food system had profound effects on the diets of the Chinese.

The biggest change is the rapid decline in intake of coarse grains or refined grains and increases in intake of edible oils, animal-source foods, poultry and eggs, see Figure 12 (cf. Zhai et al. 2014). From 1991 to 2011, year by year the Chinese child’s

daily intake more and more, compare the data 1991 and 2011, the total intake almost had doubled, pork and pork products in 1990s are the dominant intake, it takes 55% of the total intake while in 2011 only takes 40% for children. After 2000, the diet are more diversity, eggs and poultry intake are double increased, but only takes 23% and 14% in total in 2011, respectively. Dairy and fish intake dramatically increase compare in 1991 there is less than 2% to 2011 round 9%. The children in mega cities (e.g. Beijing, Shanghai, Tianjin, Chongqing)the total intake are almost 50 gram/day more than the average in China, they pursued more dairy, beef, lamb, mutton other red meat, poultry, fish and seafood. And the adults have the same diet development as children, but they consume less dairy more fish, still animal-source food overall consumption patterns.

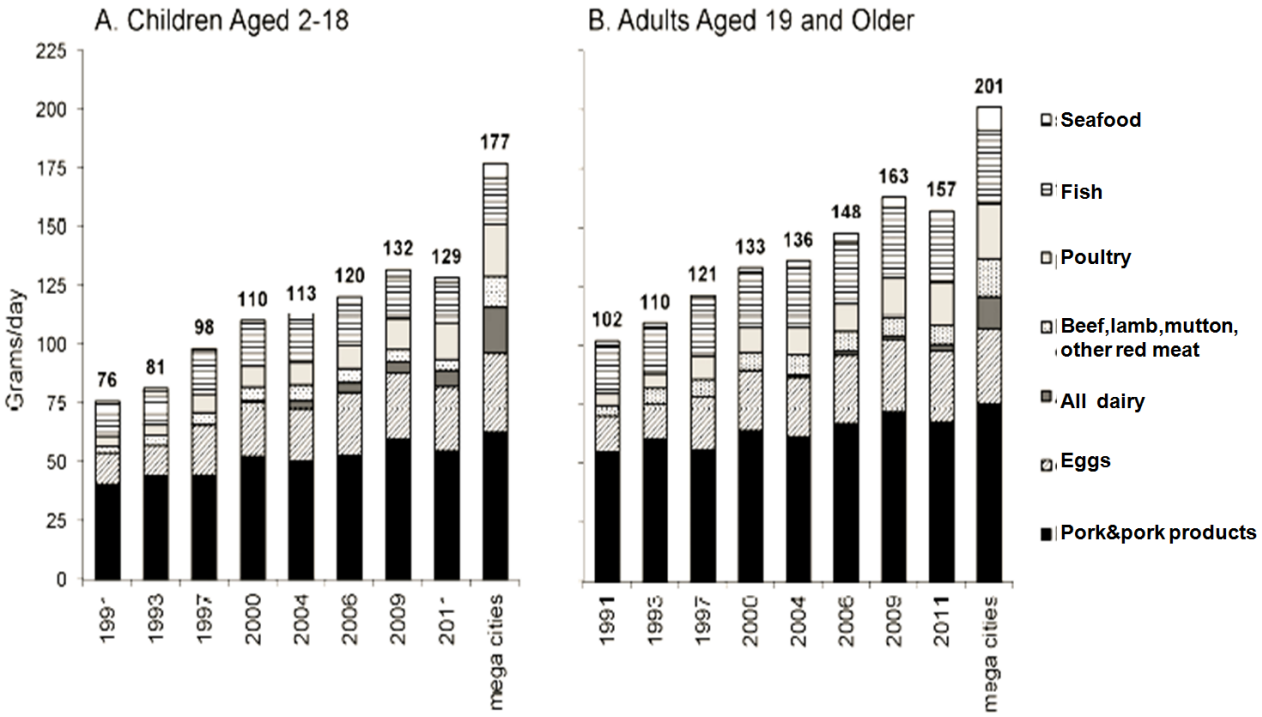


Figure 12 - Daily intake of animal source foods in China (grams/day), 1991-2009.

Remark: this figure is from "Dynamics of the Chinese Diet and the Role of Urban city, 1991–2011" (cf. Zhai et al. 2014)

The food change accompanied by cooking behavior and eating styles change, the traditional Chinese cooking way of food steamed, baked, or boiled shift to stir-fried and deep fried; the home-prepared food and eaten at home way shift to food prepared at restaurants, food stalls, canteens, schools, and other away-from-home venues. And most of time will have sugar-sweetened beverages during eating, and after meal will have sweet cakes as dessert, this is very popular modern lifestyle which praised by younger generation in cities.

The Chinese Health and Nutrition Survey (CHNS) show us, the rapid increase in the proportion of energy consumed from edible oils across all age groups. Between 1971

and1989 consumption of edible oils increased to about 14.8 g/d from 4.3 g/d (cf. Popkin et al.1993), it has a big jump to the year 2011, the average Chinese individual consuming close to 30%of his or her energy from edible oils across all ages. And from 1991-2011, there had been the rapid increase in snacking among the age two and above, see Figure 13, in 1991 round 10% snackers to 2011 it reached 57%. Meanwhile, the nutrient composition has shifted toward fats, and protein and sodium. The percentage of energy distribution experienced up and down. From 1991 to 2000, the energy from fat, carbohydrates and protein had a big rise from 22%, 28%, 32% to 66%, 60%, and 54%, respectively, which means with the economic development in China, the food pattern also changed, the energy consumption also rise so fast. But to 2011, it had a dramatically fall in all three energy distribution, which means people become more and more inactive, only more food consuming but without energy consuming or less physical activity. This also proved by Zhai (cf. Zhai et al. 2014), he reported that in 2000 there are 10.6% people consider to be snackers, 0.7% of kcal per day for individual, consume snack 6.1% of kcal per day, but to 2011 it arise to 56.7% snackers, 5.7% of kcal per day for individual, and consume snack 9.5% of kcal per day, and it also company with a higher sodium consumption 4.3 g/day, but the ideal sodium consumption should be below 2 g/day (cf. Institute of Medicine Food and Nutrition Board. 2010; Popkin et al. 1993)

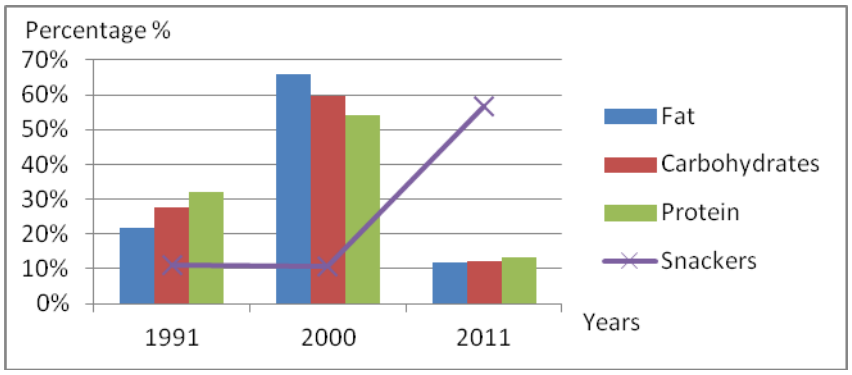


Figure 13 - The percentage of energy distribution for 2 years old and above

Remark: the data is from "Dynamics of the Chinese Diet and the Role of Urban city, 1991–2011" (cf. Zhai et al. 2014). The Bars present "Fat (blue)", "Carbohydrates (red)", "Protein(green)", line presents "Snacks (purple)".

Target the 2-18-year-old child in China, we will find in the past two decades, China has a remarkable change in nutrition and diet, see Table 12.

Table 12 - Food consumption changes and eating behavior changes for 2-18-year-old

	1991	2000	2011
Edible Oils – grams	7.6	19.8	20.9
Edible Oils – % of total energy	7.8	9.7	12.0
Total Animal source foods-kcal/d	178.6	236.4	266.2
Coarse Grains – kcal/d	87.6	41.8	25.4

Legumes & Products – kcal/d	59.5	59.5	46.1
% Kcal from boiled/steamed/baked	81.9	76.3	65.7
% Kcal from snacks per capita	1.5	1.1	8.8
% of population snacking	15.1	12.7	67.1
% Kcal from snacks per snacker	8.9	7.8	13.0
% Kcal prepared and eaten at home	90.4	86.2	72.2
% Kcal prepared away from home	6.7	10.0	15.6

Remark: this table is from "Dynamics of the Chinese Diet and the Role of Urban city, 1991–2011" (cf. Zhai et al. 2014)

Consuming more vegetable (edible) oil and animal-source foods, the traditional diet faced challenge, Coarse Grains Legumes & Productsproportion fewer and fewer. Snacker population goes up to 67.1%., fast food and street foods have been around, food purchased away from home becomes cheaper relative to preparing food at home; packaged foods and beverages and retailer networks become the modern Chinese life, the food system and eating behavior change had a fast pace relative with the other western country, which later will be an incidence of obesity and no communicable diseases in China.

1.4 Chinese Media and Screen Time Report

Traditional media means television, radio, newspapers and magazines, along with the development of modern science and technology, Internet and mobile phones have appeared, especially in the past ten years, these two become the main media for Chinese. Since 1985 the first black and white TV sets came out in mainland China, so far, the Chinese television penetration has reached 60%. Today, the Internet and the mobile phones have become an integral part of Chinese life, particular the young generation is the big fans of network media, such as computer, laptop, cellphone, smartphone, ipad, iwatch, notebook, smart bracelet. China Internet Network Information Center (CINIC) pointed out that until 2012, there are380 million people (70.7% out of all netizens) use office computer, 242 million Chinese (45.1%) use laptops, and 3.88 million Chinese people (72.2%) use mobile Internet, more and more people used to use mobile phones and office computer together to work (cf.Takungpao.2012).Global market information group Taylor Nelson Sofres (TNS)reported among 27,000 people aged 18-55 year-old from 16 countries' people, Chinese people spend longest Internet time in their daily life, round 44% people spend daily rest time on the Internet, this number reached almost triple the average access time of the Danish (cf. Tech.163. 2009). The majorities are the people below 30 years old, they spent about 19.9 hours per week on Internet, and 82.8% Chinese youth prefer network media (cf. Cui. 2015).

- Eleventh National Reading Survey (NRS)

The Chinese National Reading Survey (CNRS) organized by Chinese Academy of Press and Publication (CAPP), until 2014, China already had eleventh NRS, it involved 1.22 billion population, which accounted for 51.4% urban residents and 48.6%rural residents (cf. CAPP. 2014). The traditional Chinese reading ways by book and newspaper, but continuous decreased along with the modern reading ways, which means digital reading includes network online reading, mobile reading, e-readers, CD-ROM reader, PDA / MP4 / MP5 reading, etc. We can see this change between 2012 and 2013 inTable 13.

Table 13 - The percentage of Chinese citizen's reading way (by percentage)

	Book read	Newspaper read	Digital read contact	Digital read
2012	57.8%	58.2%	40.3%	76.3%
2013	54.9%	52.7%	50.1%	76.6%

People used to use new technique in daily life, so made the life more and more rely on Internet, compare the data 2012 and 2013 in Figure 14, daily Internet spend time are higher than before, meanwhile more time spend on reading by handy (cellphone or smart phone), but less time on electronic reading.

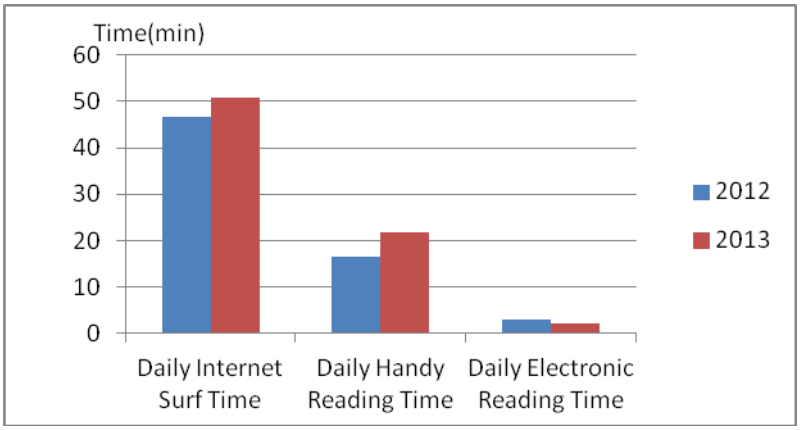


Figure 14 - How many minutes Chinese daily internet time

According to the report, we can see in Figure 15, electronic reading ways are E-reader read, CD read and PDA/MP4/MP5 read, none of these three reading ways over 6%, CD read and PDA/MP4/MP5 read percentage are getting down, so what are the Chinese people do , while more Internet surf time less reading time?

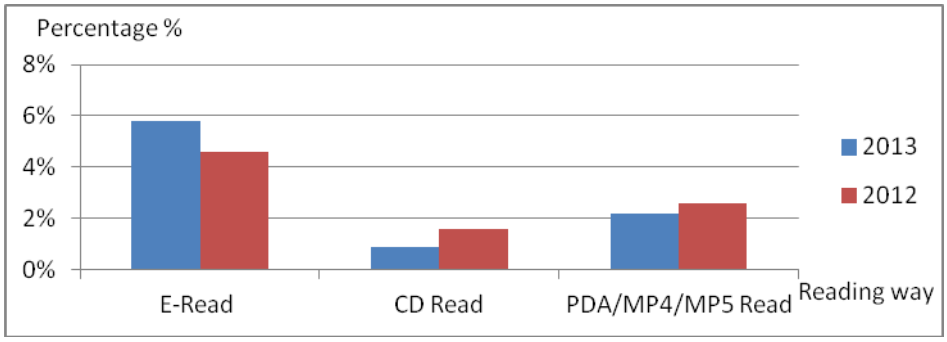


Figure 15 - Percentage of electronic read

Here we find the answer, see Table 14. People used to keen on internet entertainment, news read and online chatting are the main hobbies for Chinese, in contrast, book reading became less and less.

Table 14 - Chinese most favorite activity on Internet

News read	Information Searching	Online Chatting	Listen Music	Watch Video	Computer Games	Reading Online book
74.2%	45.0%	70.3%	52.4%	46.8%	37.0%	17.6%

- 2010 Chinese Adolescent Internet Behavior Survey (CAIBS)

2010Chinese Adolescent Internet Behavior Survey reported (cf. CNNIC. 2010), Chinese adolescent Internet users in network video play (66.6%), network literature read (48.1%) and online games (74.8%), higher than the overall Internet users of 4.5, 5.5 and 8.3 percentage points. Average daily online time between three to six hours takes 56.5%, over six hours takes 6.8%. About the mobile phone use, only 6.32% people use it make phones or text message, accounted 64.21% play with mobile phone when they have time; even during eating, walking or meeting friends they used to use it, weekends round 48.08% young people would take mobile phone play as their entertainment, compare with 8.82% social activity, 10.78% reading, 32.35% outdoor activity, this is too high rate.

- Chinese Youth Network Entertainment Investigation (CYNEI)

Wang's (cf. Wang et al.2013) research "Chinese Youth Network Entertainment Investigation (CYNEI)"among 31 Chinese Provinces included 1,526 students reported, 73.1% of the students have their own computer and Internet access, 8.5% of students have computer but no Internet, only 18.4 percent of students do not have their own computers; and 69.1% of student use mobile Internet. There are 62.8% students play computer games more than one year, especially boys, 193 played less than one year, 211 played one to three years,116 played one to five years, 151 played three to five years, 671 played over five years, they are more earlier access the computer games than girls. Chinese adolescent surf on Internet most watch movies

and television (855, 56.0%), and play animation (910, 59.6%), only fewer would focus on education and technology and other learning-related content.

- Chinese Urban Teenage Access Television Time Survey (CUTATTS)

Another research named “Chinese Urban Teenage Access Television Time Survey (CUTATTS)”by Ma (cf. et al. 2002) reported, Chinese urban teenage access television more earlier, when take TV time four levels as less than one hour, between one to two hours, two to three hours and three hours above, the percentage of time consuming on TV time will see at Table 15.

Table 15 - Percentage of Chinese teenage spend on TV time

TV Time	Child below 7-year-old		Pupil 7-12-year-old		Student 12-18-year-old		Total	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
＜1 Hour	19.70	22.90	31.10	34.20	41.30	43.50	30.70	34.20
1-2 Hours	51.60	52.10	46.90	45.80	39.20	40.90	46.20	45.90
2-3 Hours	22.70	19.30	14.90	14.60	12.80	10.30	16.40	14.50
＞3 Hours	6.00	5.70	7.10	5.40	6.70	5.30	6.70	5.40

More television time or screen consuming and less physical activity prong to a sedentary life, which engaged in higher BMI and obesity group in China. The 2010 Chronic Non-communicable Disease & Risk Factor Surveillance in China (CNDRFS) survey shows the average television viewing time of Chinese adults was (1.87±0.03) hours, television viewing time positively associated with BMI and obesity. The association is the strongest in women (β=0.21, P<0.001) and≥ 65 years people (β=0.26, P <0.001) (cf. Deng et al. 2015). Meanwhile, Dearth-Wesley (cf. et al. 2012)did research on physical activity patterns in Chinese mothers and children, increased sedentary behavior in children and mothers is correlated with greater TV ownership in Chinese households (cf. Du et al. 2002). Hours of TV watching has been linked to detrimental health implications in children and adults (e.g., greater body mass index, increased cardiovascular disease risk) (cf. Jakes et al. 2003; Fung et al. 2000; Andersen et al. 1998). These negative health implications also pose a potentially large economic burden (cf. Oldridge 2008), thus targeted public health policy and interventions aimed at limiting sedentary behavior in the Chinese population are very critical.

1.5 Chinese Transportation Report

China has undergone tremendous urbanization and economic development over the last few decades, and concurrently has entered a stage of the transportation transition defined by remarkable changes in terms of infrastructure, land use,

transportation planning, and urban design (cf. Friedman 2005; Popkin 2001b; 2002). Unfortunately, in China there is no article about the influence of active commuting on BMI or healthy enhanced PA, most research focus on the construction of city transportation systems or modern transportation enhanced environmental exposure problem for people. Here some data from these researches.

- Chinese Environmental Exposure-Related Human Activity Patterns Survey on Adults (CEERHAPSA)

This research based on "Chinese Environmental Exposure-Related Human Activity Patterns Survey on Adults(CEERHAPSA)", launched by "State Key Laboratory of Environmental Criteria and Risk Assessment (SKLECRA)" from November 2011 to May 2012. There are 91,121Chinese residents aged 18-60-year-old from 31 provinces, autonomous regions and municipalities involved (cf. Wang et al. 2014). Still 56.5% of residents choose walk as their commuting way, 37.9% use active commute (bicycle, electronic bike or motorbike) and18.8% with modern transportation (public transportation or private cars),Figure 16 and Figure 17 show the commute way of Chinese male and female.

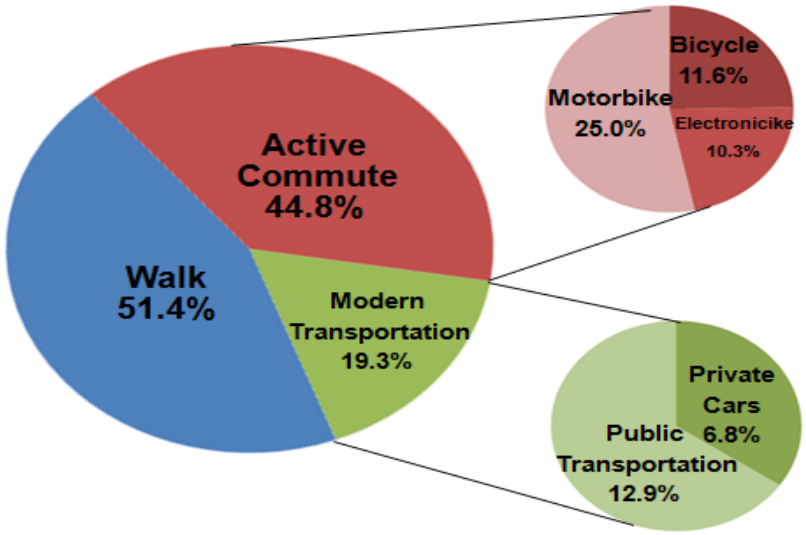


Figure 16- Male's commute way

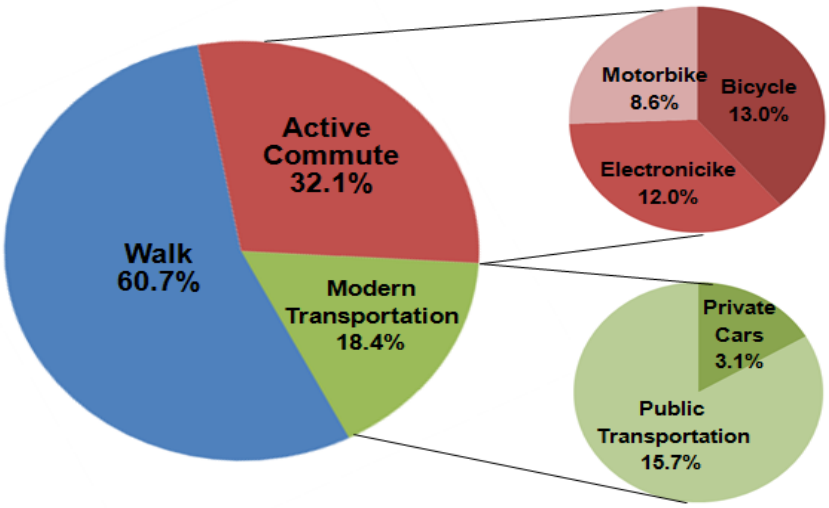


Figure 17 - Female's commute way

We can see walk still the main commute in China, it takes over half of the whole population, but when we compare the data 2002 and this survey in Figure 18, we can see the changes in these 10 years are very remarkable, walk group decreased in both genders, meanwhile active commute and modern transportation are rising so soon, which demonstrate the Chinese new lifestyle.

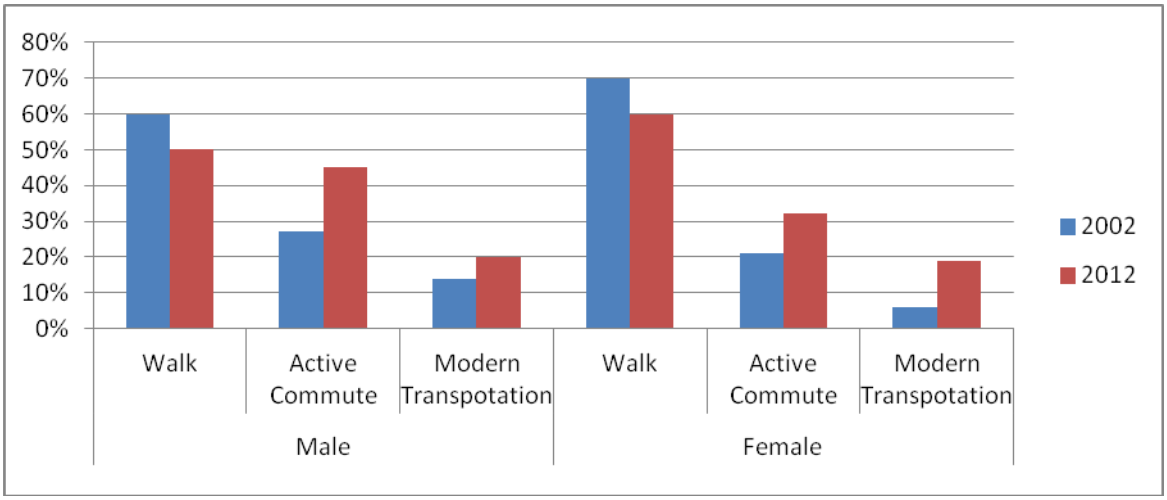


Figure 18 - Comparable data of commute way in 2002 and 2012

➢ Commute of Chinese Children and Adolescent

Parental concerns as well as social and physical neighborhood environment may influence the choice of children's and adolescents' commuting mode to school (DiGuiseppiet al. 1998; Timperio et al. 2004; McMillan, 2005; Kerr et al.2006; Timperio et al.2006; Landsberg et al. 2008). In China, students go to school adopted the principle of proximity which means students go to the nearest school in their living community, even though, parents still consider the busy traffic along school route as barrier, with "one child one family" policy in China, parents are more worrying their child's safety, even if they could not send the child to school, instead

grandparents will company them to school, children and adolescent are over protected by family.

One research by Zhu (2012) reported 5,450 students age from 6-18-year-old had 20.2% with high pressure in Liaoning province. Analysis the commute mode of them Table 16, it is defined active commute as go to school by walk or by bicycle; mechanical means of transport defined as public transportation, or private car, or by parents bicycle; active travel time defined as students' daily movement, including participate the PE course or regular PA in schools. Then we will see, round 60% students go to school by active commute, but the daily active travel time for both genders are pretty less. Evidence-based guidelines for school-aged youth recommend ≥60 min per day of moderate to vigorous PA (Strong et al., 2005), also the Chinese school rule require each student should participated at least 60 minutes PA per day, but according to our research result, students only physically present in PA but mentally absent, this is a very serious phenomenon in modern society China.

Table 16 - Students' commute mode

Commute mode	Boys	Girls
Active commute	1493 (59.2%)	1367 (58.8%)
Mechanical means of transport	1030 (40.8%)	957 (41.2%)
Active travel time(min/day)	24.5±16.65	23.23±14.48

As with any child behavior, commuting mode is influenced by parent and family attributes and circumstances. Evidence suggests that children are less likely to actively commute when their parents work (cf. Davison et al. 2008; Ziviani et al. 2004) and when the active commuting interferes with parents' work schedules (cf. McMillan 2007) and children's after-school commitments (cf. Ziviani et al. 2004). Conversely, children are more likely to actively commute if their parents actively commuted to school (cf. Merom et al.2006; Ziviani et al. 2004) and currently actively commute to work (cf. Merom et al.2006; cf. Davison et al. 2008). With more protection from family and low level of PA in schools, Chinese children and adolescents attribute to a sedentary lifestyle, which are associated with overweight and obesity (Andersen et al. 1998; Dennison et al. 2002;Eisenmann et al. 2002; Padez et al., 2005; Hancox et al. 2006), higher cardiovascular risk, bad bone health, and psychosocial problems (cf. Boreham et al. 2001; Cavill et al. 2001; Timperio et al. 2006). It will be a major contributor to the burden of disease (cf. U.S. Department of Health and Human Services, 1996) and social economy.

1.6 Chinese Physical Health Standards

Here, we would like to introduce two national standards of Chinese physical health, one is "Chinese Overweight and Obesity Criteria (COOC)", and another is "Chinese National Student Physical Health Standards (CNSPHS)".

➢ Chinese Overweight and Obesity Criteria (COOC)

Since 1993, China established its own obesity research working group, named “The Group of China Obesity Task Force (GCOTF)”. Its aim to develop national obesity index, to help the obesity people solve their problems, and prevent obesity situation in China. So in 2003, GCOTF picked 244,200 primary and secondary Han nation students aged from seven to 18 years old from 2000 Chinese National Survey on Students Constitution and Health (CNSSCH) test results, used both WHO obesity standard and American National (ANCHS/NCHS) standards to verify. But the result showed, even if Chinese cities with the highest levels of obesity population, the standard screened small group, both Chinese urban and rural male or female with P97 but still below the obesity cutoff point NCHS, and urban female P90, rural male P95, rural female P97 only close to its "overweight" level (cf.GCOTF. 2004). The same situation happened in Japan and Singapore.

Considering about the Chinese teenage growth and development characteristics, boys round 15 years old and girls round thirteen years old, the growth curve showing flat development while NCHS showing increase development, this is the big difference. We think, it might China is still in its early obesity epidemic, so the obesity could be rare in medium-term after the youth growth, it also would be the relative with the body composition and development characteristics of Asian. So China needs its own standard of overweight and obesity for children and adolescents. In 2003, GCOTF based on 2000Chinese National Student Physical Health Test (CNSPHT) results, first build three temporary norms, use different combination P85, P90 and P95 BMI percentage compare with the NCHS standard. P85 cutoff point is very close to NCHS-Overweight, and P95cutoff point is very close to NCHS-Obesity, this new norm would be more matches the Chinese character. So based on intersect test, verify physiological, lipidemia biochemical and body composition measurement to select the best norm for Chinese children and adolescents (Figure 20).

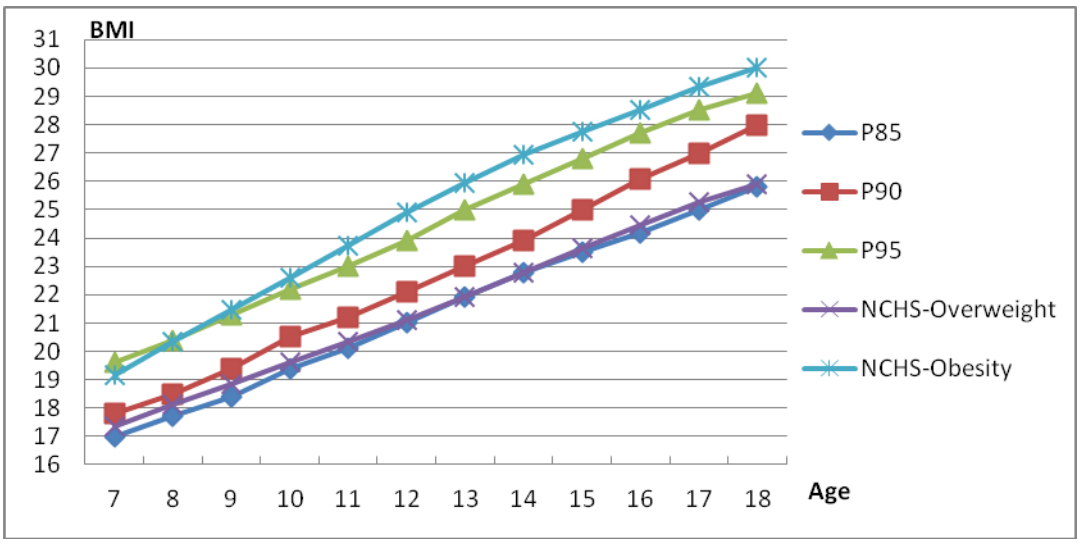


Figure 19- Temporary BMI percentage vs. NCHS in Chinese urban boys

Remarks: P85= the85thcentilesofbody mass index for age and sex; P90= the 90thcentilesofbody mass index for age and sex; P95= the 95thcentilesofbody mass index for age and sex; NCHS-Overweight= American National *standard of overweight is BMI over 25 kg/m^2; NCHS-Obesity= American* National *standard of overweight is BMI over 30 kg/m^2*

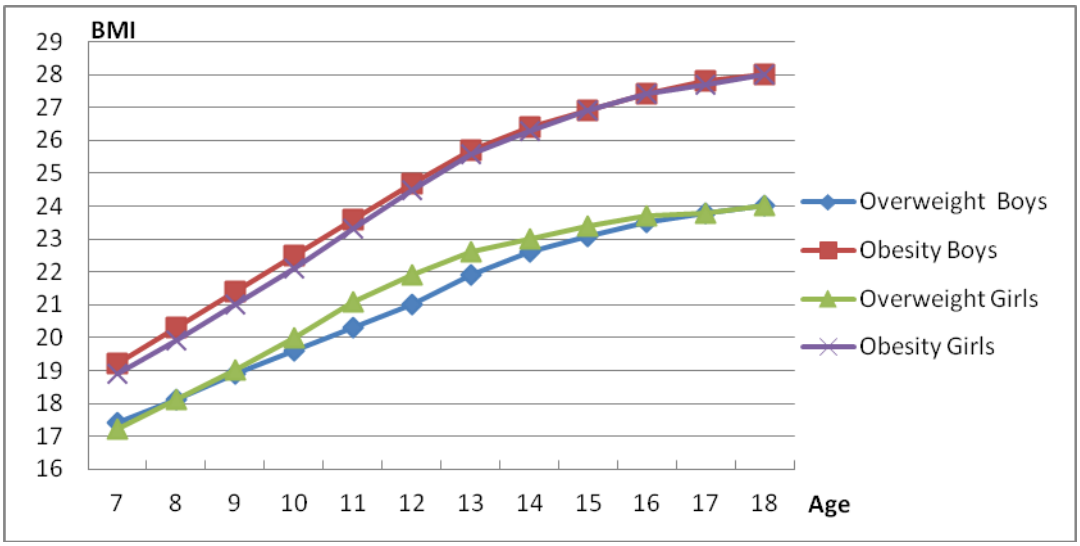


Figure 20 - BMI classification criteria for screening overweight and obese

This criteria set up in 2003, and still use nowadays. Boys' BMI over 24 kg/m^2 and girls' BMI over 28 kg/m^2 though lower the international Standard of male's BMI over 25 kg/m^{2}and female's BMI over 30 kg/m^2, but this is more suitable for Asian's body composition characteristics and physical development level.

- Chinese National Student Physical Health Standards (CNSPHS)

The Chinese National Student Physical Health Standard (CNSPHS) is a guideline of basic national school education standard, it plays an important role in education reform, evaluates students' comprehensive quality, assess schools 'annual work, implement "National Standards for Physical Exercise" in general primary school, middle school, high school, secondary vocational schools and colleges.

This standard includes body shape, body function and physical fitness as three aspects. It is a comprehensive system to assess students' physical health condition, to promote the healthy development of physical fitness, and to encourage students actively in physical exercise. The evaluation subjects are: six groups from primary school, three groups from junior high school, three groups from senior high school, first and second grade of university as a group, third and fourth grade as a group.

Weight, height, vital capacity, 50-meter run, sit and reach, these five measurements for all age students, then each different age have some special tests, Table 17shows each different group's test item and each test item's percentage composition:

Table 17 - Different age test item

Object	Item	Percentage (%)
Grade 1- College 4, Age 6-22	BMI	15
	vital capacity	15
Grade 1-2, Age 6-7	50 M Run	20
	Sit & Reach	30
	1 min Rope	20
Grade 3-4, Age 8-9	50 M Run	20
	Sit & Reach	20
	1 min Rope	20
	1 min Sit-ups	10
Grade 5-6, Age 10-11	50 M Run	20
	Sit & Reach	10
	1 min Rope	10
	1 min Sit-ups	20
	50M × 8 shuttle Run	10

The standard school year score composed of standard points and additional points, the total score is 120 points. A standard point composed of each individual index and the percentage rate, full score is 100 points. Additional points based on the extra item for each age, primary school students' physical item is 1 minute rope with 20 points, junior high school, senior high school and college students' physical items are chin-up (bringing the chin up through space, specifically in relation to its position with the bar or other hand grips) and 1000-meter run for boys and one minute sit-ups and 800-meter run for girls, each item has 10 points. Students' score divided into 4 levels, over 90.0 points is "excellent", 80.0-89.9 is "good", 60.0-79.9 is "pass", and below 59.9 is "fail". Here are the norms for students from grade 1 to college which means from age 6 to 18. We take 7-10-year-old students as example, the rest will see on appendix.

First part is the body shape, calculate the students' weight and height, obesity table 18 is the norm for both gender ages from 7 to 10. G=Grade; A=Age; Normal= Normal weight; Under =Under the normal weight; Over=Overweight.

Table 18 - BMI standards (kg/m^2)

	Score	Boys				Girls			
Grade		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Normal	100	13.7~18.4	13.9~19.4	14.2~20.1	14.4~21.4	13.5~17.8	13.6~18.6	13.7~19.4	13.8~20.5
Under	80	≤13.6	≤13.8	≤14.1	≤14.3	≤13.4	≤13.5	≤13.6	≤13.7
Over		18.5~20.4	19.5~22.1	20.2~22.6	21.5~24.1	17.9~20.2	18.7~21.1	19.5~22.0	20.6~22.9
Obesity	60	≥20.5	≥22.2	≥22.7	≥24.2	≥20.3	≥21.2	≥22.1	≥23.0

Second part is body function, calculate students' vital capacity, Table 19 is the norm for both gender age from 7 to 10. G=Grade

Table 19 - Vital capacity standards (ml)

	Score	Boys				Girls			
Level		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Excellent	100	2000	2300	2600	2900	1600	1800	2000	2250
	95	1900	2200	2500	2800	1500	1700	1900	2150
	90	1800	2100	2400	2700	1400	1600	1800	2050
Good	85	1650	1900	2150	2450	1300	1500	1700	1950
	80	1500	1700	1900	2200	1200	1400	1600	1850
Pass	78	1430	1620	1820	2110	1150	1340	1530	1770
	76	1360	1540	1740	2020	1100	1280	1460	1690
	74	1290	1460	1660	1930	1050	1220	1390	1610
	72	1220	1380	1580	1840	1000	1160	1320	1530
	70	1150	1300	1500	1750	950	1100	1250	1450
	68	1080	1220	1420	1660	900	1040	1180	1370
	66	1010	1140	1340	1570	850	980	1110	1290
	64	940	1060	1260	1480	800	920	1040	1210
	62	870	980	1180	1390	750	860	970	1130
	60	800	900	1100	1300	700	800	900	1050
Fail	50	750	840	1030	1220	680	780	880	1020
	40	700	780	960	1140	660	760	860	990
	30	650	720	890	1060	640	740	840	960
	20	600	660	820	980	620	720	820	930
	10	550	600	750	900	600	700	800	900

Third part is physical fitness test, for 7-year-old student will attend 50m run, sit and reach, and 1min rope;8-10-year-old student will attend 50m run, sit and reach, 1min rope, 1 min sit-ups, except these 10-year-old student will attend extra item 50m×8 shuttle run, see the standards in Table 20 to Table 24.

Table 20- 50m run (s)

	Score	Boys				Girls			
Level		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Excellent	100	9.6	9.1	8.7	8.4	10.0	9.2	8.7	8.3
	95	9.7	9.2	8.8	8.5	10.1	9.3	8.8	8.4
	90	9.8	9.3	8.9	8.6	10.2	9.4	8.9	8.5
Good	85	9.9	9.4	9.0	8.7	10.5	9.7	9.2	8.8
	80	10.0	9.5	9.1	8.8	10.8	10.0	9.5	9.1
Pass	78	10.2	9.7	9.3	9.0	11.0	10.2	9.7	9.3

	76	10.4	9.9	9.5	9.2	11.2	10.4	9.9	9.5
	74	10.6	10.1	9.7	9.4	11.4	10.6	10.1	9.7
	72	10.8	10.3	9.9	9.6	11.6	10.8	10.3	9.9
	70	11.0	10.5	10.1	9.8	11.8	11.0	10.5	10.1
	68	11.2	10.7	10.3	10.0	12.0	11.2	10.7	10.3
	66	11.4	10.9	10.5	10.2	12.2	11.4	10.9	10.5
	64	11.6	11.1	10.7	10.4	12.4	11.6	11.1	10.7
	62	11.8	11.3	10.9	10.6	12.6	11.8	11.3	10.9
	60	12.0	11.5	11.1	10.8	12.8	12.0	11.5	11.1
Fail	50	12.2	11.7	11.3	11.0	13.0	12.2	11.7	11.3
	40	12.4	11.9	11.5	11.2	13.2	12.4	11.9	11.5
	30	12.6	12.1	11.7	11.4	640	740	840	960
	20	600	660	820	980	620	720	820	930
	10	550	600	750	900	600	700	800	900

Table 21 - Sit and Reach (cm)

	Score	Boys				Girls			
Level		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Excellent	100	16.2	16.3	16.4	16.5	18.9	19.2	19.5	19.8
	95	14.7	14.9	15.0	15.2	17.6	17.9	18.1	18.5
	90	13.2	13.4	13.6	13.8	16.3	16.6	16.9	17.2
Good	85	11.9	11.8	11.7	11.6	14.8	14.9	15.0	15.1
	80	10.6	10.2	9.8	9.4	13.3	13.2	13.1	13.0
Pass	78	9.5	9.1	8.6	8.2	12.2	12.1	12.0	11.9
	76	8.4	8.0	7.4	7.0	11.1	11.0	10.9	10.8
	74	7.3	6.9	6.2	5.8	10.0	9.9	9.8	9.7
	72	6.2	5.8	5.0	4.6	8.9	8.8	8.7	8.6
	70	5.1	4.7	3.8	3.4	7.8	7.7	7.6	7.5
	68	4.0	3.6	2.6	2.2	6.7	6.6	6.5	6.4
	66	2.9	2.5	1.4	1.0	5.6	5.5	5.4	5.3
	64	1.8	1.4	0.2	-0.2	4.5	4.4	4.3	4.2
	62	0.7	0.3	-1.0	-1.4	3.4	3.3	3.2	3.1
	60	-0.4	-0.8	-2.2	-2.6	2.3	2.2	2.1	2.0
Fail	50	-1.2	-1.6	-3.2	-3.6	1.5	1.4	1.3	1.2
	40	-2.0	-2.4	-4.2	-4.6	0.7	0.6	0.5	0.4
	30	-2.8	-3.2	-5.2	-5.6	-0.1	-0.2	-0.3	-0.4
	20	-3.6	-4.0	-6.2	-6.6	-0.9	-1.0	-1.1	-1.2
	10	-4.4	-4.8	-7.2	-7.6	-1.7	-1.8	-1.9	-2.0

Table 22- 1-minute rope (times)

Level	Score	Boys				Girls			
		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Excellent	100	117	126	137	148	127	139	149	158
	95	112	121	132	143	120	132	142	151
	90	107	116	127	138	113	125	135	144
Good	85	101	110	121	132	105	117	127	136
	80	95	104	115	126	97	109	119	128
Pass	78	88	97	108	119	90	102	112	121
	76	81	90	101	112	83	95	105	114
	74	74	83	94	105	76	88	98	107
	72	67	76	87	98	69	81	91	100
	70	60	69	80	91	62	74	84	93
	68	53	62	73	84	55	67	77	86
	66	46	55	66	77	48	60	70	79
	64	39	48	59	70	41	53	63	72
	62	32	41	52	63	34	46	56	65
	60	25	34	45	56	27	39	49	58
Fail	50	22	31	42	53	24	36	46	55
	40	19	28	39	50	21	33	43	52
	30	16	25	36	47	18	30	40	49
	20	13	22	33	44	15	27	37	46
	10	10	19	30	41	12	24	34	43

Table 23- 1-minute sit-ups (times)

Level	Score	Boys				Girls			
		G2,A7	G3,A8	G4,A9	G5,A10	G2,A7	G3,A8	G4,A9	G5,A10
Excellent	100	49	50	51	13	47	48	49	50
	95	46	47	48	12	45	46	47	48
	90	43	44	45	11	43	44	45	46
Good	85	40	41	42	10	40	41	42	43
	80	37	38	39	9	37	38	39	40
Pass	78	35	36	37		35	36	37	38
	76	33	34	35	8	33	34	35	36
	74	31	32	33		31	32	33	34
	72	29	30	31	7	29	30	31	32
	70	27	28	29		27	28	29	30
	68	25	26	27	6	25	26	27	28
	66	23	24	25		23	24	25	26
	64	21	22	23	5	21	22	23	24
	62	19	20	21		19	20	21	22

	60	17	18	19	4	17	18	19	20
Fail	50	15	16	17	3	15	16	17	18
	40	13	14	15	2	13	14	15	16
	30	11	12	13	1	11	12	13	14
	20	9	10	11		9	10	11	12
	10	7	8	9		7	8	9	10

Table 24- 50m×8 shuttle run (m·s)

	Score	Boys	Girls
Level		G5,A10	G5,A10
Excellent	100	1'36"	1'41"
	95	1'39"	1'44"
	90	1'42"	1'47"
Good	85	1'45"	1'50"
	80	1'48"	1'53"
Pass	78	1'51"	1'56"
	76	1'54"	1'59"
	74	1'57"	2'02"
	72	2'00"	2'05"
	70	2'03"	2'08"
	68	2'06"	2'11"
	66	2'09"	2'14"
	64	2'12"	2'17"
	62	2'15"	2'20"
	60	2'18"	2'23"
Fail	50	2'22"	2'27"
	40	2'26"	2'31"
	30	2'30"	2'35"
	20	2'34"	2'39"
	10	2'38"	2'43"

1.7 Outcomes of Shanghai studies

China is a big country, there are large variations between urban and rural areas, between population groups (e.g. migrants and residents, ethnic groups) and between geographic areas (e.g. east and west). Shanghai is one of the four municipalities, it located in the East part of China, it is the economic, financial, trade and shipping center of China, here lives more than 24 million people, is one of the world's most population cities. After 1990, Shanghai had tremendous development, it is the most multi-cultural integration city in China, and people pursue western style life, with the western culture influence Shanghai became the fat city. Statistics show that, in 1982, every 10 in 100 Shanghai citizens are overweight or obesity, to

1996, every 24 in 100 Shanghai citizens are overweight or obesity (cf. China News Network. 2013).In 2009, men's overweight and obesity rates were 19.4% and 8.6%, women's overweight and obesity rates were12% and 4%, respectively. In 2012, Shanghai carried out "a healthy weight 100 tons" campaign, a total of 42,893 people signed up to participate in activities which meet the requirements(BMI over 24kg/m^2) have 36,841 participants, and one month later the second measurement has 16,962 people. There are 12,836 people in the weight has been reduced, a total of 30,520.63 kg weight loss, Shanghai city "thin" 30 tons in one month (cf. Eastday. 2012).From the above report, we can see the decrease trends of both genders, which mean Shanghai citizens became more and more care about their healthy, and already had this healthy conscious.

But report about the children and adolescents warned us, China daily reported that, in 2011approximately 13.3 percent of the 11,839 Chinese children surveyed in Shanghai fall within the classification of being overweight, 6.5 percent are being obesity, which has increased 24.4 percent over the past decade, and closer to American adolescents' obese rate with 18.1 percent and 19.6 percent (cf. ct9900. 2011). Actually, since year 2005, the youth healthy already aroused many scholars' attention, so there are some reports about Shanghai.

- 2005 Shanghai Student Physical and Health Test (SSPHT)

In year 2005, Shanghai had Student Physical and Health Test (SSPHT) (cf. Fang. 2008), it had 363,073 boys and 357,238 girls aged 7-22 years old. The total obesity rate of 7-22 years old students is 11.5%, is 1.4% higher than year 2000, 16-18 age groups is the highest obesity rate group with 14.8%; 13-15 age group is the lowest obesity rate group with 8.9%. Compare all the data with the same age groups in nationwide, Table 25is about the body shape. Shanghai students had less nutrition problems, instead, higher overweight and obesity students, especially the boys, the overweight and obesity people take a quarter among the whole population.

Table 26 shows us the average obesity rate with the same age groups in nationwide, urban boys are 15.1% with 3.71% higher, urban girls are 9.2% with 4.19% higher; rural boys are 12% with 6.93% higher, and rural girls are 9.3% with 6.67% higher. So the average urban students in Shanghai are round 4% higher than the whole nation, and rural students' overweight rate even higher than the average nation level, it reached 7%.

Table 25 - Body shape of students in Shanghai and nationwide in 2005

			Malnutrition	Underweight	Normal	Overweight	Obesity
Design proportion		NO.	2.00%	13.00%	70.00%	13.00%	2.00%
Total	Nationwide	12208910	7.88%	45.53%	35.15%	4.11%	7.33%
	Shanghai	720000	5.76%	35.95% ↓	38.49% ↑	6.15% ↑	13.66% ↑
Boys	Nationwide	6445002	9.11%	48.90%	29.37%	3.95%	8.65%
	Shanghai	362838	6.09% ↓	35.28% ↓	34.20% ↑	6.66% ↑	17.78% ↑

Girls	Nationwide	5763884	6.50%	41.75%	41.60%	4.28%	5.85%
	Shanghai	357162	5.42% ↓	36.62% ↓	42.84% ↑	5.63% ↑	9.49% ↑

Table 26 - The average obese rate in Shanghai and nationwide in 2005

	Urban Boys	Urban Girls	Rural Boys	Rural Girls
Nationwide	11.39%	5.01%	5.07%	2.63%
Shanghai	15.1%	9.2%	12%	9.3%

The physical fitness test level in Shanghai (see Table 27), both “Excellent” rate(20.92%) and “Good” rate (36.66%) are lower than the design rate , “Excellent” rate should reach 25% and “Good” rate should reach 50%, but the “Pass” rate (40.53%) is much higher than the design rate (23%), which had the same as nationwide level. So the total results in Shanghai are higher than the average China. But, “Excellent” rate like Stand long jump, 50 m run, 1000m run all lower than the design rate, which means students’ lower strength and endurance ability need more practice to improve.

Table 27 - Physical fitness statistics in Shanghai and nationwide in 2005

Item	Design proportion	Number	Fail (%)	Pass (%)	Good (%)	Excellent (%)
			2.00	23.00	50.00	25.00
Total	Nationwide	12305207	3.44	40.49	38.58	17.45
	Shanghai	720311	1.89 ↓	40.53→	36.66 ↓	20.92 ↑
Vital Capacity	Nationwide	9821492	5.29	26.33	43.21	25.17
	Shanghai	512966	5.11 ↓	24.22 ↓	43.88 ↑	26.79 ↑
Grip Power	Nationwide	4378295	2.04	11.56	36.28	50.12
	Shanghai	209409	2.38	18.24 ↑	41.16 ↑	38.23 ↓
Sit Ups	Nationwide	982328	3.22	18.75	51.78	26.25
	Shanghai	67457	2.28 ↓	14.01 ↓	44.9 ↓	38.82 ↑
Sit&Reach	Nationwide	5525816	1.86	15.60	43.47	39.07
	Shanghai	358313	6.75 ↑	19.53 ↑	41.61 ↓	32.11 ↓
Stand Long Jump	Nationwide	8860564	5.93	33.31	39.9	20.68
	Shanghai	519228	3.62 ↓	30.38 ↓	42.63 ↑	23.37
Step Test	Nationwide	4991071	2.6	19.06	41.42	36.92
	Shanghai	161501	3.18 ↑	22.5 ↑	40.79 ↓	33.53 ↓
50m Run	Nationwide	3344564	5.05	23.76	43.62	27.59
	Shanghai	216043	4.7 ↓	25.45 ↑	45.76 ↑	24.09 ↓
800m Run	Nationwide	2288617	2.49	19.23	47.51	30.77
	Shanghai	163581	2.9 ↑	18.08 ↓	53.37 ↑	25.65 ↓
1000m Run	Nationwide	2438365	3.98	20.97	47.35	27.7
	Shanghai	143110	7.03 ↑	16.41 ↓	53.21 ↑	23.35 ↓

➢ 2010 Shanghai Students Physical and Health Test (SSPHT)

In year 2010, Shanghai implemented Student Physical and Health Test (SSPHT) with participation of 8,010 boys and7, 949 girls aged 7-22 years old. The total obesity rate of 7-22 years old students is 12.26%, is 0.76% higher than year 2005,which means it had continuous increase, 10-12 age group is the highest obesity rate group with 17.44%, 19-22 age group is the lowest obesity rate group with 5.25%, see Figure 21. The malnutrition rate in Shanghai is very lower in this age group, but, as we see the 10-12-year-old group has highest obesity rate (17.44%), and 7-9-year-old group is the second highest obesity rate (13.32%) group, this age in China is the pupil in primary schools before sexual maturity, but they are the highest obesity grouping this investigation, this should arouse more attention of the society. Because obese children have an increased risk of developing health, psychological and social problems (cf.Griffiths et al. 2013; Summerbell et al. 2005) and are more likely to be obese in adolescence and adulthood (cf.Centre for Longitudinal Studies. 2007).

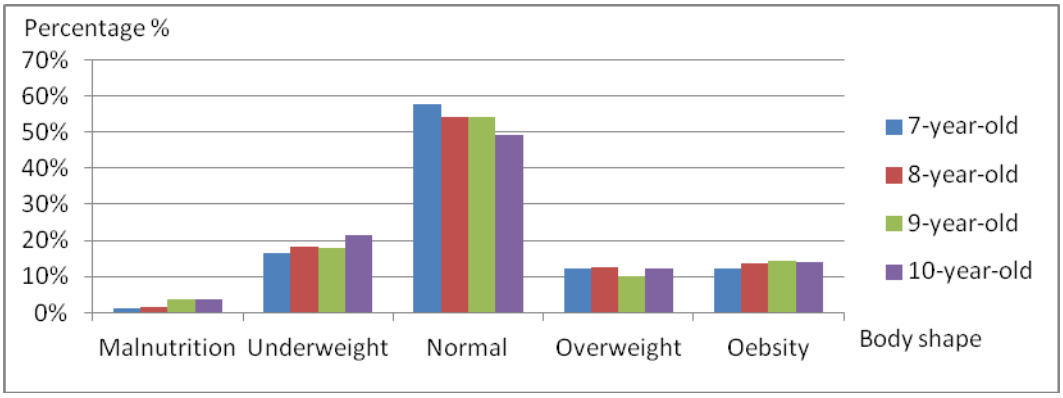


Figure 21 - Shanghai region 7-10-year-old stundets' body shape in 2010

Focused on figure 22, the 7-10-year-old group, compare all the data with the same age groups in nationwide (Figure 22, UB=urban boys; RG=urban girls; RB=rural boys; RG=rural girls). It is very obviously to see, wherever they come from, both genders in all regions the average BMI-China is the lowest, and both BMI-East Part and BMI-Shanghai are higher, this is very true portrayal. East part of China is the first developing area according to Chinese economic development policy, most people here have higher SES compare with the other regions, this is very different with previous research in developed countries, children and youth in lower SES families are usually more likely to be obese than their higher SES counterparts (cf. Chen et al. 2013), we call this is developing countries phenomenon. Shanghai located in east part of China, and it had higher SES and BMI as well.

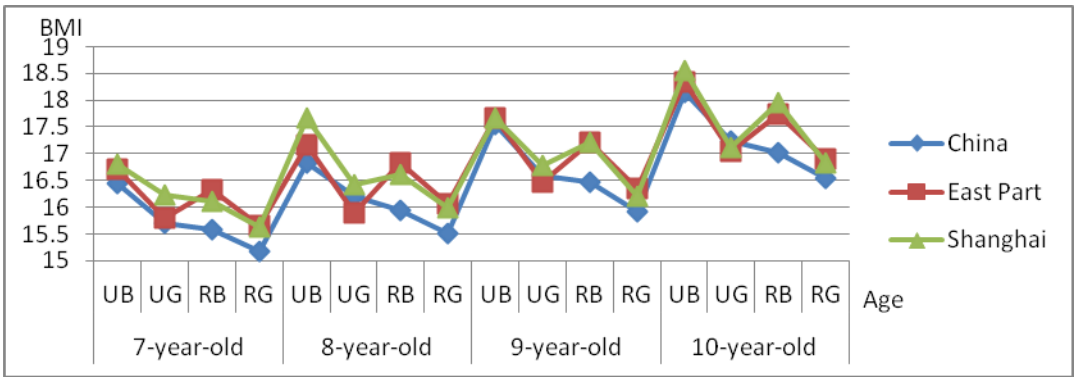


Figure 22 - The BMI value in some regions among 7-10-year-old group in 2010

About the physical fitness and health test (Table 28), Shanghai had a very higher level, in all items above the average national results in 7-10-year-old age group, which means the National Student Physical and Health Test (NSPHT) implement very well in all Shanghai schools, and students had a higher standard of PA.

Table 28 - 2010 physical fitness and health test in Shanghai and nationwide

Item	Region	7-year-old	8-year-old	9-year-old	10-year-old
Vital Capacity	Nationwide	1052.16	1218.23	1388.05	1581.14
	Shanghai	1281.55 ↑	1493.74 ↑	1687.46 ↑	1897.53 ↑
Grip Power	Nationwide	9.62	11.33	13.07	15.23
	Shanghai	9.8 ↑	11.46 ↑	13.08 ↑	15.25 ↑
Sit Ups	Nationwide	17.91	20.11	22.51	24.61
	Shanghai	26.35 ↑	28.5 ↑	30.19 ↑	32.94 ↑
Sit&Reach	Nationwide	8.56	8.28	7.64	7.45
	Shanghai	9.72 ↑	9 ↑	8.76 ↑	8.39 ↑
50m Run	Nationwide	11.41	10.80	10.36	10
	Shanghai	11.08 ↓	10.49 ↓	10 ↓	9.74 ↓
Stand Long Jump	Nationwide	121.58	131.92	140.6	148.80
	Shanghai	132.07 ↑	140.38 ↑	149.06 ↓	157.78 ↑
50M×8 Shuttles	Nationwide	137.31	132.59	128.92	124.74
	Shanghai	134.38 ↓	128.86 ↓	123.89 ↓	119.43 ↓

- An Insight into Physical Activity Features of Students

Shen's (et al.2013) research analyzing the quality of program "One Hour's School Sports Activities Per Day" reported that even nowadays in the whole nation every students need one hour sport activity by CME and CMS, still the Shanghai children's body movement status in school is unreasonable (Figure 23). Sit time is 280 min per day takes 66% of daily school time, run (28 min) and jump (11 min) time pretty less. And the frequency of running decreases with the increase of the grade.

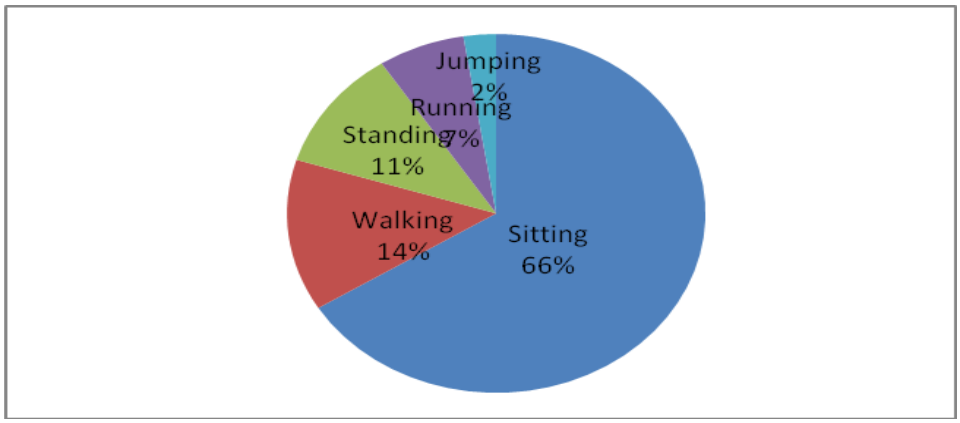


Figure 23 - Shanghai pupil one day's body movement in school

The spatial range of pupils' physical activities presents internal circle-classroom, center circle-corridor and outer circle-playground (cf. Shen.2013). But the majority time they spend at internal circle, and sitting takes highest percentage. The amount and intensity of physical activity increase with the expansion of the circle. As we motioned, in China every student should have one hour per day's PA workload in school, and this policy should be implement by each school. But this investigation results demonstrate the outstanding phenomenon is that students always sit for a long time and lack movement. So school sport reform should more focus on ensuring the time and intensity of children's body movement, and as well as the rational use of school's available resources to improve the quality of children's body movement.

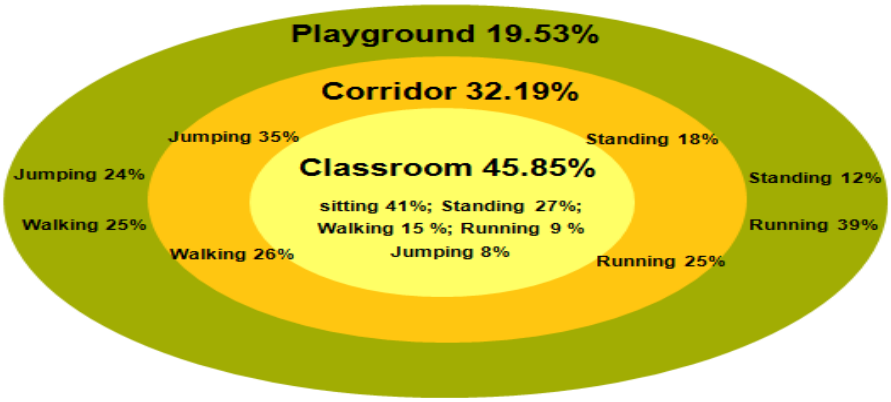


Figure 24 - Shanghai pupil's daily movement spatial range

Conclusion: Shanghai is one of the most developed cities in China, with its colonial history background, it is the most western influenced city. From our history review, we can see Shanghai presents a pioneer role in the Chinese society. It had the highest overweight and obesity rate in the first decade of 2000, with more intervention projects implement and the conscious of the healthy lifestyle of the citizen, "Shanghai is the fattest city in China" this impression is outdated. Conversely, medium and small cities or affluent villages into the moderately wealthy prevalence levels, they followed the "Shanghai-model" of developing, later probably will become the new overweight and obesity growth region. Choose Shanghai as our target city, could be a pilot study for whole China.

2 Literature review from Germany

Germany, located in the western-central Europe, it includes 16 constituent states with 357,021 square kilometers of land, 81 billion population of inhabits, it is the most populous member state in the European Union. It performs well in many measures of well-being relative to most other countries in the Better Life Index (BLI). Germany ranks above the average in education and skills, work-life balance, jobs and earnings, environmental quality, social connections, housing, personal security and subjective well-being (cf. OECDa.2014), and also have higher health spending, which accounted for 11.3% of GDP in Germany in 2012, two percentage points higher than the OECD average of 9.3% (cf.OECDb.2014). But Germany performs worse in prevention of overweight and obesity (cf. Robert Koch Institute. 1998; DEGS1.2013; Wikipedia.2015; The Local. 2010; OECD.2014, 2015). Table 29 shows statistic report of overweight and obesity rate in Germany, the results are not optimistic.

Table 29 - The statistics of overweight and obese in Germany

Organization	Time	Male (%)	Female (%)	Overweight/Obesity
GNHIES98	1998	18.9	22.5	Obesity
DEGS1	1998	23.3	23.9	Obesity
DEGS1	2008-2011	67.1	53	Overweight
Wikipedia	1998	19	22.5	Obesity
	1999	56	40	Overweight
	2007	60	43	Overweight
OECD	1999	11.5 (no gender)		Obesity
	2009	14.7 (no gender)		Obesity
	2011	36.7 (no gender)		Overweight
	2013	15.7 (no gender)		Obesity

Remark: GNHIES98: German National Health Interview and Examination Survey 1998
DEGS1: German Health Interview and Examination Survey for Adults
OECD: Organization for Economic Co-operation and Development

Germany has the highest number of overweight people in Europe (cf. Deutsche Welle.2007; BBC.2010).The obesity level in Germany is in the middle compared to other European countries (cf. Deutsche Welle. 2011).Out of 44 countries, Germany is ranked 39th for women and 42nd for men for cholesterol levels (cf. Deutsche Welle. 2011).The waist of female Germans between the ages of 14 and 70 grew by 4.1 centimeters thicker between 1994 and 2009 (cf. The Local. 2010).The belly girth of men between 16 and 70 grew by 4.4 centimeters between 1980 and 2009 (cf. The Local. 2010).A survey in 2007 had listed Germany as the country with "the highest proportion of overweight children in Europe" (cf.Die Welt. 2011).However, despite dropping in the rankings, the number of truly obese children has doubled in the past decade (cf. Die Welt.2011).Germany still has the most overweight adults in Europe (cf. The Local.2011). Actually, Germany can do more to promote healthy lifestyles and the quality of primary care.

2.1 German Sport and Health Report at National Levels

According to the research by Moß (et al. 2007), we can see the frequency of obesity (adiposity included) at the school beginners in the individual federal states Figure 25). The data from Bavarian State Office of Health and Food Safety (BSOHFS), the school enrollment year 2003 includes Niedersachsen, Hessen, Mecklenburg-Vorpommern, Brandenburg, Bayern; school enrollment year 2004 includes Baden-Württemberg, Berlin, Hamburg, Saarland, Schleswig-Holstein; school enrollment year 2005 includes Nordrhein-Westfalen (NRW), Rheinland-Pfalz, Sachsen, Thüringen.

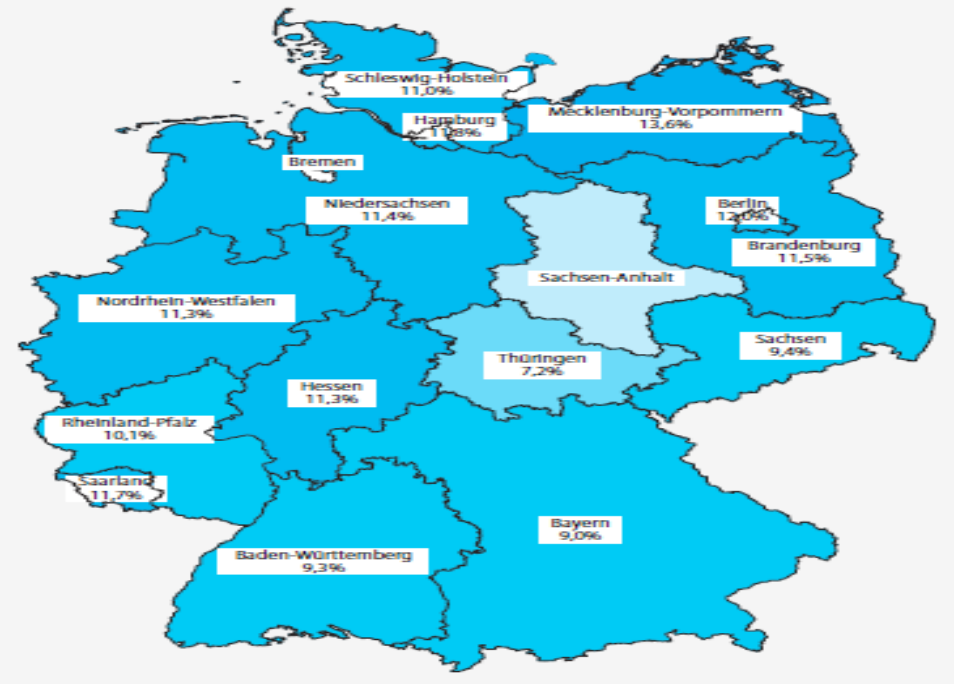


Figure 25 - The total overweight rate of each federal state

Remark: This figure original from Moß (et al.2007)

The total overweight rate is varying from each federal state, it could be the different social structure and the population of the individual regions. There are differences between north and south, north is much higher than south, but east and west have not see the difference.

As Moß (cf.et al.2007) reported, only a few states are figures on the development of the prevalence of overweight and obesity in elementary schools over the last years, and in some old federal states like NRW (cf. Rapp et al.2005), Niedersachsen (cf. Bahrdehle. 2006) and Schleswig-Holstein (cf. Thyen. 2001;2002;2003;2004; Beiträge zur Gesundheitsberichterstattung des Bundes. 2007) as well as for the new states as Thüringen (cf.Kromeyer-Hauschild et al.1999) and Brandenburg (cf. Böhm et al. 2002) over a longer period had steady increase of overweight and obesity were observed. See the Overweight and Obesity rate in Nordrhein-Westfalen from the year 1996 to 2005 (Figure 26).

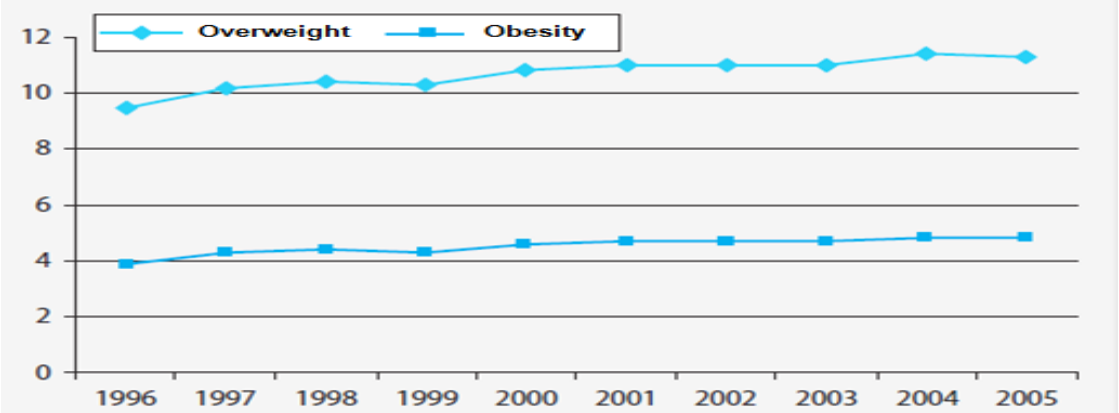


Figure 26 - The Overweight and obese rate in NRW

Remark: This figure original from Moß 2007)

The overweight and obese rate in NRW still had slow increasing in the past decade, this probable of its history, since 1950s, NRW was known as land of coal and steel, it was one of the most important industrial regions in Europe, it contributed to the German economic, and also attracted many foreigners as labor workers, so the social class and the status of migrants impact on the incidence of overweight and obesity (cf. Böhm et al.2005; Kalies et al. 2002; Delekat et al. 2007; Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit.2004; Thyen 2003; 2004).

- Health Behavior in School-Aged Children (HBSC)

In Germany, increased interest has been supported by three large empirical surveys: one is named 'Health Behavior in School-Aged Children (HBSC)', a "cross-national research study conducted in collaboration with the WHO Regional Office for Europe" (http://www.hbsc.org). Behaviors established during adolescence can continue into adulthood, affecting issues such as mental health, the development of health complaints, tobacco use, diet, physical activity levels, and alcohol use. HBSC focuses on understanding young people's health in their social context – where they live, at school, with family and friends. And collects data every four years on 11-, 13- and 15-year-old boys' and girls' health and well-being, social environments and health behaviors, to understand all the relevant factors individually and together, influence young people's health as they move from childhood into young adulthood. Here is 2009/2010 report made by HBSC-Team Germany, it calculated family wealth, immigrant background relative physical activity and body shape.

Physical activity: all students will answer how much time they spend on physical activity (PA) in their free time, the answer could be “no sport”, “less than two hours per week”, “two-three hours per week”, “over four hours per week”(Figure 27); and also how intensive of 60 minutes PA (winded and sweating), the answer could be “low PA (zero-two days moderate-intensive PA”, “medium PA (three-four days moderate-intensive PA)”, “high PA (five-seven days moderate-intensive PA” (Figure28).

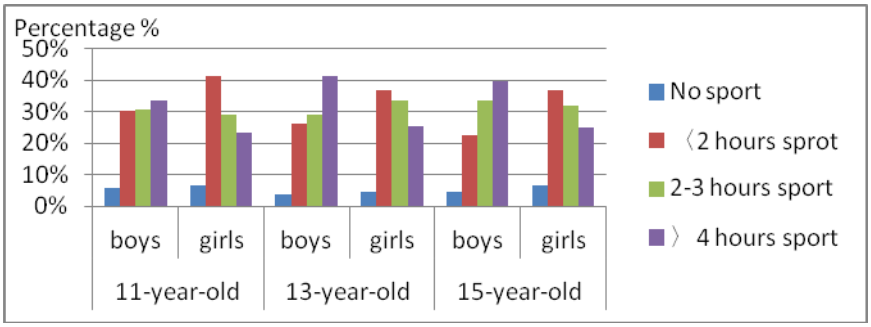


Figure 27 - Spare time PA for boys and girls (%)

Remark: Data comes from Faktenblatt zur Studie Health Behaviour in School-aged Children 2009/2010)

There are 5.3% of young people are not physically active, 31.0% of adolescents are at least four hours per week physically active, boys compared with girls are more active at all age group, especially in 15-year-old group, the difference are larger, boys have at least two hours per week 15.9 percentage points higher than girls(cf. HBSC-Team Deutschland. 2011b).

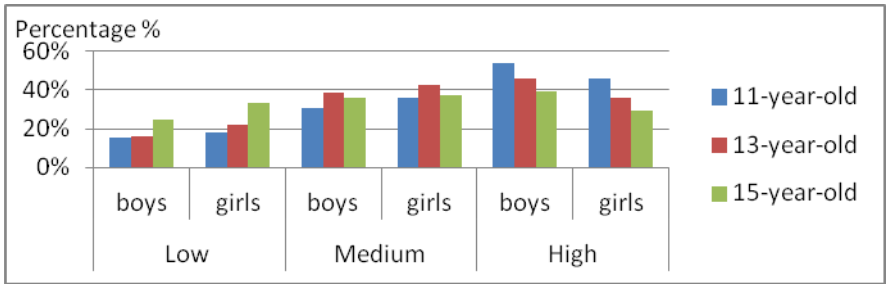


Figure 28 - Intensive of PA for boys and girls (%)

Boys compared to girls are significantly more active. Boys reach the recommendation for health-enhancing physical activity (e.g. each day 60 minutes moderate-intense PA) was significantly more likely than girls(20.0% vs. 14.0%); continues to reflect trend over the ages, only 8.6% of girls and13.6% of boys are aged 15-year-old sufficient from a health point of effectively PA view, in both genders, boys and girls the proportion of the most active group (five-seven days) of the 11-to 15-year-old very significantly decrease (-16.6 percentage points for girls and -14.6 percentage points in boys), the older the less high PA(cf. HBSC-Team Deutschland. 2011a).

Family wealthy relative with PA in Figure 29.In general, boys do more sport than girls, boys and girls from more affluent families do more exercise than these from low wealth family, especially over four hours sport per week, there are +16.7 percentage points in girls and +11.2 percentage points in boys, respectively(cf. HBSC-Team Deutschland. 2011b).

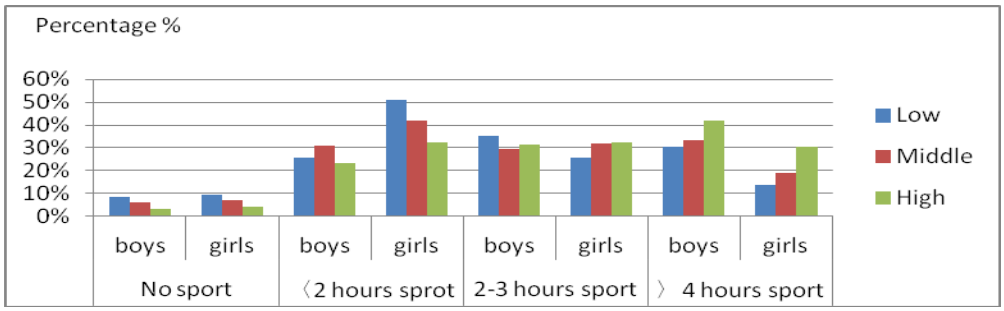


Figure 29 - Family wealth relative intensive of PA for boys and girls (%)

Immigrant background relative with PA in Figure 30.Immigrant background for boys cannot see the systematic differences, however boys without immigrant background provide the most active group (cf. HBSC-Team Deutschland. 2011a). For girls, without migration background more physical active, 5% lower in no sport per week, and 10%higher in over 4 hours PA per week, family background more influence girls than boys in PA(cf. HBSC-Team Deutschland. 2011b).

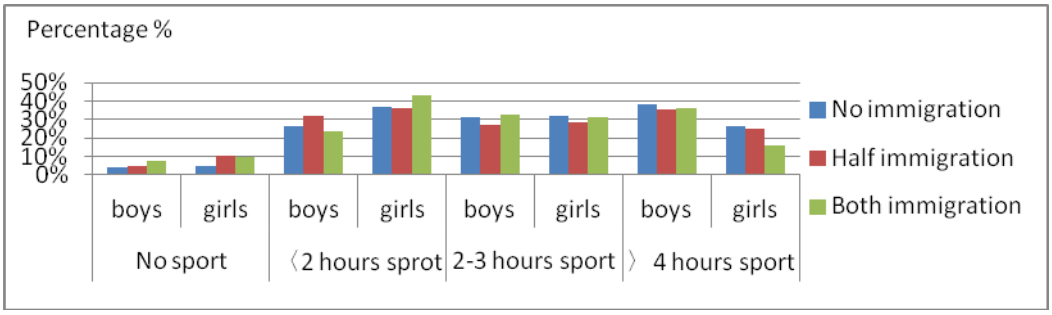


Figure 30 - Immigrant background relative with PA for boys and girls (%)

Body shape: all students will measure the weight (without cloths) and height (without shoes), then will calculate the body mass index (BMI) according to age and gender percentiles of the German reference population formed (cf. Kromeyer-Hauschild. 2001). BMI value is below the 10th percentile as "underweight", between the 10th and 90th percentiles as a "normal weight", above the 90th to the 97th percentile as "overweight" and above the 97th percentile as "obesity". There are 2,012 boys and 2,088 girls involved, and the total overweight or obesity rate of boys are 10.8% and girls are 8.5% (Figure 31).

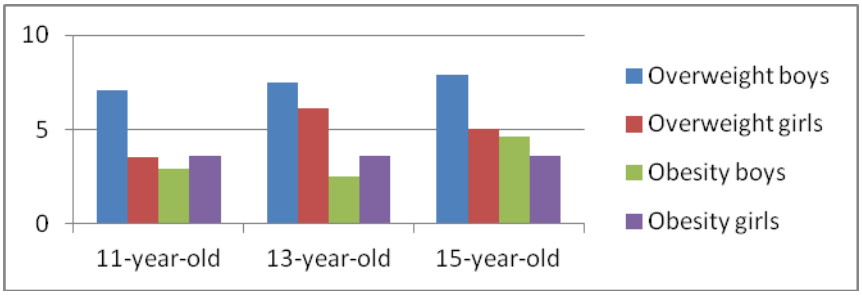


Figure 31 - Overweight and obesity rate for boys and girls (%)

In all age group, overweight boys are more than girls, obesity girls are more than boys in 11- and 13-year-old group, except in 15-year-old group, obesity boys are more than girls. Boys proportion of overweight or obesity by age 13- to 15-year-old rises slightly while girls rising proportion of overweight or obesity at 11- to 13-year-old, this made the big difference, boys have 4.9% higher than girls in total overweight or obesity rate (cf. HBSC-Team Deutschland. 2011c).

In the self-body-image investigation, 49.8% girls and 34.2% boys feel they are too dick, the right body imagination for girls are 37.6% and boys are 48.2%. Girls are more critical with their body shape (especially older) and practice often a diet than boys (cf. HBSC-Team Deutschland. 2011d)

Family wealth relative with body shape: all students will finish the questionnaire with the parents about the family wealth which relative with the family salary (Figure 32). The results show us, the lower family prosperity have higher overweight (girls: 5.6%, boys: 10%) and obesity rate (girls: 6.6%; boys: 6.7%), the higher family prosperity with lower overweight and obesity rate (girls: 6.8%, boys: 9%), and this phenomenon more common in boys family than girls.

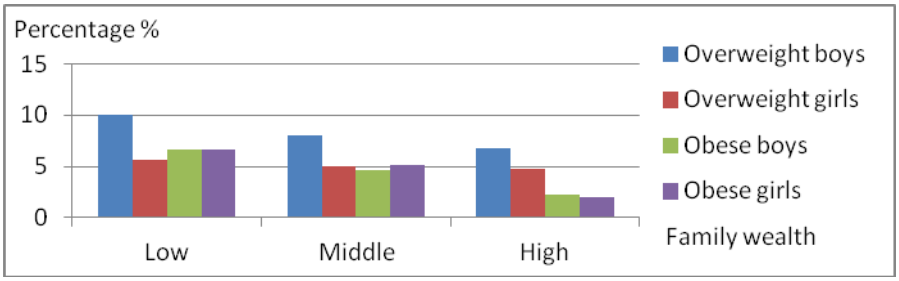


Figure 32- Family wealth relative with body shape for boys and girls (%)

Immigrant background: this part will take the relationship as no immigration background, half immigration background and both immigration background (Figure 33). The results show us, boys with 9.7% and girls with 8.2% without migration background have the lowest proportion of overweight or Obesity; In addition, the proportion of underweight for boys from both immigration background are less than half immigration background, but the proportion of obesity for boys from both immigration background are still higher than half immigration background; the proportion of underweight and obesity from both immigration background still higher than half immigration background for girls.

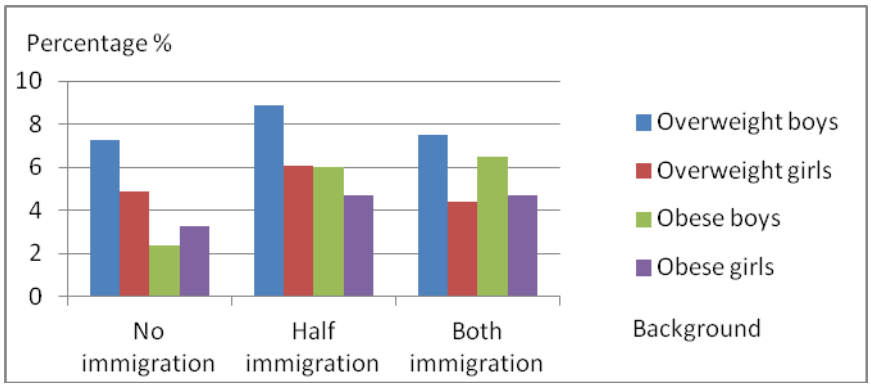


Figure 33- Immigrant background for boys and girls (%)

So we can see, the lower SES family would have higher proportion of underweight and obesity children, which means this group has the highest prevalence of poor health and of risk factors (cf. Currie et al. 2008; Richter, 2005), many studies conducted the same results in developed countries (cf. Beenackers et al. 2012; Gidlow et al 2006; Cleland et al. 2012; Chen et al.2015)

- German Health Interview and Examination Survey for Children and Adolescents' (KIGGS)

The second study is called German Health Interview and Examination Survey for Children and Adolescents (KIGGS) (http://www.kiggs.de). Study was designed as a comprehensive, nation-wide, representative interview and examination survey for the age group 0-17-year-old. Between May 2003 and May 2006, a total of 17,641 participants (8,656 girls, 8,985 boys) from 167 communities were enrolled." (cf. Kurth et al.2008). The KIGGS has one core survey and five modules see Figure 34 (cf. Kurth et al.2007), they are mental health module (BELLA), environmental module (KUS), motor activity module (MoMo), and nutrition module (EsKimo), and state module (Schlewig-Holstein).

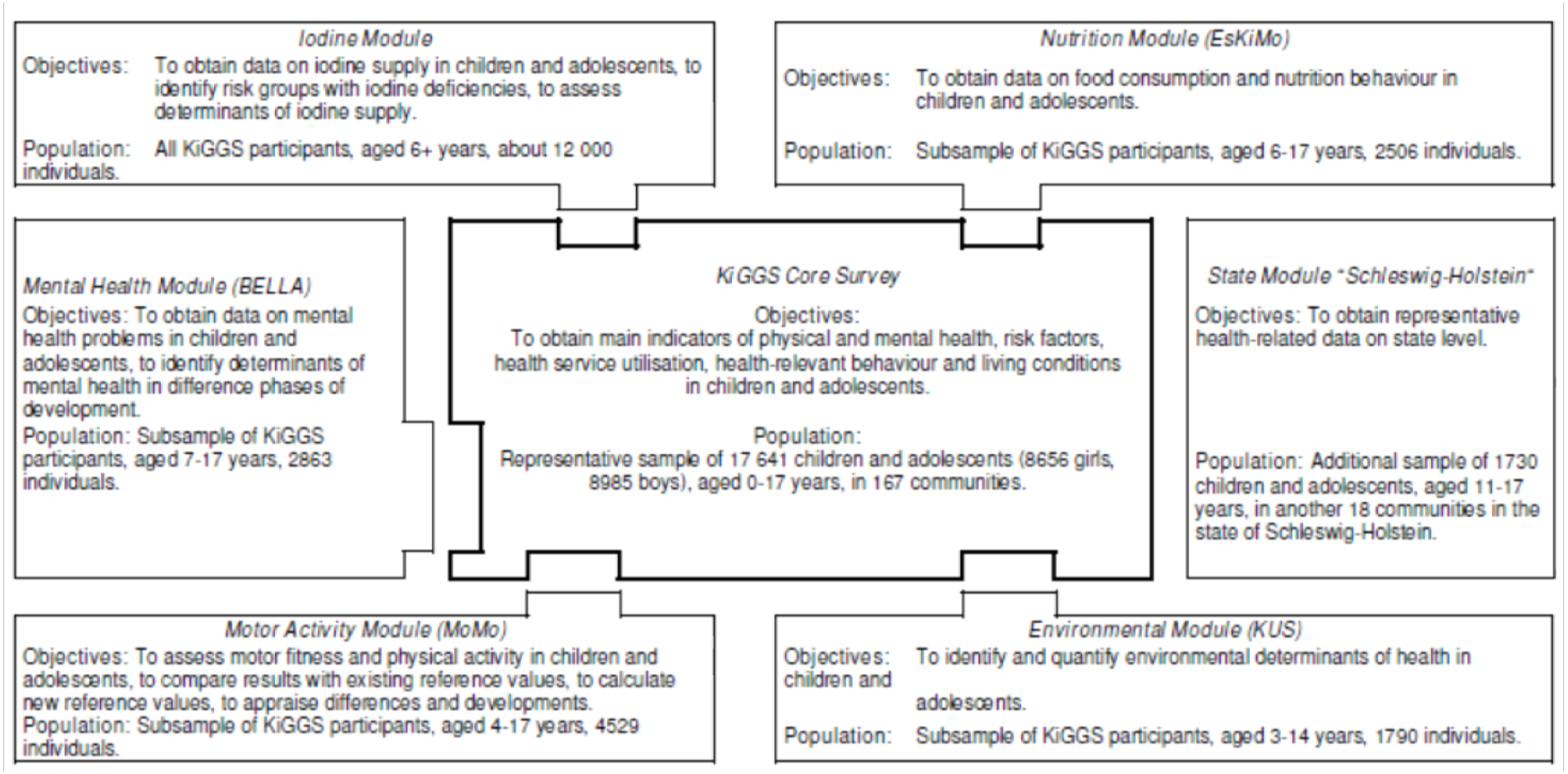


Figure 34 - The KIGGS survey structure

The strengths of KIGGS study is its large and nationally representative sample size and standardized measurements. It provides amount of researchers see Table 30.

Table 30 - The KIGGS studies

Keywords	Author	Results
Migration	Schenk1et al.	Difference between migrants and non-migrants related to socio-economic status and place of living (rural/urban and East/West).
Tobacco ,Smoking, Alcohol, Drugs, Substance use	Lampert 1et al.	Adolescents of low social status smoke more frequently; alcohol and drug consumption has no significant status-specific differences
Nutritional or Dietary	Mensink1 et al.	Consumption of sweets and soft drinks is relatively high. More than half of the children each consume fruits and vegetables on a daily base, this consumption declines with increasing age.
Breastfeeding	Lange et al.	Mothers from socially disadvantaged population groups had significantly lower breastfeeding
PA	Lampert 2 et al.	3-10-year-old:75% girls and boys go for sports at least once a week, even over 30% three times a week or more; 11-17-year-old:25% boys and 17% girls reach the recommendation sports in week
Media	Lampert 3 et al.	Boys spend more time than girls on computers, internet and games consoles, whereas girls more often listen to music and use their mobile phones. Watching television and videos is equally popular among girls and boys.
Dental check-up	Schenk2et al.	29 % children and adolescents brushed their teeth only once daily or less frequently; only 8 % have a dental check-up less than once a year.
Body measurement	Stolzenberg et al.	Head circumference, frame index and all parameters strongly associated with body fat show a significant social status gradient.
Pregnancy	Bergmann et al.	Mean weight gain during pregnancy has increased significantly by 2kg, the mean birth weight has increased significantly by an average of 50g, and there has been no significant trend for smoking and alcohol consumption in pregnancy.
Sexual maturity	Kahl 1et al.	The median age at menarche is 12.8 years, the median for voice change (voice low) 15.1 years.
Somatic disease	Kamtsiuris1 et al.	Children and adolescents were affected by obstructive bronchitis (13.3 %), neurodermatitis/atopic eczema (13.2 %) and hay fever (10.7 %). Scoliosis and asthma had 5.2 % and 4.7 % of subjects aged 0–17 years,; lifetime prevalence rates of the remaining diseases varied between 0.14 % for diabetes mellitus and 3.6 % for convulsions/epileptic fits.
Allergic diseases	Schlaud et al.	The lifetime prevalence (LTP) of at least one atopic disease was 22.9 %, the 12-month prevalence was 16.1 %; boys (17.3%) were more frequently affected than girls (14.9 %). The LTP of allergic contact eczema was 9.9 %; girls were more frequently affected than boys. 40.8 % of 3-17-year-old sensitized to at least one of the allergens tested; boys more frequently so than girls.

Pain	Ellert et al.	Pain prevalence increased significantly with age; in all age groups girls reported pain significantly more often than boys of the same age.
Injuries	Kahl2 et al.	Aged 11-17-year-old children 15.9 % had at least one injury within the last 12 months, 15.2 % because of an accident and 0.8 % because of assault. The three most frequent injury mechanisms in age 1-17 years were falls on level ground (35.2 %), falls from heights (25.2 %) and collisions with objects or persons (20.6 %).
Blood pressure	Neuhauser et al.	Systolic and diastolic blood pressure confirm previous findings of increasing blood pressure with age and height and of higher systolic blood pressure levels among boys compared with girls from the age of 14 years.
BMI percentile	Kurth et al.	The proportion of overweight rises from 9% of 3-6-year-old to 15% of 7-10-year-old and 17% of 14-17-year-old. The prevalence of obesity is 2.9%, 6.4% and 8.5% for the same age groups respectively.
Iodine intake	Thamm et al.	The iodine prophylaxis has been successful and that iodine intake has improved compared with the past.
CSHCN	Scheidt-Nave	The overall weighted prevalence of characteristics of children and adolescents with specific health care needs (CSHCN) was 16.0% among boys and 11.4% in girls.
Biochemical measures	Thierfelder et al.	Overall 43 parameters covered three areas of particular public health interest: micronutrient deficiency, seroepidemiology of infectious diseases and immunization status, and risk indicators or risk factors for chronic non-communicable diseases.
Neutralizing antibodies	Diedrich et al.	The neutralizing antibodies against poliovirus types 1, 2 and 3 were detected in 97.4%, 97.6%, and 93.6% of samples, respectively.
Motor fitness	Starker et al.	Tested the motor abilities: co-ordination, strength, cardio respiratory fitness and flexibility, there are better results from older children and adolescents than from younger ones.
Behavioral problem	Hölling1 et al.	Total Difficulties Score shows 11.5 % girls (G) and 17.8 % boys (B) are classified borderline or abnormal; 92.5 % (G) and 86.3 % (B) display an adequate pro social behavior. Most prevalent problem areas are behavioral problems (G=11.9 %, B=17.9 %), emotional problems (G=9.7 %, B= 8.6 %) and hyperactivity problems (G=4.8 %, B=10.8 %).
Eating disorders	Hölling2 et al.	21.9 % of the children and adolescents in Germany aged 11 to 17 years showed symptoms of eating disorders.
Risks & protective factors	Erhart et al.	Children with migration background a higher percentage with poorly developed personal and social protective factors is found. Older children report less family resources but more social resources than younger children; in comparison to boys, girls have more social but less personal resources at their disposal.
Quality of life	Ravens-Sieberer 1 et al.	The differences in health-related quality of life of children and adolescents from different social backgrounds and with different health statuses, which were to be expected on theoretical grounds, were demonstrated by the KINDL-R scores.
Violence	Schlack 1 et al.	82.5% of girls (G) and 67.2% of boys (B) had not been

experiences		involved in an act of violence in the last 12 months; 19.6% (B) and 9.9% (G) had been perpetrators; 5.2% (B) and 3.9% (G) had been victims and 7.6% (B) and 3.6% (G) had been perpetrators/victims of an act of violence.
Attention-deficit/ hyperactivity disorder (ADHD)	Schlack 2 et al.	ADHD had ever been diagnosed in 4.8 % of the children and adolescents altogether (B: 7.7 %, G: 1.8 %). Another 4.9 % of the participants can be considered as suspected cases. Already 1.8 % of the preschoolers had been given an ADHD diagnosis
Medical care	Kamtsiuris 2 et al.	The use made of individual early diagnostic tests for children remains above the 90 % limit until the U7 test and drops to 89.0 % at U8, falling to 86.4 % at U9. 81 % of children took part in all the early diagnostic tests provided until age 6 (U3 to U9). Another 16 % only took advantage of some parts of this service and 3 % of the children never went to one of these check-ups.
Vaccination	Poethko-Müller et al.	Mumps and rubella (MMR) vaccination was above 90% in children aged 2–17 years. Vaccination coverage for pertussis, Hib and hepatitis B is higher in younger than in older age groups.
Medicine use	Knopf	50.8 % of all children and adolescents reported to have used at least 1 medication. Highest (74.9 %) prevalence in the age group 0 to 2 years. Girls (53.1%) significantly higher prevalence rate than boys (48.7%).
Mental health	Ravens-Sieberer 2 et al.	21.9 % of children and adolescents (95%CI: 19.9-24.0) showed signs of mental health problems. The psychiatric disorders observed included anxiety (10.0%; 95% CI: 8.7-11.6), conduct disorder (7.6 %; 95% CI: 6.5-8.7) and depression (5.4%; 95% CI: 4.3-6.6).
Motor fitness	Opper et al.	Motor fitness, consists of 11 items measuring strength, cardio respiratory fitness, coordination and mobility. Physical activity was assessed using a questionnaire containing 51 items on the duration, intensity and frequency of physical activity in everyday life, during leisure time, at school and in sports clubs.
Environment	Schulz et al.	The German Environmental Survey for Children (GerES IV) calculates blood, urine, tap water, house dust and indoor air; hearing tests, measurements of traffic noise and interviews to get exposure-related information.
Schleswig-Holstein	Kamtsiuris 3 et al.	Total of 1,931 subjects examined in Schleswig-Holstein, 1,730 in the federal state module and 201 in core survey.
Nutritional or Dietary	Mensink 2 et al.	Show the amounts of foods and food groups consumed as well as the nutrient intake.

The KIGGS study is really a big study in Germany, the data show that the proportion of overweight raises from 9% of 3-6-year-old to 15% of 7-10-year-old and 17% of 14-17-year-old. The prevalence of obesity is 2.9%, 6.4% and 8.5% for the same age groups respectively (cf. Kurth et al.2007; Rosario et al.2010). The obesity prevalence ratio of 6.71% for children of parents with a German ethnic background and 17.33% for children of parents with a migration background (cf. Daniela et al.2009). Most KIGGS study more focus on the low socioeconomic status, migration background and

former East Germany. Data show that, parameters of body fat has a strong associated with social status gradient (cf. Stolzenberg et al.2010). Children without sport engagement come disproportionately often from families with low socioeconomic status, with a migration background or from former East Germany as well (cf. Lampert et al.2007).They use electronic media far more frequently and for longer times, especially television and video, games consoles and mobile phones (cf. Lampert et al.2007). Meanwhile higher percentage with poorly developed personal and social protective (cf. Erhart et al.2007) which lead to higher risks of tobacco, alcohol and drugs consuming (cf. Lampert et al. 2007), often affected by experiences of violence and have more permissive attitudes towards violence (cf. Schlack et al. 2007), and with mental health (cf. Hölling et al .2007) as compared with the higher status districts. Regard to medical care, missing health check-ups, dental check-up and vaccinations are all higher in low SES or migration family (cf. Schenk et al.2007).

- Motorik-Modul (MoMo) study

The third study called Motorik-Modul (MoMo Basiserhebung, www.motorik-modul.de), was to establish prevalence measurements on physical fitness and physical activity in German children and adolescents and to identify differences between age groups and genders. It within the framework of the longitudinal German Health Interview and Examination Survey for Children and Adolescents (KiGGS),performed according to the Declaration of Helsinki, supported by the German Ministry for Family, Seniors, Women and Youth (cf. Kurth et al.2008), conducted by the Robert-Koch-Institute in Berlin, Germany (cf. Woll et al. 2011). From 2003 to 2006, data on physical fitness and physical activity of 4,529 children and adolescents between the ages of 4-17 years from 167 cities across all states of the German Federation were collected.

MoMo has two main parts, one is physical fitness and the other is physical activity. The physical fitness was measured using endurance, strength, agility, coordination and flexibility tests (Figure 35, this is original from Woll A. et al. study)

Task structure		Motor ability				Passive systems for transfer of energy
		Endurance	Strength	Agility	Coordination	Flexibility
		aerobic	strength endurance/ power	reaction time	Coordination under time constraint/ coordination with precision	
Gross motor skills						
Locomotion	walking jumping		stand long jump(SW) force plate (KMP)		Backward Balancing(BAL) Jumping side to side(SHH)	
	upper extremities		Push-ups (LS)			

	trunk lower extremities	bike endurance test (RAD)				forward bend (RB)
Posture	Whole body				Single leg stance (EINB)	
Fine motor skills						
Fine motor limb movements	hand			Reaction test (REAK)	MLS-tracing lines (LIN) MLS-sorting pens (STI)	

Figure 35 - Structure of physical fitness tests relating motor skills to motor abilities

In endurance test, 87 % of the 3,528 children and adolescent tested reached the threshold heart rate. 13% terminated the test prematurely because of subjective exhaustion or lack of motivation. For 208 (5.7%) of subjects, PWC170 (cf. Rost et al. 1982) could not be determined. The mean values of absolute and relative endurance performance were greater in older subjects of both genders ($P<0.001$). In all age groups, male subjects performed better than female subjects ($P<0.001$). A significant interaction between the factors age and gender was identified ($P<0.001$) where the differences were greater in boys over the age of ten years while the differences were linear in girls of all ages (cf. Woll et al. 2011).

All strength tests showed that strength is higher the older the subjects are ($P<0.001$). While the difference in strength between age groups was constant for boys, the difference in strength between age groups for girls above the age of twelve years was negligible, causing a greater mean strength in boys aged 14-17 years than in girls in the same age groups ($P<0.001$)(cf. Woll et al. 2011).

The motor coordination was higher in older subjects ($P<0.001$). While boys and girls showed similar test performance for the reaction test, girls performed better than boys in the tracing lines and sorting pens tests ($P<0.001$ for both). In all age groups, girls performed better than boys ($P<0.001$) (cf. Woll et al. 2011).

Physical activity use the MoMo physical activity questionnaire (MoMo-PAQ), it consisted of 35 item for assessment of PA. The first two items assessed overall PA for at least 60 min per day during the preceding seven days at moderate to high intensity and facilitated comparisons with internationally developed activity standards (e.g. 60 min per day). The remaining 33 items covered the following activity categories: General PA (cf. Prochaska et al. 2001); PA at school (cf. Ulmer et al. 2000;Bös et al. 2002); daily PA (cf. Ulmer et al. 2000;Bös et al. 2002); PA in sports clubs (cf.Ulmer et al. 2000;Bös et al. 2002); PA outside of sports clubs (cf. Kurz et al.1996; Ulmer et al. 2000; Fuchs et al. 1989); availability of sports facilities (cf.Fuchs et al. 1989); interest in PA at school(cf.Bös et al. 2002); PA behavior of next of kin (cf.Fuchs et al. 1989); health-related expectations(cf.Fuchs et al. 1989); socio-emotional expectations; physical expectations; motivation for being physically active(cf. Ulmer et al. 2000). The PA in children and adolescent by age (Table 31).

Table 31 - PA in children and adolescent by age

Category	Parameter	Count,N	4-5 years old	6-10 years old	11-13 years old	14-17 years old	Overall	P-value	
Activities at school or kindergarten	Number of hours/week spend on PA	4,426	1.5(1.2)	2.4(0.8)	2.5(0.8)	2.1(0.9)	2.2(0.9)	<0.001	
	Number of days/week spend on PA	4,071	1.3(1.0)	2.0(0.8)	1.7(0.8)	1.3(0.8)	1.6(0.9)	<0.001	
	Participation in elective sports classes (boys/girls) [%]	3.879	N/A	11.0/7.1	13.0/10.3	10.0/9.6	10.8/9.0	n.s.	
Daily activities	Number of days/week spend on PA(boys/girls)	4,417	6.2/5.8	5.5/5.3	4.5/4.2	3.3/2.7	4.6/4.2	<0.001	for age, gender
Activities outside sports clubs	Participation in no-club sports(boys/girls) [%]	4,394	50/49	60/58	64/66	67/61	61.7/59.5	<0.001	
	Number of minutes/ week for non-club sports (boys/girls)	4,219	78/59	117/96	117/109	208/127	156/106	<0.001	for age, gender
Activities in sports clubs	Members in sports clubs (boys/girls) [%]	4,502	50/54.5	71.4/57.3	68.8/52.8	55.8/21.7	63/52	<0.001	for age, gender
	Opt out of minutes/week for club sports	842	5.7/5.9	8.3/12.4	16.6/25.2	29.7/33.4	16.5/21.0	<0.001	for age, gender
	Number of minutes/ week for club sports (boys/girls)	2,451	90/82	150/123	219/183	256/219	190/157	<0.001	for age, gender
	Participation in competitions (boys/girls) [%]	2,247	22.7/9.9	65.5/36.3	74.2/67.6	79.6/68.5	67.0/48.0	<0.001	for age, gender
Fulfillment of WHO Activity guidelines	Boys/girls [%]	3,943	35.4/28.4	24.2/17.9	9.4/8.3	8.1/5.0	17.4/13.1	<0.001	for age, gender

Remark: this table original from Woll.A (et al.2011) study, pp1137.

We can see there is significant gender difference in all age group of PA, boys are more frequently do sports than girls in all cases, and also more boys (63%) than girls (52%) are members in sports clubs, they are more participating in competitions than girls(67% vs 48%). Well, there is a phenomenon that younger children participated in outdoor PA on more days per week than older children and adolescents (P<0.001).

Compare the MoMo results and WHO 2002 , WHO 2008 activity guide in age 11-, 13-, and 15-year-old children and adolescent, we find that, no MoMo sample reach the WHO 2002 in “number of days being active for at least 1 hour” item, only 26% girls in age 11-year-old and 18.2% in 15-year-old, 31.3% boys in 13-year-old reach the WHO 2002 guide in “Being active for one hour on five days per week” item, and 20.4% boys in 13-year-old and 12.7% girls in 15-year-old fulfill the requirement put forward by the WHO 2008.

And about the PA intensity, Woll (et al. 2011) reported PA at kindergarten and school, non-club and club physical activity was smaller in older subjects for both genders (P<0.001) for all age group. PA performed at a club usually occurred with a higher intensity than physical activity at kindergarten and school and during leisure time, and intensity increased with increasing age, so PA shifts from the daily activity setting to organized sports at sports clubs on a few days per week with a change in frequency and quality of PA.

Spengler (et al.2012) reported multidimensional health-related behaviors in adolescents from MoMo. It has four clusters (clusters one-high scores in PA index and average scores in media use index and healthy nutrition index; cluster two-high healthy nutrition score and below average scores in the other two indices; cluster three-low PA score, low healthy nutrition score and very high media use score; cluster four-below average scores on all three indices) of typical health-related behavior patterns of adolescents. The study shows adolescents in cluster one had a high PA level (71.11 MET/week) than the other three clusters whose PA level was below average (below 17 MET/week in clusters two, three and four); cluster two was characterized by a high healthy nutrition score (63.1) compare with cluster one (53.24), cluster three (48.72) and cluster four (45.79), according to the Healthy Nutrition Score for Kids and Youth (HuSKY) score(cf.Kleiser et al. 2009); cluster three has the highest media use index (6.56 hours/day) while clusters one, two and four (2.85, 2.29 and 2.24 hours/day respectively) are more below the average. This study also uses Chi Square tests to reveal the prevalence of overweight between the clusters).Cluster one (12.5%) had the lowest relative number of overweight adolescents, and cluster three (22.2%) had the highest relative number of overweight adolescents. And this finding further confirmed by high amount of media use is linked to higher body fatness (cf. Marshall et al. 2004; Truthmann et al. 2012).

2.2 German Sport and Health Report at Regional Levels

Germany has 16 federal states, from state to state also has different culture because of the former German history, here are some regional level researches about children and adolescents health.

➢ Healthy children in sound communities (HCSC) research

"Healthy children in sound communities(HCSC)/Gesunde Kinder in Gesunden Kommunen(GKGK)" is a four-year longitudinal German-Dutch cross-border project which implemented in twelve municipalities and 39 primary schools 557 children from Germany (N=261) and the Netherlands (N=296)(www.gk-gk.eu).It is an integrated approach of a multi-component intervention: co-curricular PA in the morning before school lessons start ("walking bus"), health enhanced PE at school (3 lessons per week) in conjunction with health education and nutrition information as a part of the subject "science" on primary school level, co-curricula PA between school lessons and sport club based PA and sport courses for selected target groups of the pupils (measured before at school with a physical fitness test battery) regarding their motor development and health status (e.g. obese, lack of motor control, coordination, aerobic endurance etc.). In total, daily PA of about 90 minutes are provided by a sound combination of different school and sports club based PA programmers supplemented by teaching healthy lifestyles (the role of nutrition, active leisure profiles, and consumption of new media) (cf. Naul & Hoffmann, 2007; EUPEA. 2015).The motor development of German and Dutch see following Table 32.

Table 32 - Motor development of German and Dutch

	Sit-ups, *n*	Push-up, *n*	Sit and reach, cm	20-m sprint, seconds	Standing broad jump, cm	Rapid alternation, *n*	Balance backwards, *n*	6-minute run, m	BMI, *n*	Age, years
Germany, *N* = 261										
t1	14.0	12.0	3.5	4.6	107.9	23.8	24.1	876.1	16.5	7.2
t2	17.6	14.3	3.0	4.4	111.3	30.4	27.0	944.4	16.7	8.2
P	0.001	0.001	0.105	0.001	0.001	0.001	0.001	0.001	0.001	
η^2	0.329	0.214		0.414	0.041	0.516	0.174	0.307	0.051	
The Netherlands, *N* = 296										
t1	15.0	10.2	4.6	4.8	103.9	20.7	22.4	873.8	16.3	7.0
t2	17.4	12.2	2.7	4.6	111.5	26.4	26.6	914.4	16.6	7.8
P	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
η^2	0.224	0.137	0.066	0.126	0.159	0.442	0.148	0.085	0.049	

Motor ability show significant improvements in both countries: sit-ups (German:$P<0.001, \eta^2=0.329$; Dutch: $P<0.001, \eta^2=0.224$); push-ups (German: $P < 0.001$, $\eta^2 = 0.214$; Dutch : $P < 0.001$, $\eta^2 = 0.137$); 20-m run (German: $P < 0.001$, $\eta^2=0.414$; Dutch: $P < 0.001$, $\eta^2 = 0.126$); rapid alternations jumps (German: $P < 0.001$, $\eta^2 = 0.516$; Dutch: $P < 0.001$, $\eta^2 = 0.422$); balance backwards (German: $P < 0.001$, $\eta^2 = 0.174$; Dutch: $P < 0.001$, $\eta^2 = 0.148$); 6-minute run (German: $P < 0.001$, $\eta^2 = 0.307$; Dutch: $P < 0.001$, $\eta^2 = 0.085$).

BMI of children in both countries increased significantly from t1 to t2 (Germany: $P<0.001$, $\eta^2=0.051$ and Netherlands: $P<0.001$, $\eta^2=0.0490$). These results correspond with normal effects of growth. So in Naul's research, he focus on BMI percentiles (cf. Kromeyer-Hauschild et al. 2001), use P7 (heavy overweight) and P8 (obese) to

evaluate. In Germany, the number of P7 and P8 decreases from 15% to 14.6%. In the first year of four years intervention, five of19 children with obese dropped out of this percentile (decrease from 7.3% to 5.4%).In the Netherlands, the number of p7 and p8 decreased from 12.8% to 12% (cf.Naul et al. 2007; Hoffmann et al.2009)

The 36 items questionnaire includes six clusters: “Parents view on PA lifestyle of their children”, “Parents view on media consume lifestyle of their children”, “Parents view on nutrition lifestyle of their children”, “attitudes of parents towards physical activity”, “attitudes of parents towards media consume”, “attitudes of parents towards nutrition”. A mean between 1 to 1.25 stands for negative lifestyle behavior, a mean between 1.26-1.50 is a more negative than a positive behavior. A mean between 1.51-1.75 is more positive than negative and a mean between 1.76-2.00 is a positive lifestyle behavior in the view of the parents. And the results show that, parents’ assessment of their children’s lifestyle for PA, media consumption and nutrition habits there are only minor differences between the factors. All three means are assessed between 1.58 (lowest for media consumption) and 1.69 (highest for nutrition habits). But all three means stand for a more positive than negative assessment, which means the media lifestyle of their children is a little more critically observed than their nutrition habits. The assessment of the PA lifestyle (mean=1.60) of their children is closer to the mean for their media consumption. Parents significantly assess their children’s physical activity lifestyle factor on a far lower level (1.60) than their own attitude to physical activities as a lifestyle factor (1.77) (cf. Naul 2009; Hofmann 2008; Kloeze 2009; Naul et.al. 2011; HCSC group. 2009).

- Ulm research on metabolism, exercise and lifestyle intervention in children(URMEL-ICE)

Ulm research on metabolism, exercise and lifestyle intervention in children - computing incremental cost-effectiveness relation(URMEL-ICE) is a cross-sectional randomized intervention study carried out in2006, 64classes in 32 schools (1,427 pupils, median age of 7.6 years, range 6.2-9.2 years) from Ulm and adjacent regions participated (cf. Nagel et al. 2009; Kesztyüs et al. 2013; Muschel. 2012).Anthropometric measurements include weight, height, upper arm circumference, waist circumference, skin fold thickness, subscapular skin fold thickness, triceps skin fold thickness. The parental questionnaire includes parental height and weight of which BMI, migration background, educational level, maternal smoking during pregnancy, data on children’s birth weight and height. And also children's current lifestyle: time spent watching television(TV) on weekdays and weekends, playing video games on weekdays and weekends, playing outside, club sports or non club sports per week, consumption of sweetened drinks and breakfast before school.

Anthropometric results: waist circumference and upper arm circumference did not differ between boys and girls. Skin fold thickness for subscapular and triceps were on average statistically significantly higher among girls than boys. The prevalence of overweight was 16.5% in boys and 17.3% in girls, and values for obesity were 3.5% and3.6%, respectively. Among migrants, overweight was more prevalent in both

sexes (boys 25.7% vs. 11.6% and girls22.3% vs. 14.7%). For obesity, differences by migration background were markedly present in boys (9.5% immigrants vs. 0.8% in no migrants), but not in girls (3.6%in migrants vs. 3.4% in no migrants), see Table 33. (cf. Nagel et al. 2009). These observations are in line with other reports among children in 5-6 years (cf. Kalies et al. 2002; Kuepper-Nybelen et al. 2005; Rapp et al. 2005), and 7- to 10-year-old children in Germany (cf. Kurth et al.2007).

Table 33 - Overweight and obese in children

	Boys		Girls		Total	
	Number	Percent	Number	Percent	Number	Percent
Total	565		498		1,063[a]	
Overweight	93	16.5	86	17.3	179	16.8
Obesity	20	3.5	18	3.6	38	3.6
No migrants	362		327		689	
Overweight	42	11.6	48	14.7	90	13.1
Obesity	3	0.8*	11	3.4*	14	2.0
Migrants	148		139		287	
Overweight	38	25.7	31	22.3	69	24.0
Obesity	14	9.5	5	3.6	19	6.6

Remark: p<0.05; a Missing values occurred due to BMI and age*
This figure original from Nagel.G (et al.2009)

Parental questionnaire results: Parents' age and BMI did not show difference between boys and girls, but maternal and paternal overweight (OR=2.65, 95%CI=1.91–3.68 and/or=2.07, 95%CI=1.47-2.92, respectively) was associated with children's overweight. In particular, the relationship between maternal overweight and obesity of the children was strengthened (OR=7.26, 95%CI=3.40-15.52) (cf. Nagel et al. 2009), which is also in line with some previous research (cf. Kuepper-Nybelen et al. 2005; Müller et al 2001; Will et al. 2005). Children with migration background have a higher prevalence of overweight and obesity compare with children without migration background. Migration status is commonly associated with lower socioeconomic status (cf.Schenk et al. 2007), but Lange's study (et al. 2007) showed an inverse relationship between migration status and sports participation independent of household income or parental education, it could be due to different cultural values and attitudes towards sports. Van der Horst (et al. 2007) argued that parental support, such as transportation to training and competition, is a crucial component concerning children's sports participation. However, boys' birth weight (≥4,000 g) was more frequent than among girls (11.8% vs. 7.9%), more boys were born small for gestation (13.3% vs. 11.0%), and after gestation time below 37 weeks compared to girls (7.5% vs.6.4%), but none reached statistical significance, batboys were more often breastfed than girls two to four months. No obvious gender difference was observed for the exposure to tobacco smoking by the mother during pregnancy (cf. Nagel et al. 2009), maternal smoking during pregnancy is associated with overweight is in line with former publications (cf. Leary et al. 2006; Power et al. 2002; Rapp et al. 2005;Von Kries et al. 2002).

Children's current lifestyle: there is no statistically significant gender differences were observed for the consumption of sweetened beverages (≥3 drinks per week) and watching TV of more than one hour per weekday. Boys playing more video games than girls (weekdays 6.1 vs. 2.3, $p<0.05$; weekends 22.7 vs. 12.3, $p<0.05$); while girls participated less in club activities than boys (31.4 vs. 25.6, $p<0.05$) (cf. Nagel et al. 2009). Using multiple logistic regression as well as multivariate analysis of covariance (MANCOVA) to analysis, revealed that children who participate less than once a week in organized sports performed significantly worse than those who participate regularly. There were no differences between children participating once or twice per week in organized sports compared to those participating more often (cf. Drenowatz et al. 2013), which is match Saar and Jürimäe's argument that association between sports participation and fitness only in adolescents, but not in children.(cf. Saar et al. 2007). Nevertheless, it has been argued that participation in sports is one way to increase fitness and reduce body fat (cf.Michaud et al. 1999; Van Mechelen et al. 2000; Jago et al 2004; Zahner et al. 2006)

- Freiburg Intervention Trial for Obese children (FITOC)

Freiburg Intervention Trial for Obese Children (FITOC) is an interdisciplinary outpatient treatment program for obese children consisting of regular physical exercise and comprehensive dietary and behavioral education, parental involvement giving theoretical and practical information about nutrition, as well as background information about the psychological and physiological problems of obese children. 31 groups comprising 496 children, 229boyswith age of 10.6±1.5 year-old and267girls with age of 10.5±1.6 year-old, and 35 obese children aged 9.9±2.2 year-old. Anthropometrical measurements of body height and weight, fasting total-cholesterol (CH), low-density lipoprotein-cholesterol(LDL-C), high-density lipoprotein-cholesterol (HDL-C),physical performance with a standard bicycle ergo meter (Lode, Groningen, The Netherlands) using a typical test protocol starting at50Wand increasing the work load by 25Wevery three minutes until exhaustion. Thirteen Heart rate and lactate concentration were also recorded every three minutes. It also provided one sports program, which carried out in a Freiburg sports center and consisted of three sessions per week. Each session has one hour, it began with ten minutes of endurance training followed by psychometric activities and exercises to improve coordination, flexibility, strength and speed performance capacity.

Korsten-Reck(et al.2005)based on the national reference data for German children(cf. Kromeyer-Hauschild et al. 2001), using the LMS method from Cole (cf.et al. 1992), calculated individual BMI-values convert into Z-scores, which named SDscores:$SDS=[(X/M(t)^{L(t)}- 1)/L(t)S(t)$ to evaluate. After eight months intervention, average BMI, BMI-SDS of all subjects decreased significantly in the intervention group, CH, LDL-C decreased while HDL-C tended to increase, and physical performance had improved as well. But in the control group, BMI increased and BMI-SDS remained constant, CH, LDL-C and HDL-C had no significant changes, see the Table 34.

Table 34 - The intervention results for intervention group and control group

	Intervention group						Control group					
	Initial examination			Follow-up examination[a]			Initial examination			Follow-up examination[b]		
	N	Mean	s.d.	Mean	s.d.	P-value*	N	Mean	s.d.	Mean	s.d.	P-value*
BMI(kg/m^2)	446	25.5	3.3	25.0	3.5	<0.001	35	26.5	5.4	27.6	6.0	<0.001
BMI-SDS	446	2.08	0.51	1.86	0.59	<0.001	35	2.30	0.71	2.30	0.74	0.861
CH(mg/dl)	405	179.9	33.7	176.1	30.7	<0.001	11	167.6	26.5	178.8	19.4	0.108
LDL-C(mg/dl)	422	106.0	28.9	100.2	25.8	<0.001	15	90.2	20.6	92.7	20.6	0.581
HDL-C(mg/dl)	419	47.8	11.3	48.5	12.0	0.183	16	58.4	19.7	54.5	12.5	0.553
Watt/kg	411	1.9	0.4	2.2	0.5	<0.001	16	2.2	0.5	2.4	0.6	0.284

*Remark: BMI-SDS=BMI deviation scores; CH=total cholesterol; LDL-C=low-density lipoprotein-cholesterol; HDL-C, high-density lipoprotein-cholesterol; Watt/kg, W/kg body weight. *Differences between examinations; t-test for dependent samples. [a]Examination after intensive phase (8.5 ±1.2 months). [b]Examination after 9.2 ±5.9months.*

Kreuser (et al. 2013) based on weight status (BMI-SDS) and accelerometer-based motion sensor to assess the activity parameters, see Table 35.There are three parts, part a is daily activity which calculated by minute, differences were significant (U-Test)between weight classes (**means P<0.001, *means P<0.05); part b is screen-time which calculated by more than 60min/day in percent (%) for television (TV), computer (PC), and computer games (Games), differences were significant (Chi-square test) between weight classes (**means P<0.001, *means P<0.05); part c is spare time activity, homework more than 60 min/day, sports club membership, more than three sports club sessions per week, outdoor sports more than six times/week, differences were significant (Chi-square test) between weight classes (**means P<0.001, *means P<0.05).

Table 35 - PA between nonoverweight and overweight

Total	Nonoverweight			Overweight		
N=92	N=37			N=55		
Activity [a](min)	Weekday		Weekend	Weekday		Weekend
Passive time	329.5(274;383)**		349.7(299;399)	400.5(362;441)		390.7(307;468)
Active time	510.5(445;540)**		490.3(441;540)	439.5(399;478)		449.2(372;533)
Activity levels(min)						
Rest	327(274;383)**		341.0(287;401)*	417.2(265;468)		390.0(298;457)
Low	270.5(236;300)**		252.2(202;284)	244.6(210;275)		243.7(214;284)
Moderate	155.5(134;193)**		168.5(134;196)	129.3(99;150)		144.2(105;194)
High	67.3(42;102)		69.3(42;99)*	44.2(26;76)		51.0(28;81)
Screen-Time hours[b]	Weekday		Weekend	Weekday		Weekend
TV (>60 min/day)	38.24%*		58.82%*	80%		85.29%
PC (>60 min/day)	2.94% **		2.94%**	37.14%		40%
Games(>60 min/day)	0%**		2.94%**	23.53%		44.12%
Spare-Time activity [c]						
Homework (>60 min/day)	11.76%*			35.48%		
Sport club member	70.59%			57.58%		
Sport club (>3days/week)	28.0%*			0%		
Outdoor sports (>3days/week)	47.06%*			28.13%		

Remark: origin from Kreuser (et al. 2013)

The study shows a significant association between weight status (BMI-SDS) and activity parameters as well as spare time behaviors. The nonoverweight children are significantly more active and less passive than overweight children, overweight is

correlated with passive time is consistent with several studies on children (cf. Katzmarzyk et al.2009; Owen et al.2010; Vandelanotte et al. 2009; Levine et al. 2000;Bornstein et al. 2011). Overweight children and adolescent consuming more time on TV (weekdays 38.24% vs. 80%; weekend 58.82% vs. 85.29%), PC (weekdays 2.94% vs. 37.14%; weekend 2.94% vs. 40%) and games (weekdays 0% vs. 23.53%; weekend 2.94% vs. 44.12%). All these screen time entertainment would accelerate sedentary behavior (cf. Purslow et al. Janz et al.)

- The Kiel Obesity Prevention Study(KOPS)

The Kiel Obesity Prevention Study (KOPS) was startedin 1996 as a cross-sectional as well as longitudinal 8-yearfollow-up study in northwest Germany Kiel city. There are2440 5- to 7-year-old children was recruited and a full data set was obtained from 1640 children. The intention of KOPS was to investigate the determinants of childhood overweight assessment of the nutritional state by anthropometric methods as well as bioelectrical impedance measurements (cf. Mast et al. 1998).It included dietary assessment by a standardized food frequency questionnaire(cf. Mast et al. 1998), assessment of physical activity and social state by different questionnaires(cf.Müller et al. 1998; 1999; Langnäse et al. 2000), risk factors (blood pressure, blood glucose, cholesterol, triglycerides by standard procedures) and resting as well as 24 hour energy expenditure, physical activity, muscle strength and physical fitness in a subgroup of children (cf.Grund et al.1999; 2000)

The parameters from Danielzik (et al. 2005; 2006) see Table 36. There is a significant difference in BMI after four years intervention in both gender, the prevalence of overweight including obesity was 12.8 and17.6% according to 90th percentile of BMI (cf. Kromeyer-Hauschild et al. 2001) and 23 and39% according to 90th percentile of TSF (cf. Reinken et al.1998) in 5-7 and 9-11-year-old children in the KOPS cohorts T0 and T1, respectively. Girls were more often overweight when compared with boys according to WC (SDS>1.3) (cf. Fredriks et al .2005). The effect of intervention on the 4-year increase of overweight was stronger in girls with definition of WC. In nutritional status using the German BMI percentiles (cutoffs: 97th, 90th and 10th percentile) to classify (cf. Kromeyer-Hauschild et al 2001). The increase in the prevalence of overweight from 5-7 to9-11-year-old resulted from a high persistence and incidence. The4-year follow-up data show that 77.4% of children who were overweight at the age of 5-7 y remain overweight at the age of 10-11-year-old. The spontaneous incidence and remission of overweight are 7.9 and 5.3% per year, respectively. Socioeconomic status according to characteristics of districts in Kiel (rates of unemployment, non-German people and social benefits), girls and children from high SES more profit by the intervention than boys and children from low SES, middle and high class as well as intact families were able to benefit better from treatment than families sharing other characteristics (cf. Epstein et al. 1990), so a better school education and social support should be include in healthy promotion.

Table 36 - The results of nonintervention and intervention in boys and girls

	Boys				Girls			
	T0-NI	T0-I	T1-NI	T1-I	T0-NI	T0-I	T1-NI	T1-I
Physical condition								
Age(y)	6.3*	6.3	10.1	10.1	6.2	6.2	10.1	10.0
BMI(kg/m^2)	16.0	15.8	17.9	17.7*	15.9	15.8	18.1	17.8*
TSF(mm)	19.3	23.1	41.1	38.7	21.0	25.7	43.2	36.8
WC(cm)	16.7	15.6	25.9	23.7	20.2	22.4	29.1	24.1
Nutritional status (%)								
Obesity	6.1*	3.7*	6.1*	4.5*	5.5	4.4	6.4	5.2*
Overweight	6.4	5.5	11.7	10.3	7.7	6.8	10.9	8.9
Normal	81.8	83.5	75.7	78.7*	79.7	82.1	76.0	79.3
Underweight	6.8	7.4	6.5	6.5	7.2	6.8	6.6	6.6
Socioeconomic status (%)								
Low SES	47.9	44.4	41.6*	36.7*	45.6	39.5*	42.6	38.0*
Middle SES	20.4	20.8	23.7	23.9	21.0	22.9*	24.1	24.4
High SES	31.6	34.8	34.7*	39.4*	33.3*	37.5*	33.3	37.6*

Remark: T0-NI: non intervention in T0; T0-I: intervention in T0; T1-NI: non intervention in T1; T1-I: intervention in T1;: significantly different from total population; Bold indicates P<0.05.*

Danielzik (et al. 2004) also considered univariately, family-, environment- and development-related determinants showed some relations to childhood overweight and obesity as well as health-related behaviors and parental fatness had a strong influence on childhood overweight, the overweight families of low SES have the highest risk of overweight and obese children.

Landsberg (et al. 2008) measured body mass index (BMI), fat mass (FM), distance to school as well as self-reported modes and duration of commuting to school, time spent in structured and unstructured physical activities (PAs), media use, nutrition, alcohol consumption and smoking, shows the linking active commuting plus distance to school and parameters of adiposity in adolescents, increasing walking or cycling distance results in decreasing fat mass (FM),everyday need to get to and from school may enhance adolescents' overall PA.

Müller (et al. 2001) observed considerable changes in health-related behaviors within 1 year after combined "school-based" and "family-based" interventions, and he found improvement of health-related behaviors had significant effects on the age dependent increases in median triceps skin folds of the whole group (from 10.9 to 11.3mm in "intervention schools" vs. from 10.7to 13.0mm in "control schools", P <0.01) as well as in percentage fat mass of overweight children (increase by 3.6 vs. 0.4% per year without and with intervention, respectively; P <0.05).

2.3 German Nutrition and Diet Report

Süddeutsche Zeitung reported, beer drinking and butter bread eating made German are the fattest in Europe, age from 18 to 80 year-old, two in three male and one in two female are overweight (cf. Süddeutsche Zeitung. 2007). So how the German diet like, here are some researches about the nutrition and diet.

- Dortmund Nutritional and Anthropometric Longitudinally Designed Study (DONALD) study

The Dortmund Nutritional and Anthropometric Longitudinally Designed Study(DONALD) Study is a longitudinal (open cohort)study, since 1985 it collecting detailed data on diet, growth, development and metabolism between infancy and adulthood. Per annum, about 40 infants are recruited and first examined at the age of three, six, nine, twelve, 18, 24 months and then annually until young adulthood, comprise anthropometry, a three day weighed dietary record, a 24-hour urine sample (from age three to four years onwards), medical examinations and parental interviews. Since 2005, participants are invited for follow-up visits during adulthood (including fasting blood samples). Approximately 1,400 children have been recruited into the study up to 2010 (cf. Kroke et al. 2004; Buyken et al.). The Figure 36 about the assessment of DONALD study, Breakfast report by Ute Alexy (et al.2009).

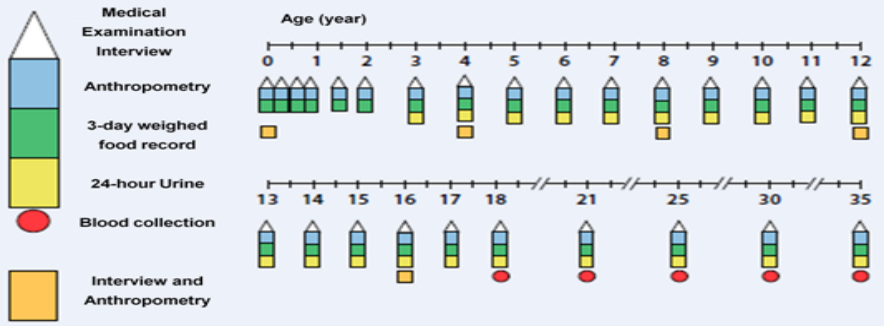


Figure 36 - Assessment of DONALDS study

From 1986 to 2007, the dietary record with three weekdays show that, 75% eat the breakfast on all three days, 11% eat on two days, 7% eat on one day and 7% skip all three days breakfast. Children and adolescents' breakfast habit changed but with the same trend, especially from 1991 to 2003, all age groups' regular breakfast decreased, but the decrease significance found only in 6-12-year-old group and 13-18-year-old group (p=0.0084 and 0.0350, respectively), not in younger group, old age more skip of the breakfast (see Figure 37).

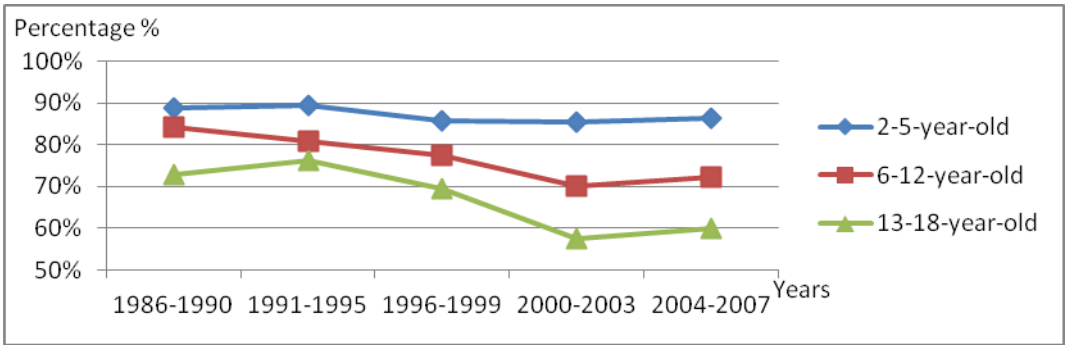


Figure 37 - The regular breakfast report by different age group from 1986-2007

Overall, breakfast type bread meals takes 62%, ready-to-eat cereal (RTEC) takes 21%, both bread and RTEC takes 4%, neither bread nor RTEC takes 12%, and 1% only take beverages. The breakfast changed significantly with age ($P<0.0001$). The percentage of bread meals remained fairly constant, but RTEC meals nearly doubled from the

youngest to the oldest age group, see Figure 38, and the carbohydrates consuming report by Guo Cheng (et al. 2010).The time trends were significant (P<0.0001) for breakfast type, as the percentage of bread meals decreased (1986-1990 is 67.1%, 2004-2007 is 59.8%, respectively), but the percentage of RTEC meals increased (1986-1990 is 16.9%, 2004-2007 is 21.5%, respectively). Among the breakfast, only 24% of bread or RTEC meals included fruit/vegetables and dairy; 74% of bread meals, but 99% of RTEC contained dairy; fruit/vegetables were eaten at 32% of bread meals and 37%of RTEC meals; beverages were consumed at 39% of bread meals, but only 29% of RTEC meals. Accordance with food-based guidelines (cf. Timlin et al. 2008; Matthys et al. 2007; Giovannini et al. 2008), was low intake of fruit/vegetables in general and dairy in bread meals.

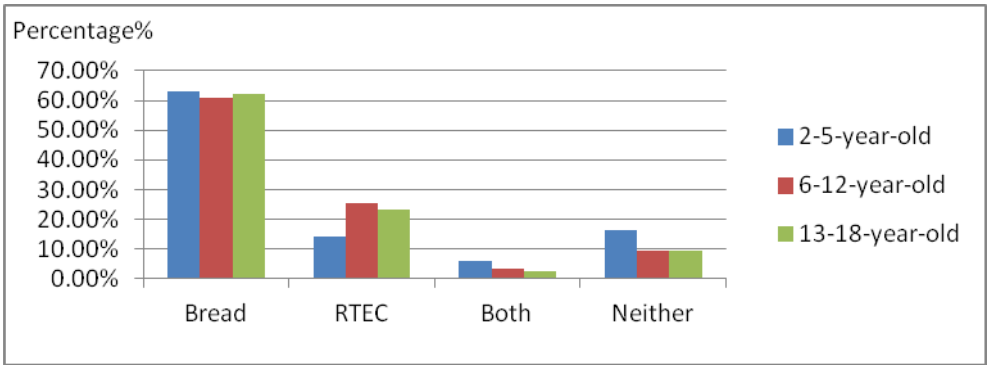


Figure 38 - The breakfast type for each age group

Compare these two time period, see Figure 39. The carbohydrates consuming increased notably in both gender, since the increasing of energy intake, the absolute intakes of all measures describing carbohydrates intake also increased during puberty apart from the intakes of whole grain and added sugar from sweets. With respect to relative measures of carbohydrates intake, glycaemic load and the percentage of energy from other sources increased throughout puberty, while energy from whole grain, fiber and added sugar from sweets decreased in boys, but still with an upward secular trend in added sugar intake, amounting to 3% more energy intake in ten years, the higher consumption of added sugar is associated with a decrease in micronutrient density in children and teenagers (cf. Joyce et al. 2008). The relative measures of carbohydrates intake, energy from whole grain, fiber and added sugar from beverages and sweets decreased in girls, it not pronounced an adverse secular trends, girls are greater relevant with healthy eating and to make healthier food choices,e.g. they consume more fiber and less fat (cf. Wardle et al. 2004).

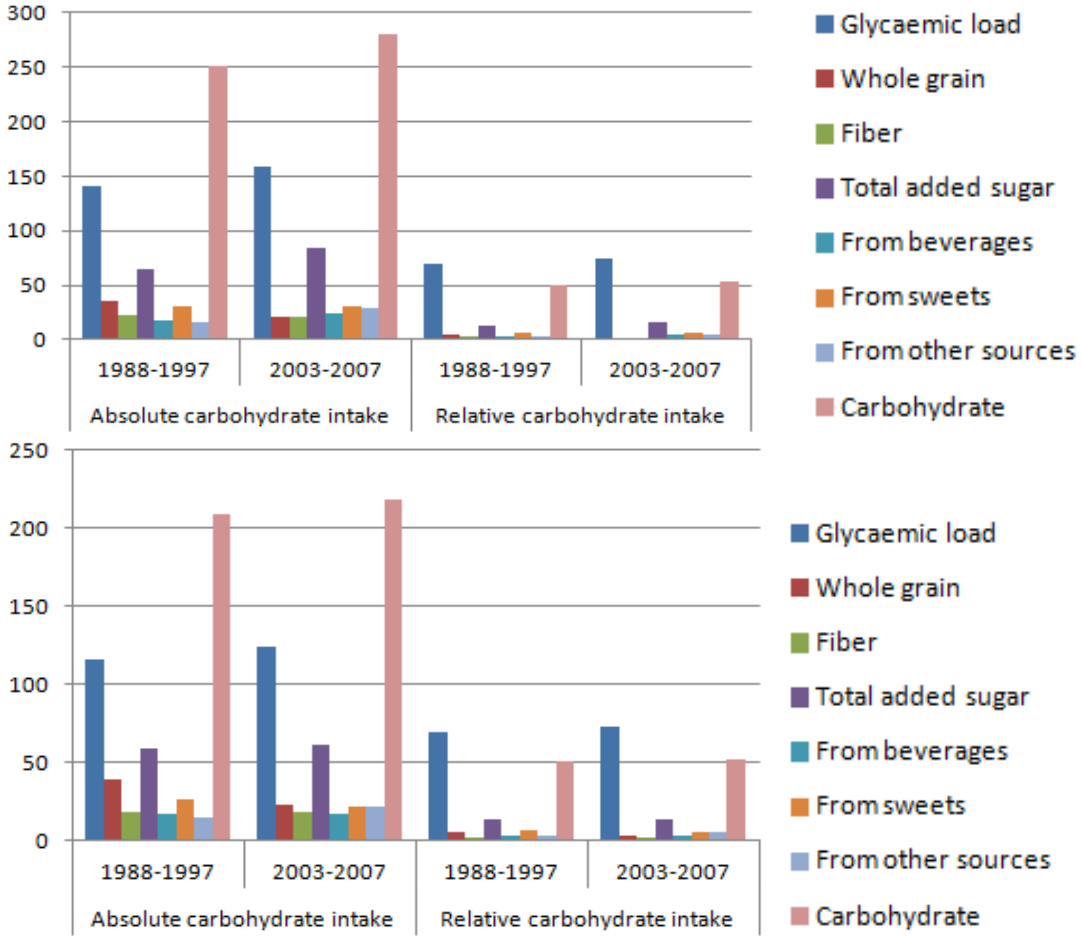


Figure 39 - Dietary characteristics for boys(up) and girls (down)

Wholegrain consumption by Ute Alexy (et al. 2010)

The definition of whole grain followed the Whole GrainLabel Statements of the US Food and Drug Administration (Food Labeling and Standards Staff, 2006). The whole grain food classified into bread; ready-to-eat-cereals (RTECs); grain; mueslis; pasta, rice; and cake, see Figure 40. Out of all the food groups, muesli had the highest wholegrain density, followed by bread and grain. The whole grain of bread decreased significantly with age in both gender, and time trends and gender differences were not significant, but boys 'intake was higher than girls. Non-bread grain intake also increased significantly with age and time, especially RTECs and cake, also in line with the trend towards RTECs being the main contributor of whole grain at the expense of bread (cf. Thaneet al. 2007).

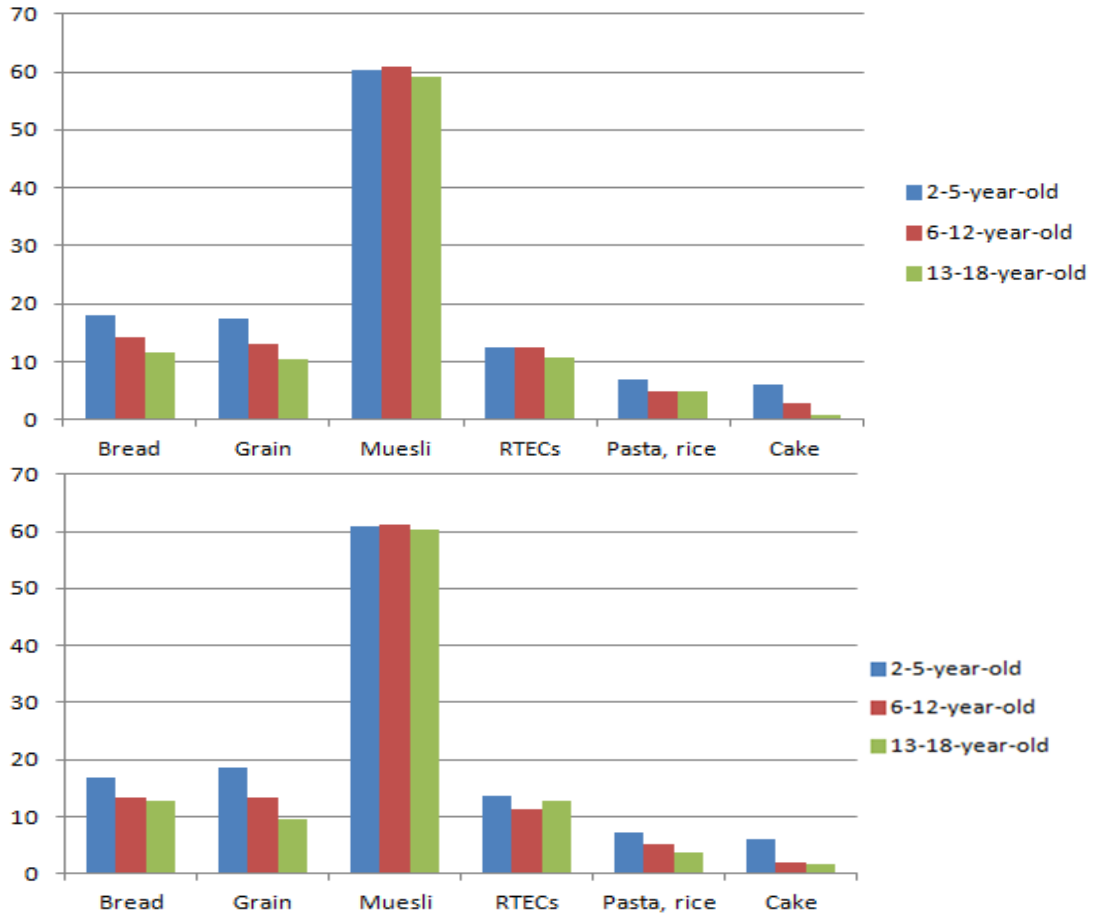


Figure 40 - Whole-grain density for different age group boys (up) and girls(down) (g/day)

The German food based dietary guidelines (FBDG) recommend between 120 g grain per day for 2-3 year old sand 350 g for 15- to 18-year-old males. In this study, Total grain intake corresponded well with the German FBDG for children and adolescents, especially in the younger age groups (cf. Kersting et al. 2005), but whole-grain intake(g/day) remained stable during the 10-year study period. This means a decrease in whole-grain density (cf. Alexyet al. 2002; Fletcher et al. 2004; Stahl et al. 2009).

Iodine intake by Simone A. Johner (et al. 2011)
24-h urinary iodine excretions (UIE) (μg/d) and concentration (μg/l) were significantly lower in girls than in boys ($P<0.0005$). However, when corrected for individualenergy intake (which was higher in boys), statistical differences disappeared ($P=0.13$). Urinary iodine concentration significantly decreased from 2004-2006 to 2007-2009 ($P<0.0005$) and fell below the WHO (2007) recommendation of 100μg/l in the second time period 2007-2009, see Figure 41.

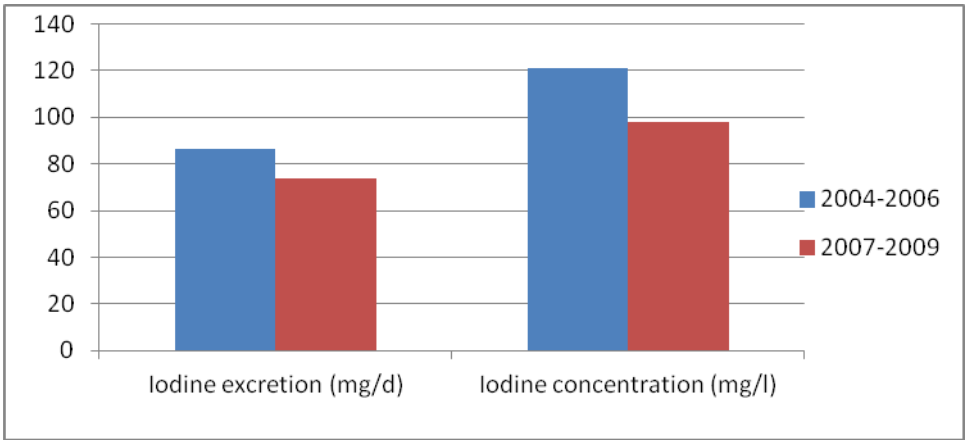


Figure 41 - The iodine excretion and iodine concentration data

Compare with boys, girls show significant lower iodine concentrations, disappeared when relating24-h UIE to energy intake. The sex differences in iodine concentration can be explained by the frequently more favorable beverage intake of German girls compared to boys (cf.Ebner et al. 2002). The lower 24-h UIE in girls is physiologically based on their lower total food and energy intake on average, which cane accounted for by considering individual energy intake.

Viewing the food group, salt, milkfish and egg intake (g/d) were significant predictors of UIE ($P<0.005$); and the main sources of iodine were salt and milk (48% and 38 %, respectively). But in Germany, since 2004 the market shares pertaining to the use of iodised salt in industrial food production have decreased from 35% in2004 (cf.Scriba et al. 2007) to 29% currently (cf. Arbeitskreis Jodmangel. 2008; Gärtner. 2009).Besides a decreased use of iodised salt in the previous years, low fish consumption in Germany, its quantitative contribution to lower iodine supply (3%). A strong increase in the iodine content of milk and milk products from 1996 to 2003, but still lower in iodine concentrations (100-120μg/l) (cf. Hampel et al. 2009; Anonymous. 2007), see Figure 42.

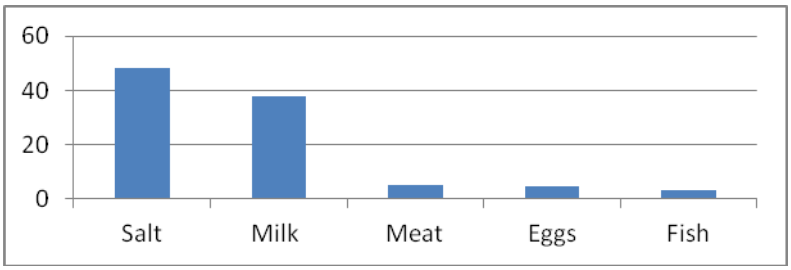


Figure 42 - Percentage contribution of food group of urinary iodine excretion

- South-west GermanyBaden-Württemberg (Stuttgart) study

Maier (et al.2013) approved by the ethiscs committee of the “Landesärztekammer Baden-Württemberg (Stuttgart, Germany)” study on 5-8-year-old children’s dietary pattern and leisure time activity between normal weight and overweight children, it includes 100 overweight ((57 girls and 43 boys) and 51 normal weight children (24 girls and 27 boys) from 117 primary schools since April 2009 to December 2010 (http://www.clinicaltrials.gov). We can see the dietary pattern between normal weight and overweight children (Figure 43), the intake of food classify into following

12 different food groups: fruits, vegetables, meat and sausages, fish, pasta and rice and potato, bread and cereals, fat, cheese, milk, eggs, sweets, others. Compare the overweight and normal weight children, we cannot see the difference from the diet pattern, this is also reported by Ortega (et al. 1995) that intake between overweight and normal weight adolescents did not differ, whereas in the studies of Hassapidou (et al. 2006) and Rocandio (et al. 2001), total energy intake of normal weight adolescents was even higher than that of overweight study participants. In Maier's study, the intake of sweets was markedly higher in normal weight children than in overweight or obese children, this is also in line with the results of a meta-analysis of studies performed in 34 different countries, that normal weight children quite frequently eat more sweets than overweight children (cf. Janssen et al. 2005). Conversely, intake of different food groups e.g. vegetables and fruits as well as meat intake of children in general did not meet the recommendations of the German research institute for nutrition of children (FKE)(cf. Alexy et al. 2008), that match with the results of Ortega (et al. 1995) and Kersting (et al. 2004) as well. Sex-specific differences in dietary pattern is that, boys 'total energy and macronutrient intake were markedly higher than in girls, despite only slight differences in weight status, they consumed markedly more cheese while girls, in general, ate more vegetables (cf.Sichert-Hellert et al.1998; Briefel et al. 1995).

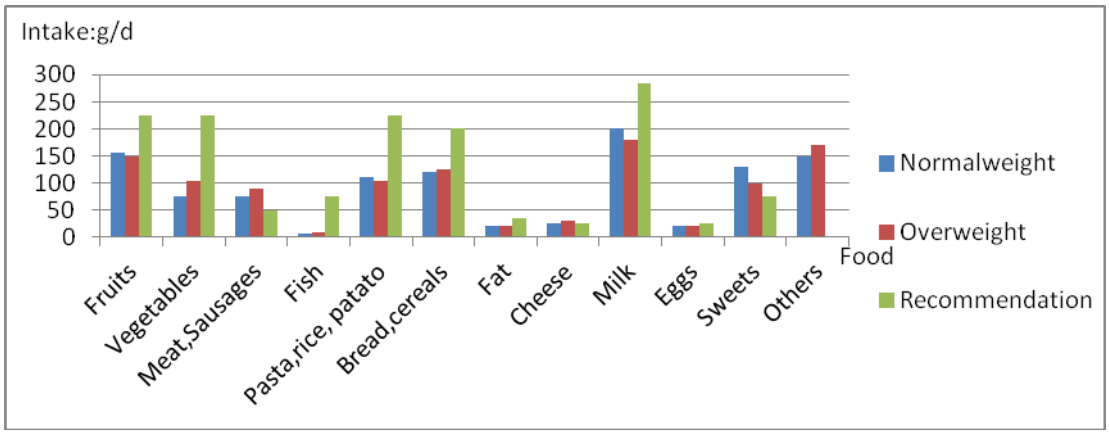


Figure 43 - The diet pattern in Marie study

- South Germany (Munich) study

Pei's (et al. 2014) study based on German Infant Nutritional Intervention Plus Environmental and Genetic Influences on Allergy Development (GINIplus)(cf. von Berg et al. 2013)and Influences of Lifestyle-Related Factors on the Immune System and the Development of Allergies in Childhood PlusAir Pollution and Genetics(LISAplus) (cf.Heinrich et al. 2002).GINIplus with 5,991 newborns from Munich and Wesel between September 1995 and July 1998, and LISAplus with 3,097 neonates fromMunich,Leipzig, Wesel and Bad Honnefbetween November 1997 and January 1999. After ten years follow up, there are still 2,565 children involved. Here is the distribution of food intake as well as median energy consuming (Figure 44), the definition of food group according to the codex general standard for food additive food category system (cf. Food and Agriculture Organization of the United Nations. 2012). In meat and fish intake and BMI correlation: BMI z-scores of overweight

children have strongly associated with fat-free mass than fat mass. In contrast, whereas normal children are BMI z-scores were more strongly associated with fat mass than fat-free mass (cf. Freedman et al. 2005). Because of high protein in meat and fish, consuming more animal protein will show positive association in fat-free mass, this is in line with the KiGGS study (cf.Kleiser et al. 2009), DONALD study (cf.Assmann et al. 2013) and some other trail in children and adolescent (cf.Neumann et al. 2013; Albala et al. 2008; Bray et al. 2012). Bakery products also have strong association with BMI, as bakery products are energy-dense, high-fat, low-fiber (cf.Cribb et al. 2011; Ambrosini et al. 2012), belong to medium-to-high glycemic index categories (cf. Atkinson et al 2008; Martinez et al. 2011)

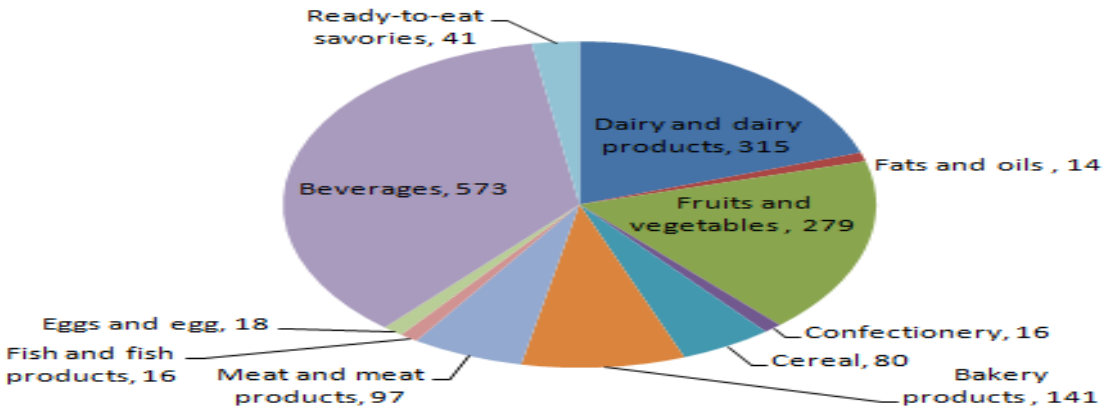


Figure 44 - The distribution of food intake as well as median energy consuming (g/day)

Conclusion: The prevalence of overweight and obesity among children and adolescents in industrialized countries has increased dramatically throughout the last three decades (cf. Maier et al. 2013), Germany is one of these countries. Diet pattern contribute to the nutrition and energy intake, physical activity contribution to the fitness and energy expenditure. Accordingly, most German researches are more considering the imbalance of energy intake and expenditure in overweight children and adolescents, because childhood obesity often persists into adulthood and can substantially decrease quality of life (cf. Mitchell et al. 2011), increase the risk of metabolic syndrome and adult morbidities (cf. Lloyd et al. 2012; Biro et al. 2010), and be a heavy financial burden on the public health system (cf. Breitfelder et al. 2011). Among these researches, it has several different types of models: standard multivariate model (e.g. DONALDS study); residual nutrient model (e.g. Stuttgart study); multivariate nutrient density model (e.g. Munich study); the results of these models can and have been interpreted using different perspectives.

2.4 German Media and Screen Time Report

Children's sedentary time is associated with more time spent consuming media, such as watching television (TV), computer (PC) use, and playing computer games. And all these screen time are contribute to sedentary behavior and involves a low fitness level and negative health outcomes (cf. Hancox et al.2004;Viner et al. 2005; Pardee et al.2007; Vicente-Rodríguez et al. 2008). Sedentary periods of more than 9 h/per day

are also declared as a chronic disease risk factor, independently of the activity time (cf. Owen et al. 2010). But with the development of new technology, more and more new electronic device into modern life, even more and more curriculum by means of modern media technology, so children access to the media earlier and earlier. In Germany, the equipment with media devices in households where young people grow up is very high. Largely are everywhere at least one cell phone, a computer or laptop, TV and internet access available. The households media device 2013 and 2014 show us that Figure 45) almost 100% households have mobilephone and computer/laptop, nine out of ten have a digital camera or a radio set, about four-fifths of an MP3 player or a smartphone. Console games are available in every three out of four families, DVD player and DVD recorder over 50 percent families owned. Compare the year 2013 and 2014, more families purchase new household instruments in year, especially these new mobile devices.

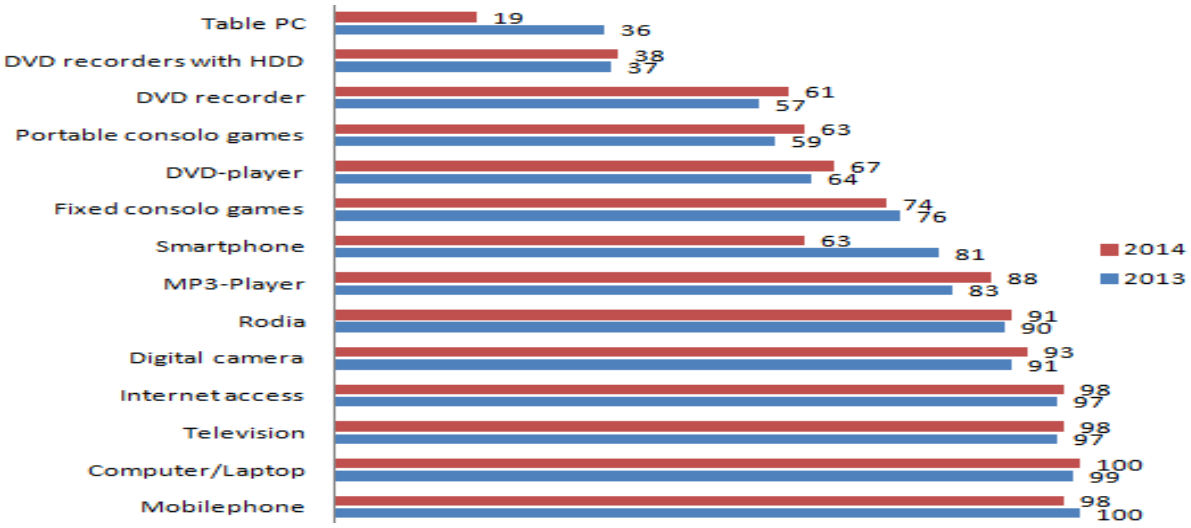


Figure 45 - Household instruments 2013 vs. 2014

Remark: this figure origin from JIM study (2013).

- Jugend, Information, (Multi-) Media (JIM) study

The Media Education Southwest Research Association (MPFS), since 1998 to 2013, 15 years continuously representative the data of series study "Youth, Information, (Multi-) Media" (JIM) to report the youth (age between 12- and 19-year-old) how to deal with radio, television, books and smart phones, as well as for use of the Internet and computer and console games in daily life. JIM study 2013, from 27.05 to 07.07, 1200 representative sample (boys 51% and girls 49%)of approximately 6.5 million young people in the Federal Republic of Germany were interviewed by telephone, among them, 12-13-year-old account for 24%; 14-15-year-old account for 25%; 16-17-year-old account for 25%; 18-19-year-old account for 25%. The report includes radio, book and read, TV, computer and internet, Online-Communities, console games, cellphone consuming.

JIM study reported the ownership about the young people themselves with the electronic devices, Figure 46. We can see the German young people is the most widely media device users, especially mobilephone, and nowadays the multifunction of mobilephone, so young people prefer mobilephone more than other single devices. While differ in gender, boys more prefer console games (boys: 56%, girls: 35%) whereas girls into digital cameras (girls: 67%, boys: 37%). Also has age difference, computer user (12-13 years: 63%, 18-19 years: 91%), Internet surf (12-13 years: 79%, 18-19 years:94%), smartphone own (12-13 years: 57%, 18-19 years: 80%) and TV watch (12-13 years: 45%, 18-19 years: 63%), it is a significant increase by age, we guess, this could be more relative with the spread social network by age (cf. JIM study 2013).

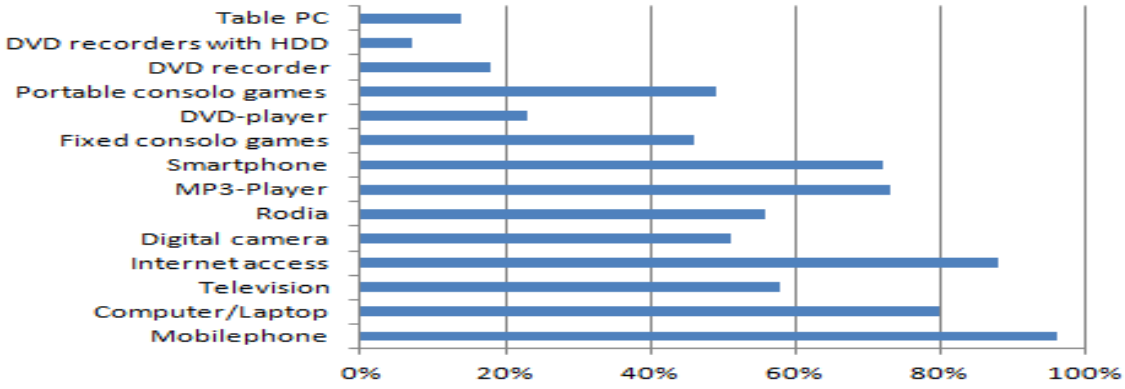


Figure 46 - The ownership of media instruments in young people

Remark: this figure origin from JIM study (2013).

The investigation of 2013 in JIM study shows the percentage of media use, see Figure 47. Cellphone with 81 percent in the first place. Followed in second place is Internet with three quarters daily pastime. With about three-fifths spend time on TV, radio and the use of MP3 files as solid everyday repertoire of adolescents. Almost every fourth person is daily readers of books or newspapers. Music play for young people always had a central role, round four of five teenagers at least several times a week radio or MP3 files. Sound recordings such as CDs are 54 percent regularly used only by every second youth. Approximately every second between 12- to 19-year-old youth regularly photographed with a digital camera. Reading is still important for German, with the same percentage as daily newspaper reading. But E-Books have not yet arrived in everyday life only four percent of adolescents would regular read electronic books (cf. JIM study 2013).

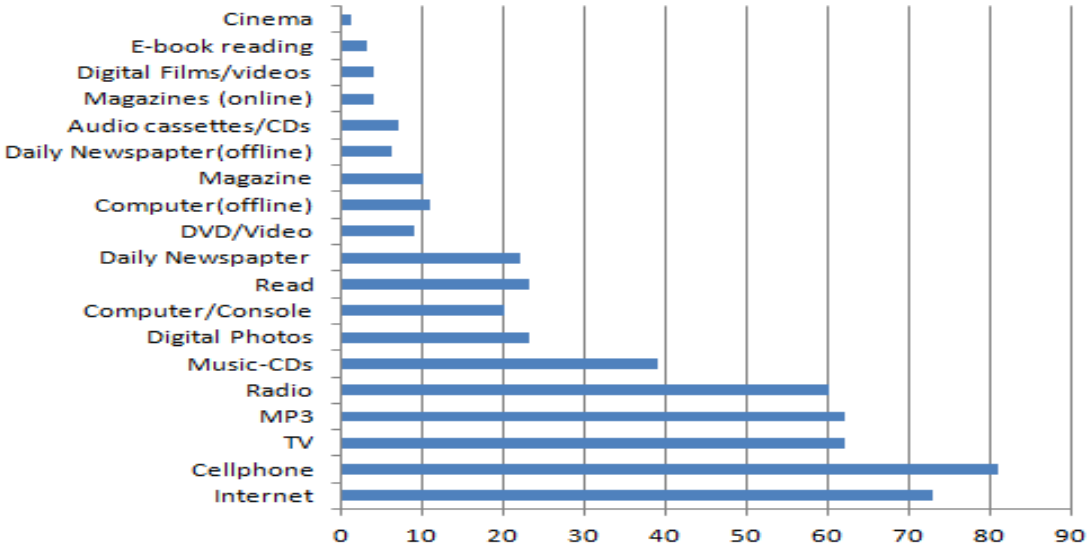


Figure 47 - The percentage of media use in free time (%)

Remark: this Figure origin from JIM study (2013).

Television consuming

TV is not a fashion device in life any more, and in Germany since 2011 to 2013, the average time on TV is very stable in weekdays, in JIM study group, 12-13-year-old spend 113 minutes, 14-15-year-old spend 112 minutes, 16-17-year-old spend 109 minutes,18-19-year-old spend 112 minutes. Girls and young women appreciate the duration of their daily TV consumption with 116 minutes, a little higher than boys and young men (107 minutes).While watching TV there are 57 percent eat or drink, so TV consuming not only without energy expenditure but with the energy intake, it is the most risk factor for overweight and obesity (cf. JIM study 2013).

Online behavior

Compare with TV consuming, German youth since 2006 to 2013, the average online time in weekdays are increasing, see Table 37, this could be the sharp increase dissemination of smartphones that provides more opportunities to access the Internet, offer much more than conventional phones.

Table 37 - Average time on internet in weekdays from 2006 to 2013 (Minute)

2006	2007	2008	2009	2010	2011	2012	2013
99	106	117	134	138	134	131	179

What do the youth do on the internet, according to four categories: "Communication" - such as email, chat or online communities summarized; "Entertainment"- music, pictures or videos; "Information" - search for information on the Internet; "games". Regardless of the age, communication is the main activity for them, 12-13-year-old takes 41%, 14-15-year-oldtakes 46%, 16-17-year-old takes 48%,and 18-19-year-old takes 44%.Three-quarters of young people regularly visit social networks; half of them exchanges with frequency emails; one-thirds in special chat; 28 percent exchange (immediate) News via "Skype"; eleven Percent regularly

use Bild telefonie; 15 percent via games platforms chat with instant messenger, especially in boys. With regard to the gender, girls with 53 percent significantly larger than boys (39%) online communication (cf. JIM study 2013).

Compare with the above online entertainment behavior, students spend 48 minutes on homework with computers or the Internet for school, with increasing age the time on computer for schoolwork or learning also rising (12-13 years: 39 minutes; 14-15 years: minutes; 16-17 years: minutes; 18-19 years: minutes).Actually, concrete substantive work need with computer performed much less frequently, only 22 percent regularly write texts for school, 15 percent use computers and the Internet at home in more mathematical contexts to perform calculations. Though computer homework along with the age also increase, still a small part in life (cf. JIM study 2013).

Mobilephone or Smartphone use

For several years, most young people are equipped with mobile phones. Currently have a total of 96 percent of a mobile phone. Youth in age12- to 13-year-old own rate reached 92 percent, from 14-year-old almost everyone has private mobile phone (14-15-year-old: 97%, 16-17-year-old: year: 98%, 18-19-year-old: 98%). Moreover, it has been very common own a smart phone in the generation after 1990th.

With the significant growth in smartphone ownership is also a larger distribution mobile access to the Internet along. Youth more prefer mobilephone with internet function see Table 38. It shows obvious age feature, older age more rely on internet, because they will install more Apps with specific functions, the most popular Messenger-App in Germany is “WhatsApp”, which can one year free use, (http://allthingsd.com/20130806/the-quiet-mobile-giant-with-300m-active-users-whatsapp-addsvoice/) and nearly 70 percentage youth have it as communication tool with messenger texting, voice message sending and photos sharing.

Table 38 - Mobilephone function between age group

	12-13-year-old	14-15-year-old	16-17-year-old	18-19-year-old
With IE (%)	78	91	92	92
Without IE (%)	41	62	67	69
APPs (N)	16	20	19	21

What do the youth do with mobilephone, here is the Figure 48 show us that, the basic function receive calls/call and SMS send still the main function, music still very important for youth (71%), and online work with mobilephone became normal. Compare year 2012 and 2013, the internet function increase more, Internet surf 2012 vs. 2013 is 40% vs. 65%, online communities 2012 vs. 2013 is 40% vs. 62%, Internet video 2012 vs. 2013 is 20% vs. 43%, E-mail check 2012 vs. 2013 is 19% vs. 31%, photo/film send 2012 vs. 2013 is 12% vs. 31%,most of these functions increased 20%, which means online work with mobilephone getting more and more popular among youth (cf. JIM study 2013).

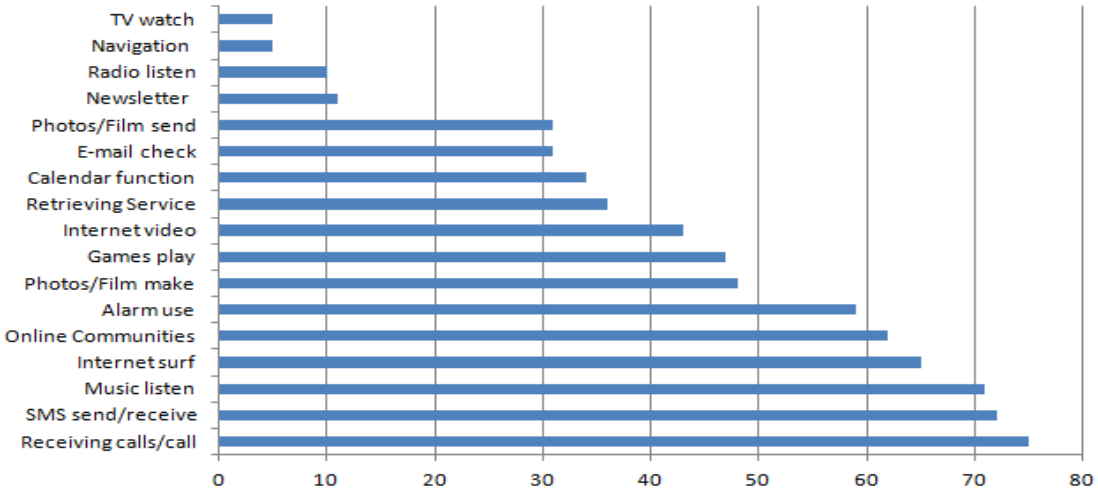


Figure 48 - Percentage of various mobilephone functions use

Remark: this Figure origin from JIM study (2013).

JIM study is a very comprehensive research, yearly reported the German youth media behavior, to understand the trends in youth media consumption, and figure out the youth internet problems and offer help, it is very important for the health development of youth. Meanwhile, in 2012, the 337th culture minister meeting (cf. Kultusministerkonferenz. 2012) declared “media education at school as mandatory task of school education and the sustainable schools and teachers to provide orientation for the media education in education and teaching, the didactic and methodological teaching way should be implement in new media education " (cf.Kultusministerkonferenz.2012). So another study named “Kinder+Medien, Computer+Internet (KIM)” study had reported children’s media, computer and internet behavior.

- Kinder+Medien,Computer+Internet KIM study

Kinder+Medien, Computer+Internet (children+media, computer+internet) KIM study have documented the media behavior of 6- to 13-year-old children in Germany since 1999.It provides answers of media use of children in Germany. The results confirm the complexity and dynamics of the subject media and speak of the need for "holistic [n], networked [n] strategy for the sustainable promotion of media literacy in the school" (cf.Kultusministerkonferenz.2012).

Since the media unmistakably an integral part of our society and therefore also are already enshrined in the daily lives of children, especially “Media Education at school" policy in 2012 bring this internet age generation into digital life. From the Figure 49 we can see the higher media coverage in German family, children are very easily equipped with mobilephone, CD, TV set, computer and internet at home.

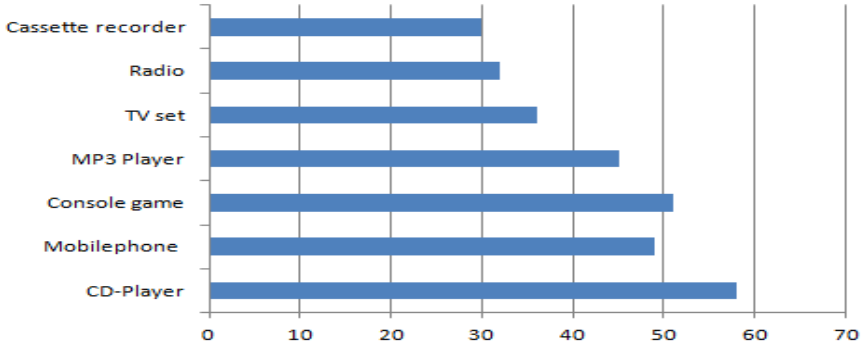


Figure 49 - The percentage of various device ownership

Remark: this figure data origin from KIM study (2012).

Television is still the most dominant media among kids and there is little evidence that there will be a fundamental change in the foreseeable future. 99.9 percent of 6- to 13-year-oldchildren watch television (almost) every day. A TV set is to be found in 35 percent of children's rooms. Nearly four-fifths of the children seen regardless of gender (girls: 80%, boys: 79%) or age (6-7-year-old: 79%, 8-9-year-old: 80%, 10-11-year-old: 80%, 12-13-year-old: 79%) or almost every day away, and another 18 percent on or several times a week. According to their parents, children start to watch TV at the average age of 3. Television is the most common activity, the kids can pursue in their spare time, all children (97%) very much like to exercise (56%) or happy (41%). With regard to sex (girls: 97%, boys: 96%) or age there is little difference (6-7-year-old: 97%, 8-9-year-old: 99%, 10-11-year-old: 97%, 12-13-year-old: 96%) (cf. KIM study 2014).

Computer usage plays a substantial role in kids' day-to-day life too. 97 percent of households in which 6- to 13-year-old children live have at least one computer or laptop.21 percent of children have their own device. Associated literacy writing skills, increases the general use by children significantly(6-7-year-old: 42%, 8-9-year-old: 72%, 10-11-year-old: 91%, 12-13-year-old: 98%).Considering the intensity of use, 37 percent of users every or almost every day with a computer or laptop, 48 percent once to several times per week and 14 percent use these devices less often than once a week (cf. KIM study 2014).

Mobilephone or Smartphone

Own a mobilephone or smartphone for many years is a matter of course for young people, but not for after 2000 this generation, the ownership of mobilephone 6-7-year-old takes 10%, 8-9-year-old takes 34%, 10-11-year-old takes 67%, 12-13-year-old takes 91% (cf. KIM study 2012), this is a significant increase with age. Also, age differ shows device choose and use, 6-7-year-old neither mobile nor smartphone play a major role, 8-9-year-old use traditional mobile phone with 22 per cent more than twice as likely as smartphone (10%). 10-11-year-old still dominate the conventional Mobile. Only the transition into adolescence with 12-13-year-old the smartphone with 55 per cent well before the conventional mobile phone (31%) (cf. KIM study 2014).

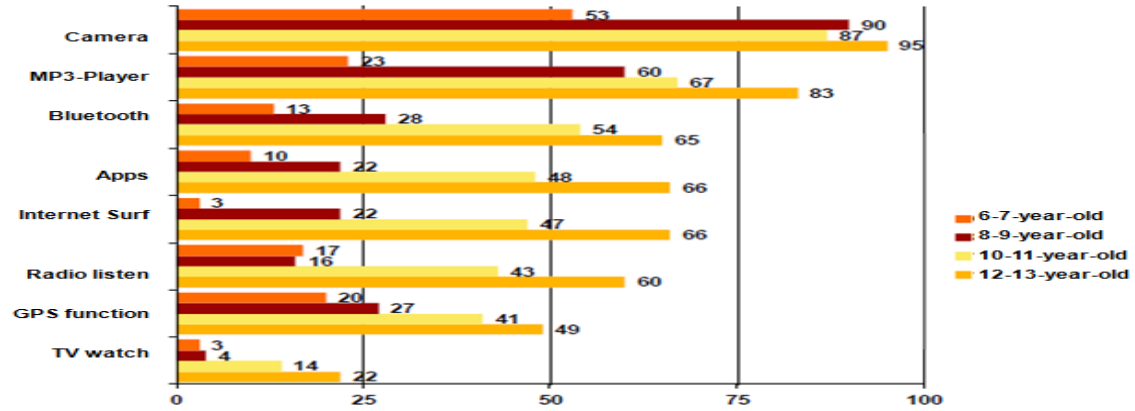


Figure 50 - The percentage of various mobilephone/smartphone choose

Remark: this figure origin from KIM study (2014).

The percentage of various mobilephone or smartphone choose (Figure 50) shows, camera is very important for all age groups, MP3-player takes second place. For teenagers, the older always pursue more functions mobilephone than younger, except the TV function, all other functions over 50 percent needed for them, we believe the wider range of functions are also relative with personal social life and applications open age.

Considering the practice of regular use regardless of the technical features of mobile phones, children contact with their parents in the foreground, over three-quarters at least once a week call parents. Making calls and sending messages thus the key features for the children mobilephone or smartphone use. Internet surf as well as games plays also common features over 40 percent at least once a week. Photo and video function takes 42% and 26%, respectively, see Figure 51.

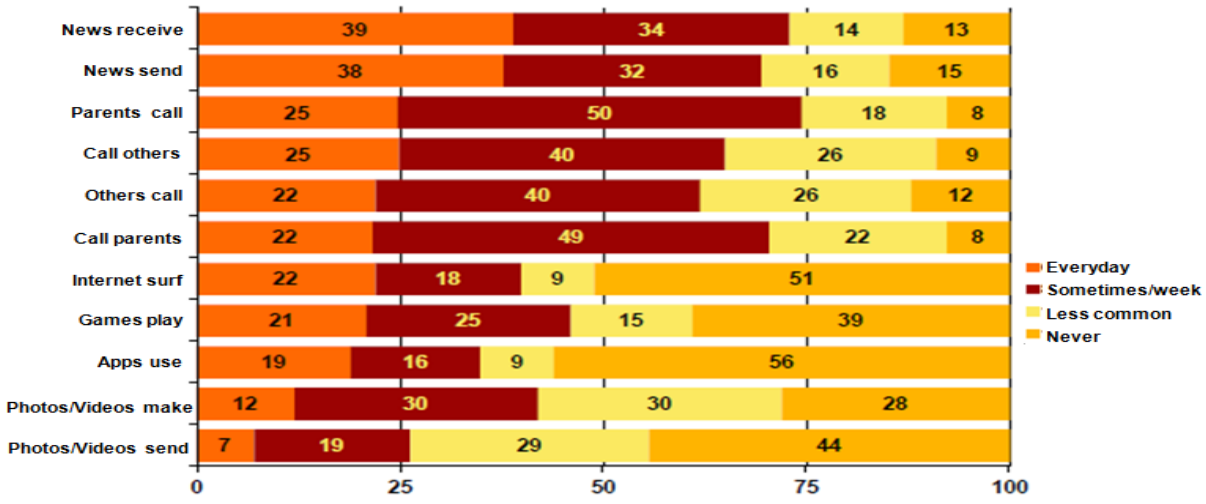


Figure 51 - The percentage of various mobilephone/smartphone use

Remark: this figure origin from KIM study (2014).

Conclusion: Both JIM study and KIM study demonstrate the media use among the German youth, have a clearly media behavior picture of children and adolescent age from 6- to 19-year-old. All these media behavior such as watching TV, using the PC, playing video games, as well as the lowest activity level was associated with

sedentary behavior which could increase prevalence of childhood overweight and obesity. Many literatures based on screen time and physical activity (PA) time to assess the association between sedentary time and overweight and obesity, statement that overweight children are less active than nonoverweight children, high amount of PA seems to be an important factor to prevent overweight in children given that PA shows the highest correlation to weight status (cf. Kesztyüs et al.2013; Olds et al. 2010; Ebbeling et al. 2002; Kettner et al. 2012; Kreuser et al.2013).

Part B

3 Review of International comparable school-based physical activities and health studies

The epidemic of childhood obesity is threatening the whole world (cf. Wang et al. 2006; 2007; 2012; Ogden et al. 2012). Overweight children and adolescents are at greater risk for health problems compared with their normal-weight counterparts (cf. Wang. et al. 2013) and are more likely to become obese adults (cf. CDC. 2010). Obese children and adolescents are more likely to have serious health conditions, such as cardiovascular, metabolic, and psychosocial illnesses; type two diabetes; hypertension; high cholesterol; stroke; heart disease; nonalcoholic fatty liver disease; certain cancers; and arthritis. Other reported health consequences of childhood obesity include eating disorders and mental health issues, such as depression and low self-esteem (cf. AHRQ. 2013). So target on the children and adolescents are more efficient way to prevent adults overweight and obesity.

There are many children and adolescents interventions literature with different research environments, such as school-based, home-based, primary care-based, childcare-based, community-based, environment-based, and consumer health based, among all these interventions school-based physical activity interventions may be effective in the development of healthy lifestyle behaviors among children and adolescents that will then translate into reduced risk for many chronic diseases and cancers in adulthood (cf. Dobbins et al. 2009). School setting is an ideal environment for population-based physical activity, WHO specifically identified schools as a target setting for the promotion of physical activity among children and youth. It provides benefit to children from all risk groups (cf. Harrell et al. 1996; WHO. 2004a), particularly those with limited or no access to play areas (cf. McKenzie et al. 1996; 2001), students involved in curriculum in school could ensure them expose to the intervention, avoid stigmatization of overweight, obesity, or other risk (cf. Harrell et al.1998). Also, many different programs among these research like physical activity (PA) or physical fitness (PF) intervention, diet or nutrition intervention, media intervention, or multi-component intervention. And the interventions include body shape (BS) evaluation with parameters as body mass index (BMI), fat mass (FM), body composition (BC), waist circumference (WC), triceps skin fold thickness (TST); physical activity (PA) with parameters as moderate to vigorous physical activity (MVPA), physiological index parameters as cardio, maximal oxygen uptake (VO_2 max), blood pressure (BP), heart beats (HB), cholesterol etc. and with special motor test. The review in this chapter could focus on school-based, aged 6-12-year-old children and adolescents, with multi-components intervention from year 2000 to 2014, the intervention duration is at least one year or above. Here the international intervention studies exclude Chinese and German studies.

3.1 Geographical Overview of Children and Adolescent Intervention Studies

A search for relevant studies was performed on Pub Med, Google Scholar, Scopus, Springer and Elsevier, using the following keywords: school or school-based or schoolchildren, and physical activity or exercise or fitness, and intervention or program. A further search was performed in the bibliography of the selected studies. Only randomized controlled trials were included, carried out from January 2000 to April 2015 as school-based interventions, focused on physical activity promotion, advice, awareness, implementation, targeted samples of schoolchildren or adolescent students (aged six to twelve years old). Because the focus of review, finally, my study includes 66 studies which fits my selected criterion, 32 European studies, 24 Asian studies, seven North American studies and three other continent studies, see Table 39 and Table 40.

Table 39 - Geographical overview of school-based intervention

	Europe	Asia	North American	Others
Studies	32	24	7	3
BS&PA	7	5	3	0
BS,PA&N	16	8	4	3
BS,PA,N&M	9	5	0	0
BS=Body Shape; PA=Physical Activity;N=Nutrition;M=Media				

Table 40 - Geographical overview of International children and adolescent intervention studies

Author	Year	Country	BS	PA	N/M	MT
Angelopoulos	2009	GRE	★	★	★	
Brandstetter	2012	GER	★	★	★	
Caballero	2003	USA	★	★	★	
Cao	2014	CHN	★	★		
Chen	2011	CHN	★	★	★	
Chen	2015	CHN	★	★	★	★
Coen	2012	BEL	★	★	★	
Danielzik	2006	GER	★	★	★	
Dearth-Wesley	2012	CHN	★	★		
Donnelly	2009	USA	★	★		
Drenowatz	2010	USA	★	★		
Drenowatz	2013	GER	★	★	★	★
Feng	2005	CHN	★	★	★	
Foster	2010	USA	★	★	★	
Fung	2012	CAN	★	★	★	
Hu	2011	CHN	★	★	★	★
Golle	2014	GER	★	★	★	★

Graf	2005	GER	★	★	★	
James	2004/ 2007	GBR	★	★	★	
Jansen	2011	NLD	★	★	★	★
Kain	2008	CHI	★	★	★	
Kettner	2013	GER	★	★		
Kleiser	2009	GER	★	★	★	
Kreuser	2013	GER	★	★		
Kurokawa	2011	JPN	★	★		
Li	2011	CHN	★	★		
Li	2007	CHN	★	★	★	
Li	2010	CHN	★	★	★	★
Lim	2014	KOR	★			
Llargués	2011/ 2012	ESP	★	★	★	
Magnusson	2012	ISL	★	★	★	
Maier	2013	GER	★	★	★	
Meij	2011	NLD	★	★		
Meng	2013	CHN	★	★	★	★
Nagel	2009	GER	★	★	★	
Naul	2012	GER	★	★	★	★
Nakamura	2012	JPN	★	★		
Ochiai	2010	JPN	★	★		
Ochiai	2015	JPN	★	★		
Pei	2014	GER	★	★	★	
Ravens-Sieberer	2008	GER	★	★	★	★
Reed	2008	CAN	★	★		
Resaland	2011	NOR	★	★		
Rush	2012	NZL	★	★	★	
Sanigorski	2008	AUS	★	★	★	
Shi	2004	CHN	★	★	★	
Sigmund	2012	CZE	★	★		
Spengler	2012	GER	★	★	★	★
Spengler	2014	GER	★	★	★	
Stenevi-Lundgren	2009	SWE	★	★	★	★
Taylor	2007	NZL	★	★	★	
Valdimarsson	2006	SWE	★	★		
Vizcaíno	2008	ESP	★	★		
Wijtzes	2014	NLD	★	★		
Williamson	2012	USA	★	★	★	
Woll	2011	GER	★	★	★	★
Xu	2007/ 2012/	CHN	★	★	★	

	2014					
Xu	2010	CHN	★	★	★	
Yamauchi	2007	KOR	★			
Zahner	2006	SUI	★	★	★	★
Zhang	2013	CHN	★	★		
Zhang	2015	CHN	★	★	★	★
Zhang	2013	CHN	★	★	★	★

Remark: BS=body shape; PA=physical activity; N=nutrition; M=media; MT=motor test
Country index: AUS=Australia; BEL=Belgium; CAN=Canada; CHI=Chile; CHN=China; CZE=Czech Republic; DER=Germany; ESP=Spain; GBR=Great Britain; GRE=Greece; ISL=Iceland; JPN=Japan; KOR=Korea; NLD=Netherlands; NOR=Norway; NZL=New Zealand; SWE=Sweden; SUI=Switzerland; USA=United States of America

- European Country studies

Among these 31 European studies, eight interventions parameter with body shape and physical activity, 15 interventions parameter with body shape, physical activity and nutrition, nine interventions parameter with body shape, physical activity, nutrition and motor test. European countries involve Germany (16 studies), Netherland (three studies), Great Britain (two studies), Spain (two studies), Sweden (two studies), Greece (one study), Belgium (one study), Norway (one study), Iceland (one study), Czech Republic (one study) and Switzerland (one study). And according to the parameter of parameter body shape and physical activity include seven studies, parameter of body shape, physical activity and nutrition have 16 studies, and parameter of body shape, physical activity, nutrition and motor test include nine studies.

Since 1980, in European Region overweight population has been increased about 30%-70% of adults, and obesity population has been increased about 10%-30% (cf.Finucane et al.2011); from 1990 to 2008, overweight infants and young children rose steadily (cf. WHO.2011); so from 2008 to 2011 European Commission initiated a joint project to monitor progress in improving nutrition and PA and prevention obesity in EU (cf. WHO.2009). All these European studies had different programs which based on their own country system and culture, here, 16 German studies indentified as following programs: URMEL-ICE (cf.Brandstetter et al.2012; Nagel et al.2009); MANCOVA (cf. Drenowatz et al.2013); KOPS (cf.Danielzik et al.2006); Brandenburg study (cf.Golle et al.2014; Maier et al.2013); CHILT (cf.Graf et al.2005); Baden-Württemberg study (cf.Kettner et al.2013); KiGGS (cf.Kleiser et al.2009; Ravens-Sieberer et al.2008; Spengler et al2012,2014; Woll et al.2011); FITOC (cf. Kreuser et al.2013); HCSC/gkgk (cf.Naul et al.2012); GINplus & LISAplus (cf.Pei et al.2014). The other EU studies, Netherland had three programs as Lekker Fit! (cf.Jansen et al.2011), JUMP-in (cf.Meij et al.2011) and Generation R study (cf.Wijtzes et al.2014); Great Britain CHOPPS program cf.(James et al.2011); Spain IVAC program (cf.Llargués et al.2011,2012) and after school PA intervention (cf.Vizcaíno et al.2008); Swedenexercise intervention (cf.Valdimarsson et al.2006) and PA performance (cf.Stenevi-Lundgren et al.2009); GreeceCHILDERN project (cf.Angelopoulos et al.2009); Belgium POP project (cf.Coen et al.2012); Norway Cardiovascular disease risk intervention (cf.Resaland et al.2011); Icelandcardiorespiratory fitness

project(cf.Magnusson et al.2012); Czech Republic 2-year intervention program (cf.Sigmund et al.2012) and Switzerland KISS study (cf.Zahner et al.2006).

- Asian Country studies

23 Asian studies, 18 from China, four from Japan and two from Korea. Unfortunately, all the Japanese and Korean studies only documented prevalence of overweight and obesity in schools, with parameters of body mass index BMI and BMI Percentile (cf.Kurokawa et al. 2011; Yamauchi et al. 2007); or BMI, waist circumference (WC) and percentage of body fat (BF%) (cf.Ochiai et al. 2010, 2015); or nutrition situation (cf.Lim et al. 2014), no physical activity intervention involved. 18 Chinese studies five parameter with body shape and physical activity, eight parameter with body shape, physical activity and nutrition, and five parameter with body shape, physical activity, nutrition and motor test. Two studies based on Chinese National Survey on Student's Constitution and Health (cf.Chen et al. 2011; Zhang et al. 2013); two studies based on China National Health and Nutrition Survey (cf.Dearth-Wesley et al 2012; Li et al. 2007); two National level studies (cf.Chen et al. 2015; Li et al. 2011); and twelve province-supported or university-based studies (cf.Cao et al. 2014; Feng et al.2005; Hu et al. 2011;Li et al. 2010; Meng et al.2013; Xu et al. 2007,2012,2014; Xu et al. 2011; Shi et al. 2004; Zhang et al. 2013; Zhang et al. 2015).

- North American studies

There are many American studies in the past 30 years. Unites States launched many different themes sport activity to prevent children and adolescents overweight and obesity, such as "The President's Challenge Cup (cf. Presidential Youth Fitness Program.2013)", "Let's Move! (cf.Fitnessgram. 2013)", "Healthy People (cf.The President's Council on fitness, sports & nutrition Rockville.2011)","5-2-1-0 Plan (cf. Baton Rouge Healthy BR)", "Designed to Move (cf. Nike. 2013)", "Shape it Up (cf. Horizon Blue cross blue shield of New Jersey. 2005)", "Camp New You (cf. Camp New You. 2010.)", "Exercise is Medicine (cf. Exercise is medicine. 2013)". Here five American studies, PAAC (cf.Donnelly et al.2009) and SWITCH (cf.Drenowatz et al.2010) have parameter with body shape and physical activity, Pathways (cf.Caballero et al.2003), HEALTHY (cf.Foster et al.2010) and Louisiana Healthy study (cf.Williamson et al.2012) have parameter with body shape, physical activity and nutrition. And another two Canadian studies Canada Action Schools (cf.Reed et al.2008) has parameter with body shape and physical activity, and from "best practice" to "next practice" (cf.Fung et al. 2012) has parameter with body shape, physical activity and nutrition.

- Other studies

There are three studies from Oceania continent with parameter of body shape, physical activity and nutrition, and one study from South American. Two studies from New Zealand with programs named Energize (cf.Rush et al.2012) and APPLE (cf.Taylor et al.2007), and another Australian study with program named of BAEW (cf.Sanigorski et al.2008).The South American study is from Chile, which has two year intervention by Kain (et. al. 2008)

3.2 Parameter by BS and PA Comparable Studies

There are 21 studies parameter by body shape (BS) and physical activity (PA), six Europe studies, eleven Asian studies and three North American studies, see Table 41.Studies' BS outcomes including BMI, and some with relative measurements such as BMI Z-score (cf.Chao et al. 2014); BMI percentile (cf.Kettner et al. 2013; Kreuser et al. 2013;Kurokawa et al. 2011), fat mass(cf. Drenowatz et al.2010; Valdimarsson et al. 2006;Vizcaíno et al.2008; Wijtzes et al.2014), waist circumference(cf. Lim et al. 2014; Ochiai et al. 2010, 2015; Resaland et al. 2011; Zhang et al. 2013),and some combine with physiological indexes blood pressure, total glucose, dyslipidemia, total cholesterol, total high-density cholesterol, high-density cholesterol, waist-to-height ratio, alanine aminotransferase, low-density lipoprotein, apolipoprotein A/B levels, c-reactive protein and fibrinogen, triglyceride, insulin resistance, bone mineral content, areal bone mineral density, third lumbar vertebra, lumbar spine L2-L4 vertebrae, femoral neck, VO_{2peak}= peak oxygen uptake, triceps skin fold thickness, diastolic blood pressure, systolic blood pressure and skin fold thickness (cf.Lim et al. 2014; Ochiai et al. 2010, 2015; Resaland et al. 2011;Valdimarsson et al. 2006;Vizcaíno et al.2008; Wijtzes et al.2014).

The contents of PA interventions widely varied, but all interventions enhance moderate to vigorous PA to increase usual PE programs. Such as extra 15-min vigorous PA add (cf. Resaland et al. 2011), increase to 200-min/week PE (cf. Valdimarsson et al. 2006), extra three 90-min sessions per week (cf. Vizcaíno et al.2008). Program PAAC (cf. Donnelly et al. 2009), SWITCH (Drenowatz et al. 2010), all use accelerometer sensor to assess the PA.

3.3 Parameter by BS, PA and Nutrition (diet) Comparable Studies

There are 14 studies parameter by body shape (BS), physical activity (PA) and nutrition (N) or diet (D), six Europe studies, one Asian studies, four North American studies and three other studies, see Table 42.Among these 14 studies, all with diet intervention, like school-lunch offer (cf. Caballero et al. 2003; Fung et al. 2012; Rush et al.2012); nutrition education provide (cf. Angelopoulos et al. 2009; James et al. 2004, 2007; Kain et al. 2008; Sanigorski et al. 2008; Taylor et al.2007; Willamson et al. 2012); teach-lead increase healthy food and decease junk food (cf. Foster et al. 2010; Llargués et al. 2011,2012; Magnusson et al. 2012). Study of Coen (et al. 2012) has nutrition control, such as increase daily consumption of water, vegetables and fruit, decrease daily consumption of soft drinks, sweets and savoury snacks. Even with the same school-lunch offer, each study has its own specialist, Caballero's pathway study change dietary intake-school lunch; Fung's APPLE study has school healthy breakfast or lunch opinion which means offer cooking course for students; Rush's Energize study has Energize teachers guide students have lunch change and lunch time games. For the nutrition assessment all studies have their own nutrition relative questionnaire.

3.4 Parameter by BS, PA , Nutrition and Motor Test Comparable Studies

There are only three European studies with parameter of body shape (BS), physical activity (PA), nutrition (N) or diet and motor test (MT), see Table 43. First is from Netherland (cf. Jansen et al. 2011) named Lekker Fit (enjoy being fit) based on behavioral and ecological models, including three physical education (PE) sessions a week by a professional PE teacher, additional sport and play activities outside school hours and an education program. Only one endurance test which is 20 meters shuttle runs as the project motor test. Second is from Sweden (Stenevi-Lundgren et al. 2009) based PA program on muscle strength, physical performance and body composition in prepubertal girls. Vertical jump height and isokinetic peak torque of the knee extensors and flexors at 60 and 180°/s as strength and coordination ability test. The last study from Switzerland (Zahner et al. 2006) named “Kinder-Sportstudie KISS” study contains PA, fitness test, anthropometry, bone health, cardiovascular risk factors, general health and psychosocial health. The fitness test including strength ability (pushing the medicine ball, throwing the tennis ball, plate tapping, jump and reach, bent-arm hang), speedy ability (20 m sprint), flexibility(sit-ups and sit and reach),coordination ability (jumping sidewards), balance ability (balancing backwards) and endurance ability (20 meters shuttle-run-test).

Table 41 - Parameter by body shape and physical activity comparable studies

Author	Country	Duration Time	Sample	Age	Body Shape				Description of Physical Activity
					BMI	FM	WC	Others	
Donnelly 2009	USA	3-year	1,527	7-9	★				Physical Activity Across the Curriculum (PAAC): A target goal of 90-min/week of MVPA per child when they receive 60-min of PE per week and combined with PAAC lessons and this would total 150-min of PA per week. Teacher training was implemented for the intervention.
Drenowatz 2010	USA	2006	402	8-11	★	★			Habitual, free-living physical activity (PA) was assessed by a pedometer (steps/day) in study 1 and accelerometer (time spent in moderate-to-vigorous PA) in study 2.
Meij 2011	NLD	2006-2008	2,484	6-12	★			WC,HC	JUMP-in：1 PFS (pupil follow-up system); 2 School sport club; 3 'The Class Moves!; 4 'This is your way to Move!'; 5 Parental information services; 6 Extra care for children.
Kurokawa 2011	JPN	2003-2009	9,225	Grade6-Junior3	★			BMI percentile	
Lim 2014	KOR	2007-2008	1,526	10-19	★		★	BP,TG,D,TC, HDL-C	
Nakamura 2012	JPN	2009	3,464	10-12					
Ochiai 2010	JPN	2004-2008	3,750	9/10 12/13	★		★	BF%	
Ochiai 2015	JPN	2004-2009	2,499	9-10	★		★	WHtR, ALT	
Reed 2008	CAN	2003-2004	268	9-11	★			BP,TC,HDL-C, LDL,AB, C-R&F	Take Leger's 20-m incremental shuttle run as cardiovascular fitness test; 7-day self-report physical activity questionnaire (PAQ) to assess MVPA.
Resaland 2011	NOR	2004-2005	256	9	★		★	BP,T,VO_{2peak} TC:HDL-C,IS	Intervention school offers 60 min of PA daily by PE teacher, MVPA for the remaining 55 min, of which 15 min were planned to be at vigorous intensity; control school offers normal 45 min of PE twice weekly

Sigmund 2012	CZE	2006-2008	176	6-9	★				The PA contains two 45-min physical education (PE) lessons per week as normal PA program and intervention school will have extra program: one 20-min recess with PA content; PA (playing) during after-school nursery (≈40-min to ≤ 90-min);an average of 2-3 short breaks per day(lasting 3-5-min each between lessons).
Valdimarsson 2006	SWE	1-year	103	7-9	★	★		BMC,ABMD,L3,LP,FN	The intervention school increased to 40 minutes/day (200minutes/week) PE curriculum conducted by PE teacher; control school takes the ordinary PE curriculum one or two sessions per week (total 60 minutes/week).
Vizcaíno 2008	ESP	2004-2005	1,044	9-10	★	★		TST,TC,BP,T,DBP,SBP,AA,AB	Normal PE (3-h per week PA at low-to-moderate intensity) continued in both schools, add extra three 90-min sessions per week, for 24 weeks in intervention schools. The PA sessions were planned by two qualified physical education teachers and were supervised by sports instructors.
Wijtzes 2014	NLD	2002-2006	5,913	6	★	★		BF%	Sedentary behaviors and physical activity behaviors were assessed by parent-reported questionnaire, sedentary behavior includes television viewing and computer game use with both of variables, frequency and duration; PA behavior includes outdoor play, sports participation active transport to/from school with frequency and duration.

Remark: Body shape: BMI= Body-Mass-Index; FM=Fat Mass; WC=Waist Circumference; HC=Hip Circumference;
Others: BP=blood pressure; TG= total glucose; D= dyslipidemia; TC=total cholesterol; HDL-C= high-density cholesterol; BF%= percentage of body fat; WHtR= waist-to-height ratio; ALT= alanine aminotransferase; LDL=low-density lipoprotein; AB= Apolipoprotein B levels; C-R&F= C-reactive protein and fibrinogen; T=Triglyceride; VO_{2peak}= peak oxygen uptake, TC:HDL-C=total high-density cholesterol; IS=insulin resistance; BMC =Bone mineral content; ABMD =areal bone mineral density; L3=third lumbar vertebra; LP=lumbar spine L2-L4 vertebrae; FN =femoral neck; TST= triceps skin fold thickness; DBP=diastolic blood pressure; SBP=Systolic blood pressure; AA=Apolipoprotein A levels; SFT=skin fold thickness;
Country: USA= United States of America; JPN=Japan; KOR=Korea; CAN=Canada; NOR=Norway; CZE= Czech Republic; SWE=Sweden; ESP=Spain; NLD=Netherlands;

Table 42 - Parameter by body shape, physical activity and nutrition comparable studies

Author, Year	Country	Duration Time	Sample	Age	BS/ PI	PA	Nutrition		Description of intervention or project
							(Phys/Env)	(Psych/M)	
Angelopoulos 2009	GRE	1.2005-1.2006	646	10	★	★	★		Theory of Planned Behavior (TPB) combined with the PE and science and environmental classes with students' workbook and teachers' manual for 1-2 hour per week. Teachers and parental both involved.
Caballero 2003	USA	3-year	1,704	Grade 3-5	★	★	★		Pathways: change dietary intake-school lunch; increase in PA-12 wk/y, twice weekly for 45-min lesson; a classroom curriculum focused on healthy eating and lifestyle-30-min session per week; and a family-involvement programs
Coen 2012	BEL	9.2008-4.2010	1,102	3-6	★	★	★	★	Prevention of Overweight among Pre-school and school children (POP): nutrition control: increase daily consumption of water, milk, vegetables and fruits, decrease daily consumption of soft drinks, sweets and savory snacks.PA control: increasing daily PA and decreasing screen-time behavior. School and parents both involved.
Foster 2010	USA	2006-2009	4,603	11.3 ±0.6	★	★		★	Four integrated components: nutrition-quantity and quality of foods and beverages; A-moderate to vigorous PA to raise heart rate to 130 beats or more per min; behavioral knowledge and skills-use Fun Learning Activities for Students Health (FLASH); communications and social marketing.
Fung 2012	CAN	2008-2010	3,678	Grade5	★	★	★		Alberta Project Promoting active Living and healthy Eating (APPLE): School health facilitators promote community gardens and healthier breakfast/lunch options. Facilitated professional development for teachers and school staff, and parent information nights.PA sessions promoted along with walk to school days, weekend events, celebrations and newsletters to promote healthy living.
James 2004,2007	GBR	8.2001-10.2002	644	7-11	★	★		★	Christchurch obesity prevention project in schools (CHOPPS): four session's nutrition education to discourage drinking of fizzy drinks (sweetened and unsweetened) among school-age children.

Kain 2008	CHI	2003-2004	2,430	8-12	★	★		★	Intervention included diet/nutrition lessons and additional PE sessions along with novel card game to promote healthy living.
Llargués 2011,2012	ESP	2006-2008	509	5-6	★	★	★	★	Investigation, Vision, Action and Change (IVAC) method: children investigate and reflect their health and lifestyle; teacher assists them in developing skills to change; 3 hour per week to develop activities related to health food habits and/or PA; family intervention with monthly recipes for a balanced diet.
Magnusson 2012	ISL	2006-2008	321	7	★	★		★	Interventions offer PA and nutritional teaching kit; increase outdoor teaching, organized fieldtrips, promotion of active commute to and from school; one extra PE lesson per week; dietary intervention was on fruit and vegetable intake.
Rush 2012	NZL	2004-2006	1,352	5⁄10	★	★	★	★	Energizer educated includes PA promote-active transport, lunchtime games, leadership training and bike days; healthy eating-replace sugary drinks with water and eat breakfast, canteen makeovers were conducted to remove pastries and pies, and to add healthier options.
Sanigorski 2008	AUS	2003-2006	1,001	4-12	★	★	★		Be Active Eat Well (BAEW) has 10 objects: 3 capacity building; 5 evidence-based behavior changes and2 innovative to promote healthy eating and PA.
Taylor 2007	NZL	2003-2005	730	5-12	★	★	★		A Pilot Program for Lifestyle and Exercise (APPLE): Encourage healthy eating with science lessons highlighting adverse health effects of sugary drinks and fatty foods. Cooled water filters installed in schools to promote drinking water. Initiatives were set to promote more PA activity as well as sports equipment was provided for free time.
Williamson 2012	USA	2006-2009	2,060	10	★	★	★		Three prevention groups: Primary Prevention (PP), an environmental modification program; Primary + Secondary Prevention (PP+SP), the environmental program with an added classroom and internet education component; Control(C).
Yamauchi	KOR	not	159	10-11	★	★	★		Use portable activity monitor wear on waist for 7 consecutive days to assess the total daily energy

2007		mention	schools	13-14					expenditure (TEE) and daily step frequency (STP) to determine physical activity levels (PALs).

Remark: Physical Activity: Phys/Env=Physical/environmental intervention; Psych = psychosocial intervention; M= media
Country: GRE=Greece; USA= United States of America; BEL=Belgium; CAN=Canada; GBR=Great Britain; CHI=Chile; ESP=Spain; ISL=Iceland; NZL=New Zealand; AUS=Australia; KOR=Korea;

Table 43 - Parameter by multi-component comparable studies

Author Year	Country	Duration Time	Sample	Age	Body Shape		Description of Physical Activity	Motor Test	Diet(D) / Media(M)
					BMI	Other			
Jansen 2011	NLD	2006-2007	2,622	6-12	★	WC	3 physical education (PE) sessions a week by professional PE teacher, additional sport and play activities outside school hours and an educational program.	20m shuttle run	
Stenevi-Lundgren 2009	SWE	1999-2002	125	7-9	★	BC	Intervention group with 40 min/day of general PA per school day, 200 min/week; control group with normal Swedish PE with 60 min/week.	PT,VJH	
Zahner 2006	SUI	One year	502	6-13	★	WC,BC,BP, G,I,A,L,HC RP,SHBG	General physical fitness includes aerobic fitness, strength, balance, coordination, speed. PA was assessed by accelerometer was constantly worn around the hip over 7 days	BB,PMB,TTB,JS, SU,20m,PT,J&R, BAH,S&R, SRT	D

Remark: Body shape: WC=waist circumference; BC = Body Composition; BP=blood pressure; G=glucose; I=insulin; A=adiponectin; L=Lipids; HCRP= highly sensitive CRP; SHBG=sex hormone binding globulin
Motor test: PT =isokinetic peak torque of the knee extensors and flexors at 60 and 180°/s; VJH =vertical jump height; BB= balancing backwards; PMB= pushing the medicine ball; TTB= throwing the tennis ball; JS= Jumping sidewards; SU= sit-ups;20m= 20 meters run; PT= plate tapping; J&R=jump and reach; BAH= bent-arm hang; S&R= sit and reach; SRT= shuttle-run-test;
Country: NLD=Netherlands; SWE=Sweden; SUI=Switzerland;

3.5 Summary of Comparable Studies in China and Germany

There are 15 Chinese studies with 18 articles and nine German studies with 16 articles in total. All of them are randomized trial of multiple interventions for childhood or adolescent overweight or obesity. According to the different research purposes, in both countries have big scale national level survey and small project focus on region. The authors choose the different parameters to show us the results of the survey and prove the hypothesized conclusions, see table3.6. In general, there are two Chinese studies and one German study include test the body shape, have physical activity intervention, do the motor test, survey the nutrition and media use; three Chinese studies and four German studies have the body shape test, physical activity intervention, motor test and nutrition survey; one German study have body shape test, have physical activity intervention and motor test. Exclusive the motor test, there are more studies in both countries. Five Chinese studies and five German studies all have body shape test, physical activity intervention, nutrition and media use; one Chinese study and two German studies have body shape, physical activity and nutrition parameters; four Chinese studies and two German studies include body shape and physical activity intervention. Here we can see the details, see table 3.7-3.10. Compare all these studies; we will see differences by the following catalog.

- Research scale

15 Chinese studies with 18 articles, four national studies and eleven regional studies, the national study based on China National Healthy and Nutrition Survey (CNHNS) (cf. Dearth-Wesley et al. 2012; Li et al. 2007), Chinese National Survey on Student's Constitution and Health (CNSSCH)(cf. Chen et al. 2011), and National Student Healthy Standard Test (NSHST)(cf. Zhang et al. 2013).Regional studies more based on municipality city like Beijing (cf. Li et al. 2011; Shi et al.2004 ; Zhang et al. 2013), Shanghai (cf. Cao et al. 2014;Xu et al. 2011); or capital city like Nanjing (cf. Xu et al. 2007,2012,2014), Guiyang (cf. Feng et al. 2005); or single province study like Shanxi (cf. Hu et al.2011), Shandong (cf. Zhang et al. 2013); or multi-city study like Chen (et al. 2015), Li (et al. 2010), Meng (et al. 2013).

Nine German studies with 16 articles, only KiGGS is a national-wise study, others are regional studies. Four studies in south-west Germany Baden-Württemberg city Ulm (cf. Brandstetter et al. 2012; Drenowatz et al. 2013; Nagel et al. 2009), Freiburg (cf. Kreuser et al.2013), Stuttgart (cf. Maier et al. 2013), and another is in south-west region (cf. Kettner et al.2013); one multi-city study by Pei (et al.2014); one cross-border study by Naul (et al. 2012); one from Schleswig-Holstein city Kiel (cf. Danielzik et al. 2006); one from Nordrhein-Westfalen city Cologne (cf. Graf et al.2005); and one from Brandenburg (cf. Golle et al. 2014). See table3.12.

- Research size

The national level Chinese studies have a big amount of subjects, the age group from 7- to 18-year-old, 231,326 students included in Chen's study (et al. 2011) and 215,317 students included in Zhang's study (et al. 2013), Dearth-Wesley's study (et al.2012)

focused on age 6- to 8-year-old group with 167 targets and 7- to 9-year-old group with 186 targets; Li's study (et al. 2007) more focused on age from 7- to 17-year-old overweight targets 6,368 and normal weight targets 485. Regional Chinese studies, Li's (et al. 2012) and Meng's (et al.2013) study both target age is 7- to 13-year-old, the total number is 9,750 and 9,570, respectively; Chen's (et al. 2015) study focused on 7- to 18-year-old with 70,000 students involved. The rest studies sample divided into two types, intervention group (I) vs. control group(C) and female (F) vs. male (M). Cao (et al. 2014) had I(1,287) and C(1,159) with age 7- to 10-year-old; Hu (et al. 2011) had I(90) and C(76) with age 6- to 8-year-old; Li (et al. 2011) had I(601) and C(476) with age 7- to 11-year-old; Xu (et al. 2011) had I(264) and C(202) with age 7- to 11-year-old; Shi (et al. 2004) had I(747) and C(755) with age 9- to 10 –year-old. Feng (et al.2005) had M(66) and F(44) with age 8- to 12-year-old; Xu (et al. 2007,2012,2014) had M(3,356) and F(3,492) with age 12- to 18-year-old; Zhang (et al. 2013) had M(14,578) and F(14,452) with age 10- to 18-year-old; Zhang (et al. 2015) had M(3,749) and F(2,950) with age 7- to 12-year-old.

There is only KiGGS study has German national level investigation with age group from 3- to 17-year-old had 13,450 students involved, this is the biggest research in whole Germany. Except Naul's study (et al. 2012) which the objects classified by country, German (261) and Netherland (296) with age from 6- to 10-year-old; the rest studies also classified by two types, intervention group (I) vs. control group(C) and female (F) vs. male (M). Brandetetter's study (et al.2012) had I(450) and C(495) with age from 7- to 8-year-old; Danielzik's study (et al.2006) had I(344) and C(1,420) with age from 6- to 10-year-old; Graf's study (et al. 2005) had I(459) and C(187) with age from 5- 9-year-old. Drenowatz's study (et al. 2013) had M(594) and F(526) with age from 7- to 8-year-old; Golle's study (et al. 2014) had M(108) and F(69) with age from 9- to 12-year-old; Kettner's study (et al.2013) had M(159) and F(159) with age from 7- to 8 year-old; Maier's study (et al. 2013) had M(81) and F(70) with age from 5- to 8-year-old; Nagel's study (et al. 2009) had M(594) and F(526) with age from 6- to 9-year-old; Pei (et al. 2014) had M(1,308) and F(1,257) with age 10-year-old group.

Chinese studies and German studies compared in China and Germany, the national level studies had more scale also the target age had big range (cf. Kleiser et al. 2009; Ravens-Sieberer et al.2008; Spengler et al. 2012, 2014; Chen et al. 2012; Li et al. 2007; Dearch-Wesley et al. 2012; Zhang et al. 2013), regional studies had small scare and small range age as well (cf. Brandetetter et al. 2012; Danielzik et al. 2006; Drenowatz et al. 2013; Graf et al. 2005; Golle et al. 2014; Kettner et al.2013; Kreuser et al.2013; Maier et al. 2013; Nagel et al. 2009; Naul et al. 2012; Pei et al. 2014; Cao et al.2014; Chen et al. 2015; Feng et al. 2005; Hu et al.2011; Li et al. 2011; Li et al. 2010; Meng et al.2013; Xu et al. 2007,2012,2014; Xu et al. 2012; Shi et al.2005; Zhang et al. 2015; Zhang et al. 2013). Scholars did sex-specific research(cf. Feng et al. 2005; Zhang et al. 2015; Zhang et al. 2013;Drenowatz et al. 2013; Golle et al. 2014; Kettner et al.2013; Maier et al. 2013; Nagel et al. 2009; Pei et al. 2014) and intervention program (cf.Cao et al.2014;Dearch-Wesley et al. 2012;Hu et al.2011; Li et al. 2011;Xu et al. 2011; Shi et al. 2005; Brandetetter et al. 2012; Danielzik et al. 2006; Graf et al. 2005) in China or Germany , both had contribution to the children and adolescent overweight and obesity area.

- Research setting

There are eight school-based simple studies in China (cf. Chen et al. 2015; Hu et al. 2011; Li et al. 2011; Li et al. 2010; Meng et al. 2013; Xu et al. 2007.2012,2014; Zhang et al. 2013; Zhang et al. 2015; Zhang et al. 2013), six school-home-based studies (cf. Cao. et al. 2014; Chen et al. 2011; Dearth-Wesley et al. 2012; Feng et al.2005; Li et al. 2007; Shi et al.2004;) and one school-home-community-based study (cf. Xu et al. 2011) in China.

There are five school-based simple studies in Germany (cf. Golle et al. 2014; Graf et al. 2005; Kettner et al.2013; Kreuser et al.2013; Maier et al. 2013), nine school-home-based studies (cf. Brandetetteret al.2012; Danielzik et al.2006; Drenowatz et al. 2013; Kleiser et al. 2009; Nagel et al. 2009; Ravens-Sieberer et al.2008; Spengler et al. 2012, 2014; Woll et al. 2011), one school-community-based studies (cf. Pei et al.2014) and one school-home-community-based study (cf. Naul et al. 2012).

Compare the study setting between two countries, there are no differences, that only Germany had one more school-community-based study, but does not mean Chinese scholars did not conduct school-community-based research, most Chinese community relative studies only focus on the community adults, not specialize for children or adolescent, or had short time intervention, or more cooperated with clubs not schools. This is traditional Chinese culture, firstly, Chinese school sport facilities not open to the community; secondly, though the Chinese study policy is community school study, but still many parents would choose star schools for their child even it is far away, thus school children more from multi communities, it would be more difficult for scholars do school-community researchers.

- Research parameter

Among all the Chinese and German studies, we take research include body shape, physical activity intervention, motor test, media and diet or nutrition as 5-parameter-study, research has body shape, physical activity intervention, motor test and diet or nutrition or research has body shape, physical activity intervention, media and diet or nutrition as 4-parameter-study, research has body shape, physical activity intervention and motor test as 3-parameter-study; research has body shape test, physical activity intervention, nutrition and media use exclude motor test as 4-parameter-study (E); body shape, research has physical activity intervention and nutrition exclude motor test as 3-parameter-study (E);research has body shape test and physical activity intervention as 2-parameter-study (cf. Gioia Mura et al. 2015; Baker P.R.A. et al. 2005; Dobbins M. et al. 2009).

So there are two Chinese studies (cf. Zhang et al. 2013; Zhang et al.2015) and one German study (cf. Spengler et al. 2012) are 5-parameter-study, all these three studies are national level survey. Two Chinese studies based on Chinese National Students 'Health Test (NSHT), which involved 215,317 students age from seven to twelve years old. And the German study based on German Health Interview and Examination Survey for Children and Adolescents (KiGGS), which involved 13,450 students age

from three to seventeen years old. Both surveys, mental evaluation contains physiological items and motor test, psychological evaluation contains both parents and child questionnaires. Because of the different characters of these two countries, Chinese survey more focus on the differences between urban and suburban students, but German survey more focus on students' family background (SES). All these three studies are comprehensive studies, which have specific representative age group in both countries.

There are three Chinese studies (cf. Chen et al. 2015; Li et al. 2010; Meng et al. 2013) and four German studies (cf. Drenowatz et al. 2013; Ravens-Sieberer et al. 2008; Naul et al. 2012; Woll et al. 2014) are 4-parameter-study, and five Chinese studies (cf. Feng et al. 2005; Xu et al. 2007,2012,2014; Xu et al. 2011) and five German studies (cf. Brandstetter et al. 2012; Graf et al.2005; Kleiser et al. 2009; Nagel et al. 2009)are 4-parameter-study (E). There is no big difference between countries of these studies. Though all these 17 studies have 4-parameter, seven studies with motor test can easily to demonstrate the physical ability development during the intervention period, which is more objective; and ten without motor test studies more focus on media or nutrition or lifestyle item, which is also very nice to see the improvement during the intervention, but these results come from the questionnaire which means more subjective. There is only one German study (cf. Golle et al. 2014) is 3-parameter-study, compare the urban and rural area students. And another two Chinese studies (cf. Li et al. 2007; Shi et al. 2005) and 3 German studies (cf. Danielzik et al. 2006; Maier et al. 2013; Pei et al. 2014) are 3-parameter-study (E), also including one Chinese study (cf. Shi et al. 2005) and one German study (cf. Pei et al. 2014) do not have physical intervention. Compare these studies, still cannot see the difference in research ways, only German study have more content in questionnaire, can see more detailed outcomes. Last, there are four Chinese studies (cf. Cao et al. 2014; Dearth-Wesley et al. 2012; Li et al. 2011; Zhang et al.2013) and two German studies (cf. kettner et al. 2013; Kreuser et al. 2013) are 2-parameter-study. Also cannot find differences between countries.

We can see, there is no big difference between China and Germany with the same amount parameter, which mean the research method almost the same, though the outcomes are different according to the different designed questionnaires. Also with the same parameter's research, German study have more details about the classification of questionnaire, more considering about the family background, while Chinese study have more item of physiological test, more considering about students 'physical health. And we also find that, more parameter study have more outcomes, more objectively understand the students, more clearly see the improvements.

- Item of motor test

There are four Chinese studies and six German studies have motor test, and the motor test includes endurance, strength, agility, coordination, flexibility ability. Compare the Chinese study and German study, we find there are three same test, which are strength ability, both have stand board jump, agility ability have 50-m run, and flexibility ability have sit & reach. Four Chinese studies acutely from the same test which named National Student Physical and Health Standard Test (NSPHST), and

each age students will have different test, three studies (cf. Chen et al.2015; Zhang et al. 2013; Zhang et al.2015) choose 800-meter run for girls and 1000-meter run for boys as endurance test, and all studies choose 50-meter ×8 shuttle run as flexibility test. But there is no test for the balance ability.

Six German studies have four different test designs, URMEL-ICE project (cf. Drenowatz et al. 2013) built its own test named AST (Allgemeiner Sport motorischer Test für Kinder), which contains 6-min run as endurance test, medicine ball throw and throw on target as strength test, 20-meter run as agility test, obstacle run and one leg stand as balance test, throw-and-run and sit & reach as flexibility test. Brandenburg project (cf. Golle et al. 2014) also designed five tests for five sport ability, 9-min run as endurance test, ball push as strength test, 50-meter run as agility test, star coordination run as balance test, and sit & reach as flexibility test. HCSC/gkgk is a cross border project (cf. Naul et al. 2012), it contains 6-min run as endurance test, pushups and stand board jump as strength test, 20-meter run as agility test, backwards balance as balance test, sit ups and sit & reach as flexibility test. The last project is KiGGS by Ravens-Sieberer (cf. 2008), Spengler (cf. 2012), Woll (cf. 2011), it chooses bike endurance test as endurance test, stand board jump, farce plate and pushups as strength test, backwards balance, jump side to side and one leg stand as balance test, forward bend and reaction test as flexibility test.

We can find all these studies some have overlapped test items but still have special test in each project. Compare between countries we will see, that Chinese motor test lack of balance ability, and endurance ability test in China separate by gender. But German motor test have more item in strength, balance and flexibility ability test, also the test more close game, each project has their own design of motor test not like China has only one version (national test).

Among all Chinese and German studies, there are no significant differences between study settings, but still with different parameters by countries due to the scholars' knowledge and culture background. Basically, multiple setting with huge amount of scale, more sectors involved like teachers, parents, local administrators, club coaches, therefore, more outcomes exist.

The big difference between two countries are, that Chinese survey is more government dominated, it is a central-local compulsory implement match, all students need finish National Student Physical and Health Standard Test (NSPHST) as a task. The NSPHST provides students 'body shape, motor test, nutrition situation and as well as myopia (near-sighted) and caries rate, so the parameters more inclined to BMI, physical fitness, diet, media. The German national level study KiGGS consists of one survey and four modules, each has different age sample, it is more focus on healthy-relevant behavior and living conditions, so the parameters are more with BMI, physical activity, socioeconomic status (SES), race, region.

3.6 Conclusion

Despite diversity of school-based interventions in my study, common characteristics were the application of integrated actions at local level, aimed to increase physical activity, physical fitness, motor agilities, and/or to decrease sedentary habits, keep normal weight status, have a healthy lifestyle. From all these 66 studies, there is only one cross-country study (cf. Naul et al. 2012), not many comparable studies involved, although have some suboptimal studies, for example, Feng's study (cf. et al. 2005,China) and Drenowatz's study (cf. et al.2013,Germany) have sex-specific, Spengler's study (Germany) has race-specific, Chen's study (cf. et al. 2011,China) and Kleiser's study (cf. et al. 2009, Germany) have socioeconomic status (SES) differ, Meng's study (cf. et al. 2013, China) and Naul's study (cf. et al. 2012,Germany) are cooperated projects. Secondly, exclusive short time intervention and no physical activity implement programs, most Asian studies did not report the original study goals or did not target obesity, that is, they targeted cardiovascular risks (cf. Ochiai et al. 2010,2015; Lim et al. 2014) or diet habit change(cf. Nakamura et al.2012), finally only few matched my study, relatively small scale. Thirdly, I cannot find many English written Asian studies, even attempted to identify more studies reported in languages other than English, but only less met my inclusion criteria; fourthly, still some studies are included even not directly target childhood obesity prevention because they had diet and physical activity interventions and reported body weight-related outcomes which provide us valuable information.

In general, studies done in schools that had large sample sizes, longer follow-up, with more vigorous and higher intensity interventions, were more likely to be effective (cf.Chen et al. 2011; Li et al. 2007;Zhang et al. 2013; Kleiser et al. 2009; Spengler et 2012,2014; Woll et al. 2011).Comprehensive interventions that promoted environmental changes, like modified food and beverage items offered in school cafeteria(cf. Xu et al. 2011;Maier et al.2013; Nagel et al.2009; Nual et al. 2012;), or structural changes in school physical activity(cf. Li et al. 2011; Li et al. 2007; Li et al. 2010; Meng et al.2013; Zhang et al. 2013; Kreuser et al.2013) as well as changes in individuals' knowledge and attitude(cf. Chen et al. 2015; Hu et al.2011; Shi et al.2005;Graf et al.2005;Pei et al. 2014;Ravens-Sieberer et al. 2008; Spengler et al. 2012,2014; Woll et al. 2011) were more likely to be successful than those addressing either one alone. Educational interventions were less likely to be effective than environmental changes. Given that children are exposed to many other influences outside of school, it is heartening to see that interventions implemented in schools can have a significant impact on weight and other outcomes, so school-based multiple components is a better option for childhood overweight and obesity prevention.

As we know, the only comparable study which meets criteria of my study is Naul's HCSC/gkgk (cf. 2012). It uses transdisciplinary intervention approach, with comprehensive multi-setting strategy implement at local community in Germany and Netherland, physical activity intervention contains daily physical activities of at least 60 up to 90minutes of health-enhanced physical education, extracurricular physical activities combined with a cross-curricular health and nutrition education. This

school-based, cross-sectoral approach with relevant stakeholders (schools, community offices of education and public health, sport clubs, parents) study had successes in both countries, which could be a valuable study of my Chinese-German cross-country study.

The target of my research is 6-10-year-old school children in China (Shanghai) and Germany (Nordrhein-Westfalen). China and Germany are two big countries from different continent, with different culture and school education system, sounds difficult to put them together to analysis. But look back of Chinese culture, China has 56 ethnic from 23 provinces, 5 autonomous regions and 4 municipalities, difficult to do research among all these different ethnic from different economic status province, so geography study would be better to show the situation. City like Shanghai, more developed and international, citizen from all of China, the lifestyle more eastern and western combined which is more alike most other immigrant municipalities in the world. Meanwhile, Shanghai is one of the overweight and obese cities in China, and also implements anti-overweight, purchase healthy lifestyle as a model city in China. Look at Germany, after second world war it split into two parts, eastern German and west German still have their own characters; and in modern time more immigrants come to Germany, this can be seen in KiGGS study which more focused on socioeconomic status (SES) and different ethnic group. Nordrhein-Westfalen is one of the biggest population states in Germany as well as in Europe, it is an industrial area, has lots of immigrants with diversity cultures, and it also the first cross-border study area in Europe. So I choose Shanghai as a model city of China and Nordrhein-Westfalen state as model state of Germany into my study.

Table 44 - Comparable Chinese study vs Germany study

	Articles	Studies	Scale	BS,PA,MT,N&M	BS,PA,MT&N	BS,PA&MT	BS,PA,N&M	BS,PA&N	BS,N&M	BS&M	BS&PA	Other
Chinese studies	18	15	National 4 Regional 11	2	3	0	5	1	1	1	4	1
German studies	16	9	National 1 Regional 8	1	4	1	5	2	1	0	2	0

Table 45 - Comparable Chinese study vs Germany study

Divergencies	Chinese studies	Convergencies					German studies	Divergencies
		BMI/BMI Z-score/BMI percentile	Physical Activity	Motor Test	Diet	Media		
National Students' Health Test, including FVC test	Zhang 2013						Spengler 2012	Health-related behavior with Motorik-Modul test
	Zhang 2015							
Test WC,HC,BP,SFT,TST,G,T,TC,HDL-C, LDL-C; parental engagement	Chen 2015						Drenowatz 2013	Motor test AST
Test WC, BC,BP,T,TC, LD L-C, HDL-C; cost-effectiveness are included	Li 2010 Meng 2013						Ravens-Sieberer 2008	Focus on mental health
							Naul 2012	Comparable study
							Woll 2011	Have Motorik-Modul test
							Golle	Compare urban and rural

							2014	
Focus on behavior	Feng 2005						Brandstetter 2012	Test WC and TST, have healthy behavior test
TV time as media consuming are involved	Xu 2007,2012, 2014						Graf 2005	Have health education
	Xu 2011						Kleiser 2009	Analysis SES
							Nagel 2009	Parental characters include to analysis lifestyle
							Spengler 2014	Health-related behavior with Motorik-Modul test
Parents are involved	Li 2007						Danielzik 2006	Test WC and TST
							Maier 2013	Sex-specific and SES, test spare time activity
Focus on behavior	Shi 2005						Pei 2014	Analysis by food group and energy partition
Analysis SES	Chen 2011							
	Cao 2014						Kettner 2013	Sex-specific, age-related differences
Have parent-child PA, sedentary behavior	Dearth-Wesley 2012						Kreuser 2013	BMI-SDS, evaluate spare time and screen time
Have healthy knowledge and sedentary time	Li 2011							
Have SFT test	Zhang 2013							

Table 46 - Motor test China vs Germany

Chinese study	Endurance	Strength	Agility	Coordination (balance)	Flexibility	German study
Chen 2015	800m run(girls) 1000m run(boys)	stand board jump	50-m run		50m×8shuttle run	
Li 2010 Meng 2013		stand board jump	50-m run		50m×8 shuttle run	
Zhang 2013 National test	800m run(girls) 1000m run(boys)		50-m run		50m×8 shuttle run sit & reach	
Zhang 2015 National test	800m run(girls) 1000m run(boys)		50-m run		50m×8 shuttle run sit & reach	
	6-min run	medicine ball throw, throw on target	20-m run	obstacle run, one leg stand	throw-and –run, sit &reach	Drenowatz 2013
	9-min run	ball push	50-m run	star coordination run	sit &reach	Golle 2014
	6-min run	push ups stand board jump	20-m run	backwards balance	sit ups sit &reach rapid alternation	Naul 2012
	bike endurance test	stand board jump force plate push ups		backwards balance jump side to side one leg stand	forward bend reaction test	Ravens-Sieberer 2008 KiGGS study
	bike endurance test	stand board jump		backward balance	forward bend	Spengler

		force plate push ups		jump side to side one leg stand	reaction test	2012 KiGGS study
	bike endurance test	stand board jump force plate push ups		backward balance jump side to side one leg stand	forward bend reaction test	Woll 2011 KiGGS study

Table 47 - All Chinese study review

Author	Age	Sample	Scope	Setting	Program	Key words
Cao	7-10	Intervention:1,287 Control:1,159	Region Shanghai	Multiple: School-home-based	Ethics Committee of Fudan University Project: 112IRB00002408, FWA00002399	BMI; BMI Z-score;
Chen(2011)	7-18	Total: 231,326	National	Multiple: School-home-based	CNSSCH:2005 Chinese National Survey on Student's Constitution and Health	BMI; Socioeconomic status (SES)
Chen(2015)	7-18	Total:70,000	Region Liaoning,Shanghai, Chongqing, Tianjin, Guangdong ,Ningxia, Hunan	Simple: School-based	Non-profit public service of the Ministry of Health of China, No. 201202010	PA; Nutrition; Parental engagement
Dearth-Wesley	6-8 7-9	2000 cohort:167 2004 cohort:186	National	Multiple: School-home-based	CNHNS: China National Health and Nutrition Survey	Parent-Child PA, Sedentary behavior;
Feng	8-12	Male:66 Female: 44	Region Guiyang	Multiple: School-home-based	2002-2004 Guizhou Province Health department project	PA, Nutrition; Behavior
Hu	6-8	Intervention:90 Control:76	Region Shanxi	Simple: School-based	Learn to Think (LTL) project	Self-thinking; Ability
Li(2011)	7-11	Intervention:601 Control:476	Region Beijing	Simple: School-based	Key Projects in the National Science & Technology Pillar Program during the Eleventh Five-Year Plan Period (2008BA I58B05)	BMI;PA time; Healthy acknowledge; Sedentary time
Li(2007)	7-17	Overweight:6,368 Normalweight:458	National	Multiple: School-home-based	CNHNS: 2002 China National Health and Nutrition Survey, No: 2001DEA30035, 2003DIA6N008	PA, Nutrition, Parental involved

Li(2010)	7-13	Total:9,750	Region Beijing,Shanghai, Chongqing, Shandong province, Guangdong Province Heilongjiang Province,	Simple: School-based	Chinese clinical trial: ChiCTR-TRC-00000402	BMI; Body composition (BC);Nutrition;PA; Waist Circumference(WC)
Meng	7-13	Total:9,570	Region Beijing,Shanghai, Chongqing, Shandong province, Guangdong Province Heilongjiang Province,	Simple: School-based	Chinese clinical trial: ChiCTR-TRC-00000402	BMI;PA; Nutrition; Cost-effectiveness
Xu (2007⁄2012 /2014)	12-18	Male: 3,356 Female: 3,492	Region Nanjing	Simple: School-based	2004 Nanjing High School Students' Health Survey	PA; BMI; TV time
Xu 2011	7-11	Intervention:264 Control:202	Region Shanghai	Multiple: School-home-community based	Shanghai Municipal Center for Disease Control and Prevention hundred young talent training plan (NO.: 2006-23)	BMI; PA; Diet;
Shi	9-10	Intervention:747 Control:755	Region Beijing	Multiple: School-home-based	2002-2004 Beijing Center for Disease Control and Prevention project	PA, Nutrition; behavior
Zhang 2013	10-18	Male:14,578 Female:14,452	Region Shandong	Simple: School-based	Medical and Health Program of Shandong, China (2009-HE049)	1-h PA; BMI; Skin fold thickness (SFT); WC;
Zhang 2015	7-12	Male: 3,749 Female: 2,950	Region Beijing	Simple: School-based	2015 Master student's thesis	PA; Skills; Psychology; National Students healthy Standard test
Zhang 2013	7-18	Total:215,317	National	Simple: School-based	2010 National Student Healthy Standard Test	BMI;National Students Healthy Standard Test;PA; Diet; Media

Table 48 - All German study review

Author	Age	Sample	Scope	Setting	Program	Key words
Brandstetter	7-8	Intervention:450 Control:495	Region Ulm	Multiple: School-home-based	URMEL-ICE: Ulm Research on Metabolism, Exercise and Lifestyle in Children; Parental questionnaire	BMI; BMI Z-score; Healthy behavior; triceps skin fold (TST); waist circumference (WC)
Danielzik	6-10	Intervention:344 Control:1,420	Region Kiel	Multiple: School-home-based	KOPS: Kiel Obesity Prevention Study; Parents involved	BMI; TST; WC
Drenowatz	7.6±0.4	Male:594 Female:526	Region Ulm and adjacent region	Multiple: School-home-based	URMEL-ICE: Ulm Research on Metabolism, Exercise and Lifestyle in Children; Parental questionnaire	BMI; BMI percentile; PA; Allgemeiner sportmotorischer Testfür Kinder (AST)
Golle	9-12	Male:108 Female:69	Region Brandenburg	Simple: School-based	Brandenburg study; Parental questionnaire	Urban and Rural; BMI; Motor test
Graf	5-9	Intervention:459 Control:187	Region Cologne	Simple: School-based	CHILT: Children's Health Interventional Trial	Health education; PA; Motor test
Kettner	7.1±0.6	Male:159 Female:159	Region South-west	Simple: School-based	Baden-Württemberg study; Parental questionnaire	Sex-specific; age-related differences;
Kleiser	3-17	Normal:13,450	National	Multiple: School-home-based	KiGGS: German Health Interview and Examination Survey for Children and Adolescents; Parental questionnaire	BMI;Socio-economic status(SES);
Kreuser	8-11	Normal:37 Overweight:55	Region Freiburg	Simple: School-based	FITOC: Freiburg Intervention Trial for Obese children	Daily PA; Spare time; Screen time; BMI-SDS
Maier	5-8	Male:81 Female:70	Region Stuttgart	Simple: School-based	Baden-Württemberg study; Parental questionnaire	Sex-specific; Diet; SES; spare time activity;
Nagel	6-9	Male:594 Female:526	Region Ulm and adjacent region	Multiple: School-home-based	URMEL-ICE: Ulm Research on Metabolism, Exercise and Lifestyle in Children; Parental questionnaire	PA; Diet; BMI; Lifestyle; Parental characters
Naul	6-10	German:261 Netherland:296	Region German-Dutch border cities	Multiple: School-home-community-based	HCSC/gkgk: healthy children in sound communities	German-Dutch; Motor test; PA; Diet
Pei	10	Male:1,308	Region Munich, Leipzig,	Multiple:	GINplus: German Infant Nutritional Intervention Plus Environmental and Genetic Influences on Allergy	Intake of 11 food group;

		Female:1,257	Wesel, Bad honnef;	School-community -based	Development LISAplus: Influences of Lifestyle-Related Factors on the Immune System and the Development of Allergies in Childhood Plus Air Pollution and Genetics	Energy partition model; BMI Z-scores
Ravens-Sieberer	7-11	Normal:2,863	National	Multiple: School-home-based	KiGGS: German Health Interview and Examination Survey for Children and Adolescents; Parental questionnaire	Mental Health; BELLA study
Spengler(2012)	11-17	Normal:1,643	National	Multiple: School-home-based	KiGGS: German Health Interview and Examination Survey for Children and Adolescents; Parental questionnaire	Health-related behavior Pattern; PA; Motorik-Modul study
Spengler(2014)	10-24	Normal:2,169	National	Multiple: School-home-based	KiGGS: German Health Interview and Examination Survey for Children and Adolescents; Parental questionnaire	PA; Media use; Nutrition; Health-related behavior; Motorik-Modul study
Woll	4-17	Normal:4,529	National	Multiple: School-home-based	KiGGS: German Health Interview and Examination Survey for Children and Adolescents; Parental questionnaire	Motorik-Modul test; PA

4 Investigation of HCSC Project

HCSC instead of„ Healthy Children in Sound Community", which is an EU-based project. The strategy and structure of the project has been prepared after the outcome and recommendations of the EU-Study on "Young people's physical activities and sedentary lifestyles" (cf. Brettschneider et al. 2004; GK-EAC/33/03) that was accomplished as one of the four studies in the frame of the European Year of Education through Sport 2004. Then, in year 2005, German professor Roland Naul who comes from German Willibald Gebhardt Institute (WGI) and Dutch professor Willem Van Monfort who comes from Netherlands Institute for Sport and Exercise (NISB) together plan to launch the project and also prepared the basic issue. In February 2006, the first meeting in border city Velen, the mayor of Velen recommended this project should promote in Velen as a pilot study. Two month later established the project organization called back office (will explain in 4.2), the German-Dutch cross-border project named „Gesunde Kinder In gesunden Kommunen (German) / gezonde kinderen in een gezonde kindomgeving (Dutch) "(www.gk-gk.eu) implement in 12 municipalities in Netherland and Germany in 2008-2009. The HCSC project has multi-component concepts (PA, nutrition, media) and the necessity of cross-sectoral approaches with relevant local stakeholders (schools, community offices of education and public health, sport clubs, parents) to prevent the childhood obesity, promote an active lifestyle.

4.1 Concept and Strategy of HCSC

The concept of HCSC is target to counteract physical inactivity and obesity of children and to support a healthy lifestyle with motor abilities and psycho-social well-being at the age of primary school, it not only focuses on overweight children, instead all children groups are addressed. There are four key target areas for the protection and promotion of healthy lifestyles in children:

- ✓ The participating children should be motivated to sustain an active lifestyle. This applies not only to the problem group of overweight children, but explicitly to all children. In addition to encouraging 60 to 90 minutes of daily exercise and the wider development of basal motor skills for exercise, games, and sports, it should also be designed to promote balanced nutritional and media consumption patterns.
- ✓ The starting point for the promotion of these three areas of behavior (exercise, nutrition, media) is to link up the different spheres of these children's lives. Families, schools, sports clubs, and communities are especially significant contacts for this type of intervention measure, all of which need to closely cooperate within a local network on the project's round tables.
- ✓ The complex of measures provides for instruction and activities inside and outside the school and the classroom, and these are also linked together, for example, with three hours of physical education with the emphasis on the promotion of health, combined with an hour of interdisciplinary social studies covering topics such as „my body," „my nutrition," „my exercise habits," and „my media-free time." Isolated groups of students whose basal motor activity

diagnosis calls for additional exercise are supported individually within the project by means of appropriate differentiated offers.

- ✓ The envisaged cooperation and joint coordination between the partners (such as family, school, sports club, and community) is achieved by means of a local network. The key partners meet locally at regular intervals as a round table to plan and organize the project and its upcoming activities. In each participating municipality there is a „community moderator" who is responsible for agreeing local activities with the round table partners and then implementing them together with the schools, sports clubs, and local government departments.

The HCSC project strategy is to give a successful and developmentally appropriate education, physical integrity (e.g., without motor deficits or overweight but with regular physical activity and a healthy, balanced diet), plus psychosocial integration into their life-world and the "active" development of age-appropriate, ethical, and moral behavior in dealing with their classmates and their adult caregivers (cf.HCSC group.2011; Shen et al. 2014, 2015).

4.2 Organization and Construction of HCSC

The organization structure can be seen in the following Figure 52. First, public authorities (school board and health board of the municipality) and civil societal partners (representatives of local sport club organizations and single sport clubs, private based health centers) build a community based multi-actor network called „front office", which have four main tasks:

- ✓ Promotion of additional weekly exercise periods by means of a joint action concept for daily exercise periods coordinated and agreed between schools and sports clubs;
- ✓ Improved nutrition and the development of eating habits by means of practical measures, including relevant information in schools' general and social studies classes;
- ✓ Community health care (public health) in which local authorities prioritize physical activity as a means for ensuring healthy growth and an active lifestyle in children and adolescents and facilitate interdepartmental measures with more cooperation between school, youth, health, and sports departments;
- ✓ Improvement of the community infrastructure for movement, play, and sports, making children's and young people's everyday life settings (residential districts, school routes and school yards, play streets, etc.) safe, clean and attractive, allowing more modern, activity-friendly space for informal sports activity-a further motivation for children and young people to take more exercise.

Beside the cross-border project, this concept and strategy was applied in an EU-wide project on behalf of EC's programme"Preparatory Action in the field of Sport" (2009-2011). Then, the applicant body (German Sport Youth) and all "partner organizations" from different selected countries build together a common network to diffuse, implement and evaluate the HCSC-EU project (steering committee). Here

the “partner organizations” means the applicant body is sport/youth sport organizations as well as university based higher learning institutes with research units in PA and youth sports. Like in HCSC-EU project the “partner organizations” are Youth Sport Trust – YST (UK), Český Svaz Tělesné Výchovy-CSTV (CZ), Nederlands Instituut for Sport enBewegen -NISB (NL), European Non-Governmental Sport Organizations - ENGSO Youth (EU), the (European Academy of Sports, Velen - eads (DE), Federazione Italiana Aerobica e Fitness – FIAF (IT); Charles University of Prague (CZ), E. Piasecki University School of Physical Education (AWF -PL) and the Willibald Gebhardt Research Institute (WGI - DE) based at the University of Duisburg-Essen (cf.HCSC group.2011)

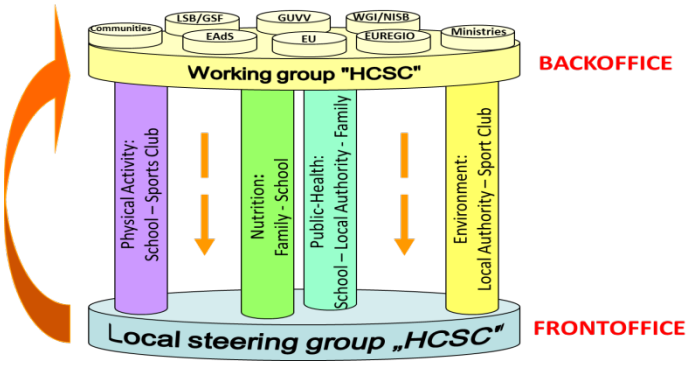


Figure 52 - Organization structure of HCSC (cf. HCSC group.2011)

Each partner organization as a “second organizer” will establish a national “back office” in its country for further support of all national “third parties (schools or sport clubs)” who build a community based “round table” network as a “front office” at municipalities which participate in the project. The duty of the national “back offices” is the evaluation of the HCSC project in cooperation with their “front offices” of the municipalities who represent the local network partners (schools, sport clubs, municipality offices for health, education and sport) as well as in cooperation with experts of other “second organizations” who represent together the international “steering committee” of this project. Meanwhile with the support of the second organizers in the different countries the local schools and sport clubs at selected municipalities will implement the HCSC programs of extended and health enhanced PE/PA units including nutrition aspects into the school curriculum and including further education units for teachers and coaches (cf. Naul et al.2009,2011; Shen et al.2014).

4.3 Arrangements and Implements of HCSC

At the beginning of the project, all the first year students involved are given a basal motoric diagnosis that scrutinizes their age-appropriate learning development and their weight status (BMI). Subsequently, they all receive individually tailored support during the third school sport period. In addition, on two afternoons a week, all pupils are offered further differentiated courses provided by local sports clubs as a way of continuing to encourage individuals’ exercise skills and healthy behaviors. And at each end of school year are given another motoric diagnosis. During the school days,

HCSC provides curricular, cocurricular, and extracurricular activities (integration), see the following:

- Physical Education

School based ordinary physical education is allotted three hours per week in each HCSC schools: first basic physical education lesson for all children in the class (training of basal motor skills, elementary physical education, promoting flexibility, coordination, endurance, and strength); second basic sports lesson involving different types of games to extend these basal motor skills in games and sports; third differentiated physical education lesson for all the students, given by additional teaching staff in small groups and separate rooms according to the children's individual development profile (BMI and motor development).

- General and Social Studies

The curriculum for general and social studies included one hour per week on the topics body, diet, lifestyle, and health promotion, highlighting their joint contribution to healthy development. In order to more effectively and more directly promote the raising of healthy children, our joint health project not only needs to monitor the motor and physical development of each of the participating children, but it also needs to reveal lifestyle components that either encourage or hinder that development, particularly those factors that influence their exercise habits, eating habits, and media consumption because all three of these have a lasting effect on lifestyle. From the second school year we therefore ask the children and their parents to each complete a questionnaire including questions about these three factors. The results are then used to interpret the motor tests.

- Extracurricular School Sport

For the HCSC/GKGK project, each school is cooperating with at least one sports club in its municipality. Thanks to this cooperation, it is possible to offer all the students in the project two additional afternoon classes of movement and exercise to reinforce and broaden the improvement in their health and to supplement the three PE lessons they receive at school, specifically to bring their daily exercise periods up to 60 or 90 minutes.

- Active School Route and Sports During Break Times

The "walking bus" was introduced to provide an active transport between school and home. This concept means that children walk to school along safe sidewalks accompanied by individual parents or other persons. On this route, there are "stops" near to the children's homes at which the walking bus will halt at prearranged times so that the individual children from each residential area can join it. Other extracurricular activities include sport during breaks, play dates, sports, swimming parties, and so on.

- Healthy Eating and Food Preparation

As part of the general and social studies class, and as additional events in the afternoon and early evening, there will also be separate and joint cookery courses and "school fruit events" for the schoolchildren and their parents. For example, in HCSC-GKGK project, two basisschoolen in Enschede already have a school vegetable garden with an adjoining medium-sized kitchen where the children can themselves grow, harvest, and learn to prepare the produce. Similarly, during break periods, many GKGK schools organize and prepare a "healthy breakfast" together with teachers. And most of the GKGK schools in NRW take part in the EU's "school fruit project."

All these measures combine to produce an ideal HCSC timetable as exemplified (Table 49). The local networks incorporating teachers, community moderators, and other partners are all working toward the implementation of this weekly timetable in schools. HCSC combine their single efforts and programs for a commonly agreed health-enhanced PE/PA-program for local children to promote and implement more opportunities for an active lifestyle to counteract physical inactivity and overweight/obesity.

Table 49 - HCSC timetable

Time	Monday	Tuesday	Wednesday	Thursday	Friday
Active Commuting	Walking Bus				
08:05					PE: separated subgroups to balance special needs
08:55	PE: basic motor skills development				
09:40	Break: healthy breakfast, active school				
10:05				Science: Nutrition, my body, my PA	
10:55			PE: basic skills and techniques in games		
11:40	Break: healthy breakfast, active school				
11:55					
12:40					
13:20					
Active Commuting	Walking Bus				
Afternoon		PA: Sports Club		PA: Sports Club	

4.4 Evaluation and Supervision of HCSC

An evaluation report will be provided for each level of the project (steering group, back offices, front offices). Supervision will be conducted by the steering committee for the different national “back offices”, and the national “back offices” will supervise their “front offices/third parties” of the municipalities. In addition, the steering committee will do fact-finding-visits to municipalities to supervise implementation and evaluation activities. Furthermore, the steering committee and the “back offices” will provide two manuals: one manual for monitoring the implementation process of the HCSC-program at schools and sport clubs; a second manual for evaluation measurements of an active lifestyle of primary school children (cf. HCSC group 2011).

4.5 Record of HCSC in Germany and Europe

HCSC project first started in 2005, professor Roland Naul and professor Willem Van Monfort together plan to build a German-Dutch children overweight and obesity prevention project in Germany and Netherland border to promote an active lifestyle. As a part of working group at the Sports Unit of DG EAC “Sports and Health” at the European Commission in Brussels in year 2006, a pilot project finally with two classes of third years and three classes of second years was implemented and evaluated over half a school year at the beginning of the school year 2007⁄2008(cf. Hofmann 2008; Hofmann & Naul. 2009). Later, interregional cooperation between provincial governments in the Netherlands and the North-Rhine Westphalia Ministry of Economic Affairs and Energy led to a joint Interreg IV A application for a four year longitudinal project to set up local networks (round tables) in twelve selected municipalities with twelve more elementary and basisschoolen in the border regions of Germany and the Netherlands to carry out a four-year GKGK intervention at local primary schools (cf. Naul 2012). The original values of motor ability tests show significant increase in endurance, coordination, velocity and force tasks. Also first changes for BMI distribution are explored in intervention, it achieved a lot.

HCSC promoted in Europe has traced to two big issues. First, in 2006, World Health Organization (WHO) launched European ministerial conference on „European Figureer on counteracting obesity” in Istanbul, aim to slow down and stop the obesity epidemic within the next 4-5 years, especially among children, and that the obesity prevalence trends should be reversed before 2015. To achieve this, the Figureer explicitly calls for action beyond health education: changes in the physical, political, informational and social environments are needed to facilitate a healthy energy balanced lifestyle (cf.WHO.2006).Second, in 2008 Brussels, EU Working Group „Sport& Health” implement the EU Physical Activity Guidelines: Recommended policy actions in support of health-enhancing physical activity (HEPA), since then, all the EU member countries reviewed and strengthened the existed national sports strategies to promote HEPA.(cf. European Commission.2008). So the best practice gkgk gained a further European dimension in 2009, when a proposal

submitted on behalf of the lead partner German Sports Youth and the European umbrella association „ENGSO Youth," together with sports organizations and research institutions from five other EU countries (Czech Republic, Italy, Netherland, Poland and United Kingdom), was approved by the European Committee.

As one of the preparatory actions successfully proposed to the sports unit of DG EAC in Brussels for 2010. From January 1st to June 30th 2010, (end of school year and/or regular summer programs of youth sport activities) HCSC diffuse the program to all these six countries to build the back offices of project and local multi-actor-networks in the municipalities; from July 1st 2010 up to January 31st2011, it further diffusion of the HCSC concept in each participating country and implementation and evaluation of the HCSC program into at least one national municipality in each participating country (local schools and sport clubs); from February 1st and will be completed on March 31st 2011, data analysis of the test items, feedback and evaluation reports of the applicant and its partner organizations for the local stakeholders (front offices) as well as for the EU-Sport Unit in Brussels (final report)(cf. Naul. 2012)

4.6 Record of HCSC in Shanghai

The successful implement of HCSC in Europe courage WGI look for more partners outside Europe, so first time WGI came to China in 2011 discussed with University in Hong Kong, Macao and Shanghai, finally made an agreement with sport department of Tongji University in Shanghai as HCSC's "partner organization" in China. So Tongji University undertake HCSC China part task. HCSC-CN includes central components of the life world of children's nutrition, physical activity, and screen time in leisure, social and geographical environment, so family, school, sport club and community are the four essential settings for this project. The implement of HCSC-CN project can be addressed by the following Figure 53.

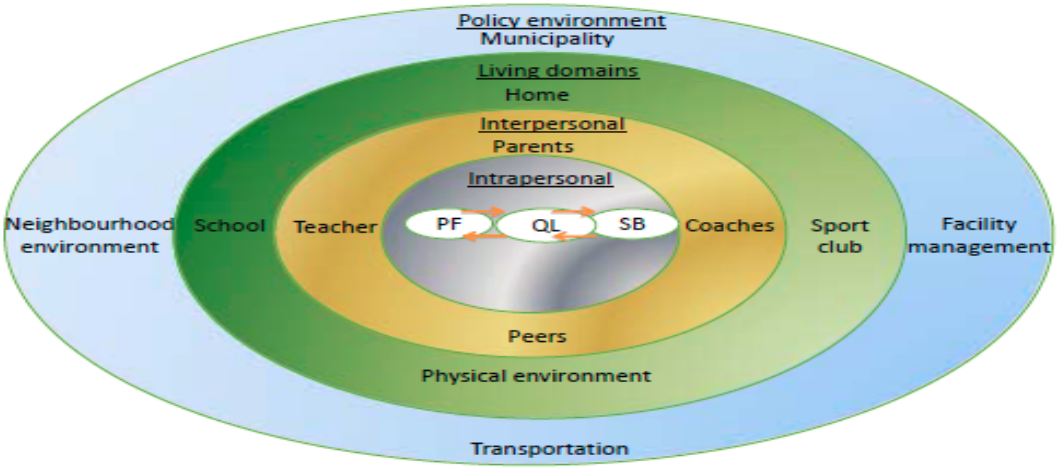


Figure 53 - Concept structure of HCSC-CN (cf. HCSC group.2011)

As we see in Figure53,the first and core actor level is the participating children and their three intrapersonal behavior areas: physical and health development (PF) plus motor skills, including BMI; the qualitative aspects of their active or passive lifestyle

(QL) that cover the social context of their leisure behavior (exercise, nutrition, and media) including their mental and emotional well-being; and aspects of their social integration into peer groups together with indicators of group climate, group cohesion, and physical self-concept (SB), this intrapersonal level distinguishes three different areas of behavior for the students. And all these performances need the physical activity guider to implement, so in October 2011, Tongji sport department built HCSC-CN research group, which includes one group leader, one project manager, four physical activity guiders, two monitors, fifteen testers and two data analysts. January 2012 had the training for the physical activity guider and testers to help all members perform their duties well.

The second actor level is the interpersonal relationships in the children's central life-worlds (i.e., the influence and interaction of children with their parents, teachers, trainers or coaches, and peers), so in March 2012 Shanghai, HCSC group did investigation among Shanghai primary schools, finally choose Tongji primary school and Dahushan road No.1 primary school as first pilot study model schools and 300 students from two primary schools are involved (cf. Shen et al. 2014).

The third level is their physical-material life-world, (i.e., the existing or constructed conditions of their residential area or their residential conditions, the infrastructure of schools and school grounds, and the structural characteristics of the participating sports clubs). HCSC-CN schools added extra three physical activity sessions per week, therefore count the original two physical education course, there five session of physical acidity per week. Except the organized school sports, HCSC-CN schools made parent-child plan for students which means after school each child will together with parents do at least two times sport activity per week, each time at least half an hour, and the content can be more flexible and variable, no special request. Joining sport club are encouraged but consider about the extra fee for family, here in this project we do not make agreement with parents, only suggested.

The last level is local political control of the children's life-worlds and living conditions: the town's education, health and sports policies, sociospatial planning and development processes for their residential neighborhoods, the available sports facilities for their physical activity, and the means of transporting them to and from these life-worlds (schools, clubs, etc.) in the form of more or less motorized and nonmotorized segments of their daily physical activity (cf. Naul. 2012). This is also considered when we choose the HSCS-CN schools. After investigation of HCSC Shanghai primary schools in early 2012, our research group made two times of activity between PE guiders and motor testers in schools, finally September 2012, HCSC-CN project implement in the autumn semester in Shanghai.

Part C

5 Reviews and hypothesis between China and Germany

5.1 Chinese Results and Outcome of Reviews of Overweight

We reviewed the formation and development of Chinese overweight situation, which first formed in municipality like Beijing, Shanghai. The formation of this Chinese phoneme could conclude as follow. In China, municipalities compare with other cities, it has better economic status, citizens are more divers, they are open-minded and easier to accept new things, so western restaurant first open their chain stores in municipality. KFC, McDonalds these fast food contain more oil and more sugar or salt, though convenient not healthy (cf. Reardon et al. 2012, 2013). But people used to purchase these western foods as a fashion, especially the youth (cf. Zhai et al. 2014). As traditional eating habit changed but lack of sport, people are become overweight or in a sub-health state. So we can see that the first overweight group from municipality, since now already over 20 years, and the moment spread to other capital cities and also effect the developing small cities.

The main overweight group in adults is the 30 to 45 years old men, not only the number are still growing, but also obesity-related non-communicable diseases are rising (cf. Yoon et al. 2006; Yang et al.2010; Reynolds et al.2003, Popkin 2008; He et al.2005). The main overweight group in children and adolescent is age from six to ten years old boys, and higher rate of these overweight children later to be overweight adolescents and adults (cf. Gordon-Larsen et al. 2014; NPFT. 2010; NSPHT 2010).

The mild malnutrition rate has decreased and low weight detection rate has decreased as well, but obesity and overweight rate are continuing grow in whole China (cf.NPFT. 2010; NSPHT 2010). From 2005 to 2010, concentrated in developed regions like municipality and eastern coast line cities; urban area had higher obesity and overweight rate than rural area, overweight and obesity boys more than girls (cf. Jones-Smith et al 2011; Doak et al.2000, 2002; Wang et al.2002; Mendez et al.2005). From 2010 to 2014, the obesity and overweight rate still continue, but municipality cities were under control, small developing cities have more and more overweight and obesity people; north China had more overweight and obesity cities than south China, east China had more overweight and obesity cities than west China. Children and adolescent's overweight and obesity rate became grows fast in both gender, overweight and obesity children became overweight and obesity adolescent, boys are more easily overweight or obesity than girls (cf. Xi et al. 2012; Wildman et al. 2008; Wang et al, 2007).

In general, Chinese overweight and obesity from municipality to other developing city, from Middle Eastern coast to north eastern coast, from east China to middle China. Big cities have more overweight and obesity people than small cities, urban area have more overweight and obesity people than rural area in the same city, men overweight and obesity more than women, boys overweight and obesity more than

girls. And overweight and obesity age become younger, the overweight and obesity group get bigger, and overweight and obesity related disease increase faster.

5.2 Chinese Results and Outcome of Reviews of Motor Development

The Chinese motor test first time in schools was in 1960's as a militarization sport, two hours PE classes within their curricula and two hours for extracurricular sport activities, the item of PE based on the military training, such as upper limb exercise, raising both arms, chest forwards, head up, but also have basketball, football and table tennis in class (cf. Shen et al. 2012; Gu. 2006; Fu 2008). The main work of PE is healthy first, no academic knowledge and no motor test. Then later 1980's, it established Chinese students' healthy test in all schools according to the age (cf.NSC 1978; CME et al. 1978). In primary schools, motor test contains strength (throw the balls or long jump), endurance (boys 1000-meter run, girls 800-meter run), speed (50-meter run) and flexibility (sit ups), in university have different kinds of ball games (basketball, football, badminton, table tennis) and gymnastic, but only one or two semester, there is no motor test only technique test (cf. ME & NSCMH 1982). After 2000, PE had more items, and all the students need national students' physical test according to the grade every semester. It contains strength (long jump), endurance (boys 1000-meter run, girls 800-meter run), speed (50-meter run) and flexibility (sit ups, 50m×8 shuttle sit &reach, one minter rope), and sport techniques (cf. CSC. 1995; Shen et al. 2012). The Chinese students' motor ability decreased year by year, especially in endurance ability (cf. Chen et al.2011; NSPHT 2010; NPFT 2010), most students do not like sport, take sports as a task, and fewer students enjoy sport.

In general, Chinese motor test is national designed physical test, all students are involved, it test every semester, contains strength, endurance, speed and flexibility test, in high grade will have sport technique test. Students' physical ability is not good as their comparators.

5.3 German Results and Outcome of Reviews of Overweight

Germany has the highest number of overweight people in Europe (cf. Deutsche Welle, 2007; BBC.2010). Since 1990, the overweight or obesity rate in Germany is already high, but the prevention of overweight and obesity performed worse in the past two decade. In 1998, the German National Health Interview and Examinations Survey 1998 (GNHIES98) reported that, the obesity rate of male is 18.9% and of female is 22.5%. But 2011 the Organization for Economic Co-operation and Development (OECD) reported that, the overweight rate in Germany is up to 36.7% (no gender), and the obesity rate in 2013 is 15.7% (no gender)(cf. Robert Koch Institute 1998;DEGS1.2013; Wikipedia. 2015; The Local. 2010; OECD.2014,2015). The situation has not changed, even get worse.

But lots of overweight and obesity relative projects launched in whole Germany. Project named "Health Behavior in School-Aged Children (HBSC)" (cf. HBSC-Team Deutschland. 2011), "German Health Interview and Examination Survey for Children

and Adolescents' (KIGGS) (cf. KIGGS-Team 2007, 2008)", all national-wide surveys which proved the overweight situation in children and adolescents. And regional-wide project like "Healthy Children in Sound Communities (HCSC/gkgk)" (cf. HCSC group), "Ulm research on metabolism, exercise and lifestyle intervention in Children (URMEL-ICE)" (cf. Brandstetter et al. 2012), "Freiburg Intervention Trial for Obesity Children (FITOC)" (cf. Kreuser et al.2013), "The Kiel Obesity Prevention study (KOPS)"(cf. Danielzik et al.2006), are more focus on intervention in children and adolescents. From all these above projects, we see that, the overweight and obesity proportion still higher though under control now, but still has doubled in the past decade (cf. Die Welt. 2011), children and adolescents' overweight and obesity are still higher compare with the other 44 Europe countries (cf. Deutsche Welle. 2011).

In general, German overweight and obesity has historical elements, there are more overweight and obesity children and adolescent from former East Germany than West Germany (cf. Daniela et al. 2009), children and adolescent with German ethnic background or migration background or low socioeconomic status had higher overweight and obesity rate compare with the others (cf. Lampert et al. 2007; Erhart et al. 2007; Schlack et al. 2007, Hölling et al .2007).

5.4 German Results and Outcome of Reviews of Motor Development

The biggest motor test in Germany is MoMo test from KIGGS project, it has large national representative sample size, and the motor test includes endurance (aerobic and bike endurance test), strength (strength endurance/power and standing long jump, force plate, and push-ups), agility (reaction time and reaction test), coordination (coordination under time constraint/coordination with precision, single legs stance, MLS-tracing lines and MIL-sorting pens, backwards balance, jump side to side), flexibility (forward bend, reaction test). It also has gross motor skills like walking, jumping, gross motor limb movements (upper extremities, trunk, lower extremities), fine motor limb movements (hand) (cf. Ravens-Sieberer et al. 2008; Spengler et al. 2012; Woll et al. 2011). And the other three studies' motor test also include endurance (6-min run or 9-min run), strength (medicine ball throw and throw on target, or ball push, or push-ups and stand board jump),agility (20-m run or 50-m run),coordination (obstacle run and one leg stand, or star coordination run, or backwards balance), flexibility (throw-and-run, sit & reach, or sit-ups and rapid alternation)(cf. Drenowatz et al. 2013; Golle et al. 2014; Naul et al. 2012). The motor test show us, German students who engaged in sport have good motor ability, the intervention students have better performance than control students, boys better than girls in both groups.

In general, German motor test are project designed test, though has difference still can see some same test, German test has more game involved, and more equipment needed (like bike endurance test). German students, who participates more physical activities, who will have better physical ability.

5.5 Hypothesis of HCSC-CN-DE

The HCSC-CN-DE study based on HCSC/gkgk project, has body shape measurements and motor tests. The motor test has six ability tests which contains strength (sit-ups), explosive strength (stand board jump), agility (20-m run), endurance (6-min run), coordination (jump sideways), and flexibility (sit & reach). According to the former studies, here are the hypotheses.

5.5.1 BMI

- Chinese girls have a lower mean BMI than German girls at t1, t2, and t3
- Chinese boys have a lower mean BMI than German boys at t1, t2, and t3
- More German girls will be more overweight and obese than Chinese girls at t1, t2 and t3
- More German boys will be more overweight and obese than Chinese boys at t1, t2, t3
- Overweight and obese Chinese girls will not significantly lower their BMI from t1 to t3
- Overweight and obese Chinese boys will not significantly lower their BMI from t1 to t3
- Overweight and obese German girls will significantly lower their BMI from t1 to t3
- Overweight and obese German boys will significantly lower their BMI from t 1 to t3

5.5.2 Physical development

- Chinese girls will have a better coordination (jump sideways) than German girls at t1, t2, and t3
- Chinese boys will have a better coordination than German boys at t1, t2, and t3
- German girls will improved their coordination results more than Chinese girls between t1 and t3
- German boys will improve their coordination results more than Chinese boys between t1 and t3
- German girls will have a better aerobic endurance capacity (6 Min. run) than Chinese girls at t1, t2, and t3
- German boys will have a better aerobic endurance capacity than Chinese boys at t1, t2, and t3
- Both German boys and girls will improve their endurance capacity much more than their Chinese counterparts between t1 and t3
- Chinese girls will have a better endurance strength (sit ups) than German girls at t1, t2, and t3
- Chinese boys will have better endurance strength than German boys at t1, t2, and t3
- Chinese girls and boys will improve their endurance strength development much more than their German counterparts between t1 and t3

- German girls will have a better explosive strength (standing broad jump) than Chinese girls at t1, t2 and t3
- German boys will have a better explosive strength than Chinese boys at 1, t2, and t3
- Both Chinese girls and boys will have a better improvement of explosive strength than their German counterparts between t1 and t3

6 Data and analyze of HCSC-CN-DE

6.1 HCSC-CN-DE Research Parameter

The HCSC-CN-DE project has Chinese and Germany parts, and both have anthropometric measurements and a motor test. Anthropometric measurements in China use a digital scale (Kedao, TZCS-I, China), and in Germany are carried out by professional staff. Body mass was recorded to the nearest 0.01 kg, height wasmeasuredwith precision of 1 mm. BMIwas calculated as body weight divided by heightsquared (kilograms per square meter). The motor test includes coordination (jump sideways), endurance (6-minute run), strength (sit-ups), explosive strength (standing board jump), agility (20m run), and flexibility (sit & reach) (cf. Hoffmann & Naul. 2009).

The jump sideways test is carried out in 50cmx100cm ground-box in which student jumps sideway as much as he can in 15 seconds, when the feet touch the middle line, or over the sideline, or jump at the same box, these are valid jump should not count.The 6minute run was tested in a 9mx18m area, the first two runs are demonstratated by guiders, then the following students run for as long as possible within 6 minutes. Forsit-ups, the tester lies on the mattress, one person helps to fix his or her feet on the ground and meanwhile count how many the subject can do in 45 seconds. The standing board jumpwas measured the subject-specific way of expressing it.The 20m run was measured by how fast the tester can finish the 20m run. In the sit & reach the test in China, the tester sits on the ground with straight legs, with hands trying to reach as far as possible in 3 second.In Germany, subjects stand on the box, bend their body and try to reach as far as possible in 3 second. All those tested were guided or tested by professional workersin both countries. Apart from the 6-minute run, all other tests were taken two times to the nearest millimeter or second, then recorded, and the better results will be recorded to analyze later.

The agility test (20m run) in China was calculated by a PE teacher with en electronic stop watch (Tianfu, PC2810, China), and in Germany it was calculated by en electronic runnng machine (Imhof Timing, Germany). For the flexibility test (sit & reach) in China, an electronic sit & reach machine (Kedao, TZCS-3, China) was used, and in Germany a manual sit & reach machine (self-made) was used. All other tests used the same equipments. Considering about the accuracy, the 20-m run and sit & reach results will be comparedin Chapter seven and eight.

6.2 HCSC-CN-DE Research Method

HCSC-CN-DE includes walking to school and physical activity intervention. Walking to school means students go to school or leave school by walking, using no other transportation; physical activity intervention includes three parts. Firstly, physical education. In schools, ordinary physical education in schools is allotted3 hours/week in Germany and in China to train the basic motor skills, elementary physical education, promote flexibility, coordination, endurance and strength. Secondly, sport

study. In both countries, schools will organize1 hour/week curriculum which relative with body, diet, lifestyle and health promotion, highlighting their joint contribution to healthy development. Thirdly, extra activity. Thanks to the HCSC schools in both sides, it is possible to offer all the HCSC students have extra activity in the afternoon to reinforce and broaden the improvement in their health (cf. Hofmann & Naul 2009; Naul et al. 2012; Shen et al. 2014).

6.3 HCSC-CN-DE Research Data and Analyzing of BMI

The presented results are based on data from990 children from Germany (N = 693) and the China (N = 297).Children came from 12 different cities: Shanghai(2 schools), Bocholt (4 schools), Emmerich (3 schools), Kleve (4 schools), Mores (4 schools), Rheinberg (3 schools), Velen (2 schools), Bottrop (2 schools), Borken (1 school), Isselburg (1 school), Reken (1 school), Mülheim (3 schools), and were on average 6.85years old (SD = 0.48)when intervention started and the first measurement took place in September 2012 (t1).The Chinese children's average age was 7.13 years old (SD = 0.34) and the German children's age was 6.57 years old (SD = 0.62), and therefore Chinese children are approximately 6 months older than German children. After intervention, the second measurement took place in November 2013 (t2), twelve to thirteen months later (depending on the communities and schools), so that the age of Shanghai children was8.20 years old (SD = 0.40), and German children was 7.53 (SD =0.61) years old. Our average age of two cohorts were 7.87 years old (SD =0.51) att2. And after two-year intervention, the third measurement took place around November 2014 (t3), twelve months later (depending on the communities and schools), so that the age of Shanghai children was9.18 years old (SD = 0.42), and German children was 8.54 years old (SD = 0.62). So the average age of two cohorts were8.86 years old (SD =0.52) at t3. In the whole measurements, 470 girls (China143 and Germany 327) and 520boys (China 154 and Germany 366) took part in whole measurements. In total, 990 children from two Shanghai schools and 25 German schools took part in these cohorts.

Furthermore, data from measuring point t1, t2 and t3 were collected and compared in age and gender distribution. Special focus was set on children by BMI-Cole value (children who are overweight and obese) at t1, t2 and t3. The BMI and BMI-Cole will also be compared by country in chapter seven and chapter eight.

6.3.1 Hypothesis one and two

Hypothesis one and two were tested. Hypothesis one stated that Chinese girls show lower levels of BMI compared to German girls at (t1 to t3) and hypothesis two stated that Chinese boys show lower levels of BMI compared to German boys (t1 to t3).
Altogether, the BMI of Chinese as well as German children show average levels. In both countries, BMI increased significantly with big effect sizes from t1 to t3 for girls as for boys [girls: $F(2,467) = 76.56$, $p < 0.001$, $\eta^2 = 0.247$, and boys $F(2,571) = 105.606$, $p < 0.001$, $\eta^2 = 0.290$]. In total, boys show higher levels of BMI than girls can be seen in Figure 54 in both countries. Looking at country level, Chinese children show higher BMI than German children. Therefore, the hypotheses have to be rejected.

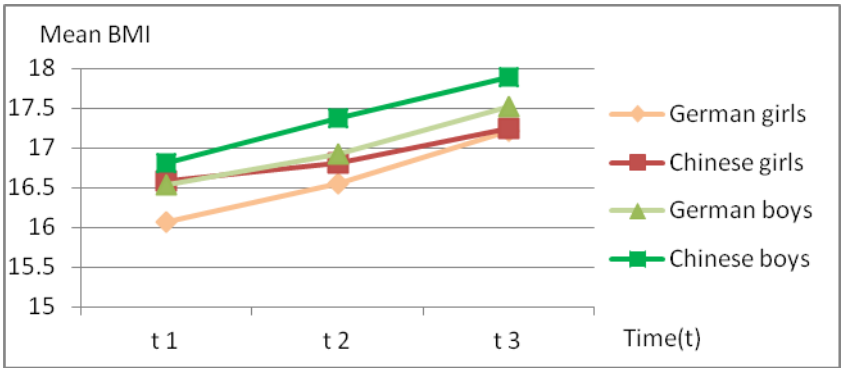


Figure 54 China vs. Germany mean BMI (t1, t2, t3)

6.3.2 Hypothesis three and four

Hypothesis three and four were tested. Hypothesis three stated that more German girls are more overweight and obese than Chinese girls in t1, t2 and t3; and hypothesis four stated that more German boys are more overweight and obese than Chinese boys in t1, t2 and t3.

According to BMI-Cole, we divide both the Chinese cohort and German cohort into four groups: group one is underweight (BMI-Cole <1), group two is normal weight (1≤BMI-Cole<2.5), group three is overweight (2.5≤BMI-Cole <3.5), and group four is obese (BMI-Cole ≥3.5). Because of the different cohort between countries, therefore choose to compare the overweight rate and obese rate, see Figure 55 and Figure 56.

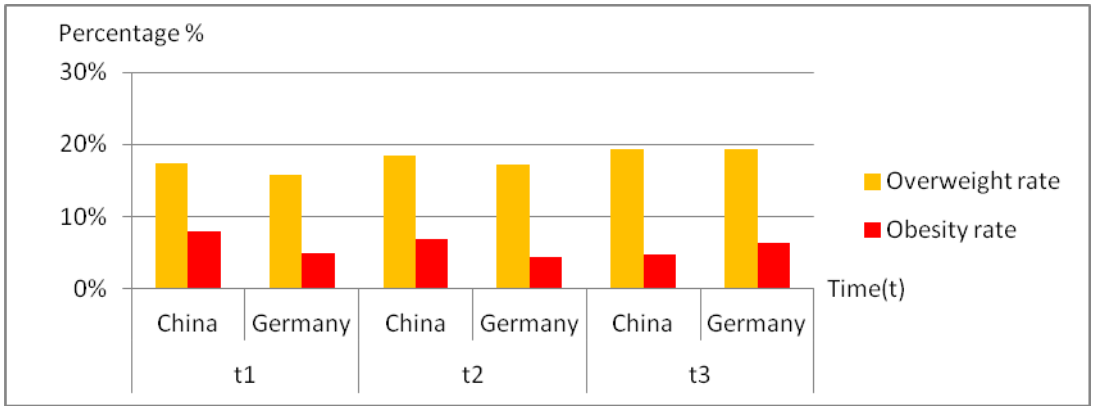


Figure 55 - The Percentage of overweight and obese between China and Germany from t1 to t3 in girls

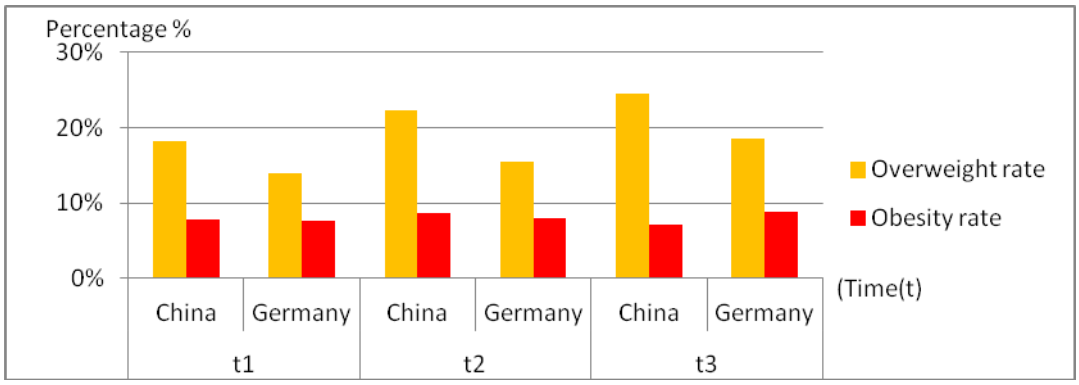


Figure 56 - The Percentage of overweight and obese between China and Germany from t1 to t3 in boys

The above figures show us that, in t1, t2 andt3, both countries have more overweight children than obese children. Chinese girls are more overweight and obese than German girls at t1 and t2, but not in t3, and there is no significant difference of BMI-Cole in t1 (p=0.167), while there is significant difference of BMI-Cole in t2 (p=0.008) and t3 (p=0.027). There are more overweight Chinese boys than German boys at t1,t2 and t3; there are more obese Chinese boys than German boys at t1 and t 2, but not in t3,there is no significant difference of BMI-Cole in t1 (p=0.556),t2 (p=0.053)and t3 (p=0.075).Therefore, hypotheses have to be rejected.

6.3.3 Hypothesis five and six

Hypothesis five and six were tested. Hypothesis five stated that overweight and obese Chinese girls will not significantly lower their BMI from t1 to t3; and hypothesis six stated that overweight and obese Chinese boys will not significantly lower their BMI from t1 to t3.

There are 26 overweight girls and twelve obese girls, 27 overweight boys and 13 obese boys, and so in total 38 overweight and obese Chinese girls and 43overweight and obese Chinese boys. From Figure 57, we can see that, from t1 to t3, there is a significant decrease of BMI-Cole in Chinese girls [t1 = 3.3, t2 = 3.1, t3 = 2.8; F (2, 36) = 19.043, $p<0.001,\eta^2=0.514$], and also in Chinese boys [t1 = 3.3, t2 = 2.9, t3 = 3.1; F (2, 38) = 5.899, $p<0.006,\eta^2=0.237$]. Therefore, hypotheses are incorrect, have to be rejected.

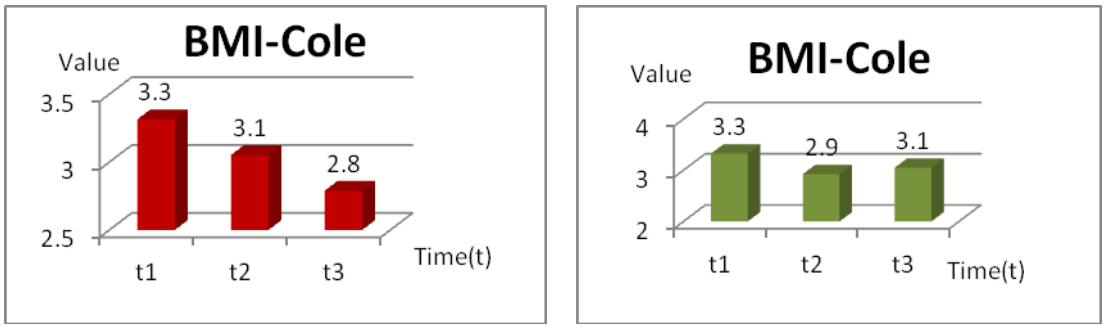


Figure 57 - Chinese overweight and obese BMI-Cole (t1, t2, t3) (left: girls; right: boys)

6.3.4 Hypothesis seven and eight

Hypothesis seven and eight were tested. Hypothesis seven stated that overweight and obese German girls have significantly lower their BMI from t1 to t3, and hypothesis eight stated that overweight and obese German boys have significantly lower their BMI from t1 to t3.

There are 41 overweight girls and 22 obese girls, 38 overweight boys and 39 obese boys, and so in total 63overweight and obese German girls, 77overweight and obese German boys. From Figure 58, we can see that, from t1 to t3, there is no significant decrease of BMI-Cole [t1 = 3.2, t2 = 3.1, t3 = 3.1; F (2,61) = 2.827, $p<0.067,\eta^2=0.085$] of medium effect size in German girls, but there is a significant decrease of BMI-Cole [t1= 3.3, t2 = 3.2, t3= 3.1; F (2,75) = 4.742, $p<0.012,\eta^2=0.112$] with a large effect in

German boys. Therefore, hypothesis seven is incorrect, have to be reject; hypothesis eight is correct, have to be proved.

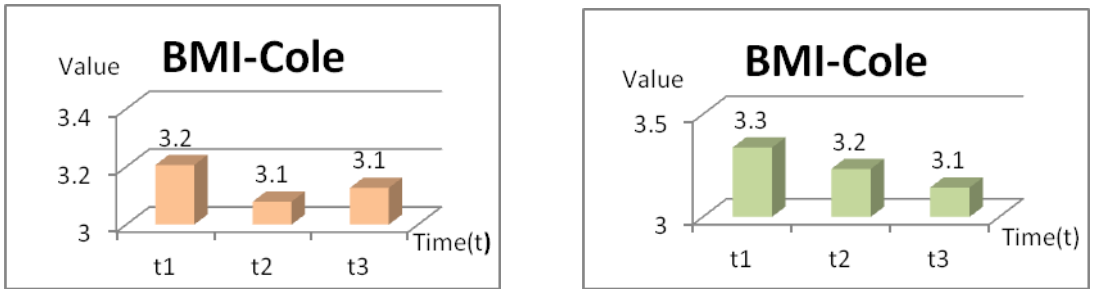


Figure 58 - German overweight and obese BMI-Cole (t1, t2, t3) (left: girls; right: boys)

6.4 HCSC-CN-DE Research Data and Analyzing of Motor Test

HCSC-CN-DE's motor test was tested during PE lessons at school. Test items were sit-ups (endurance strength), standing broad jump (explosive strength), 6-minute run (endurance), 20m run (speed), jumps sideways (all coordination) and sit and reach (flexibility). Test items and test execution were based on the German test manual DMT-6-18 (cf. Bös et al. 2009) except the sit and reach test, which is an item of the 'Euro-Fit' test battery used in the Netherlands instead of stand and reach in the DMT-6-18 in Germany; However, the Shanghai test tested sit and reach using a sit and reach machine. Therefore, as we mentioned, both the sit and reach and 20m run both items will not be compare here because of the different test equipment, but will analyze the calculation by country in chapter seven and eight.

6.4.1 Hypothesis one and three

Hypothesis one and three were tested. Hypothesis one stated that Chinese girls show better coordination capacity compared to German girls at t1 to t3, and hypothesis three stated that German girls improve coordination capacity compared to Chinese girls at t1 to t3.

In motor test coordination capacity (jump sideways), 141 Chinese girls and 326 German girls participated. From t1 to t3(see Figure 59), there is significant increase of jump sideways in both countries [China (t1 = 30.54 $\pm$ 5.97, t2 = 37.70 $\pm$ 6.98, t3 = 41.06 $\pm$ 7.46; Germany (t1 = 22.87 $\pm$ 6.34, t2 = 28.46 $\pm$ 6.02, t3 = 33.05 $\pm$ 6.04), F (2,464) = 437.272, $p<0.067,\eta^2=0.653$] of high effect size in girls, and there is no difference between the two countries [F (2,464) = 4.229, $p<0.015,\eta^2=0.018$]. Also, from t1 to t3, Chinese girls had better jump sideways results than German girls, but German girls improved more than Chinese girls (German vs China: 44.51% vs 34.46%). Therefore, hypotheses are both correct, have to be proved.

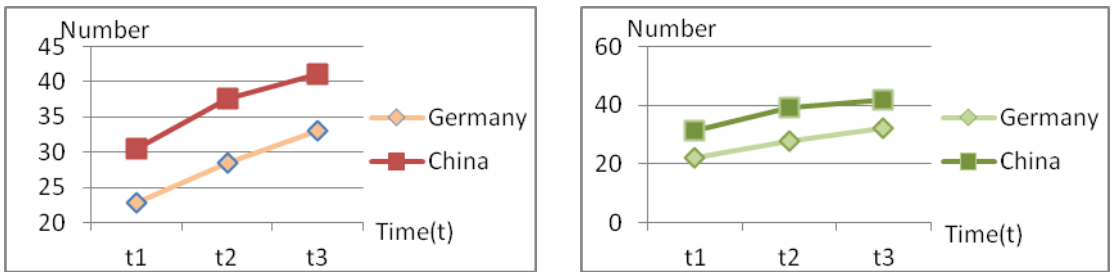


Figure 59 - Germany vs. China jump sideways results (t1, t2, t3) (left: girls; right: boys)

6.4.2 Hypothesis two and four

Hypothesis two and four were tested. Hypothesis two stated that Chinese boys show better coordination capacity compared to German boys at t1 to t3, and hypothesis three stated that German boys improve coordination capacity compared to Chinese boys at t1 to t3.

There were 150 Chinese boys and 365 German boys participating in the motor test coordination capacity (jump sideways).From t1 to t3 (see Figure 59) there is a significant increase of jump sideways in both countries [China (t1 = 31.17 ± 6.55, t2 = 39.27 ± 7.61, t3 = 41.76 ± 8.51; Germany (t1 = 22.02 ± 6.56, t2 = 27.84 ± 6.63, t3 = 32.29 ± 6.19), F (2,512) = 449.951, $p<0.001,\eta^2=0.637$] of high effect size in girls, and there is no difference between two countries [F (2,512) = 7.824, $p<0.001,\eta^2=0.030$]. Also, from t1 to t3, Chinese boys had better jump sideways results than German boys, but German boys improved more than Chinese boys (German vs. China: 46.64% vs. 33.97%). Therefore, hypotheses are both correct, have to be proved.

6.4.3 Hypothesis five, six and seven

Hypothesis five, six and seven were tested. Hypothesis five stated that German girls show better aerobic endurance capacity compared to Chinese girls at t1 to t3, hypothesis six stated that German boys show better aerobic endurance capacity compared to Chinese boys at t1 to t3, and hypothesis seven stated that both German boys and girls improve their aerobic endurance capacity much more than Chinese counterparts at t1 to t3.

There were 143 Chinese girls and 319 German girls who participated in motor test aerobic endurance capacity (6-minute run).From t1 to t3 (see Figure 60),there is a significant effect of 6-minute run by time [China (t1 = 815.79 ± 127.34, t2 = 874.85 ± 153.28, t3 = 821.09 ± 162.31; Germany (t1 = 836.17 ± 103.15, t2 = 880.49 ± 108.42, t3 = 919.99 ± 119.38), F (2,459) = 32.228, $p<0.001,\eta^2=0.123$] of high effect size in girls, and there is no difference between the two countries [F (2,459) = 26.616, $p<0.001,\eta^2=0.104$]. Also, from t1 to t3, German boys (363) had better 6-minute run results than Chinese boys (156), [China (t1 = 878.53± 161.36, t2 = 922.51 ± 179.95, t3 = 866.12 ± 180.87; Germany (t1 = 886.29 ± 109.66, t2 = 951.58 ± 114.96, t3 = 993.78 ± 128.36), F (2,516) = 40.796, $p<0.001,\eta^2=0.137$] of high effect size in boys. In addition, both German girls and boys improved more than Chinese girls and boys (China vs. German: girls 0.65% vs. 10.02%, boys 0% vs. 14.72%). Unfortunately, Chinese girls and boys did not improve according to biological growth, and were even

far behind what would be expected for their age. Therefore, hypotheses are correct, have to be proved.

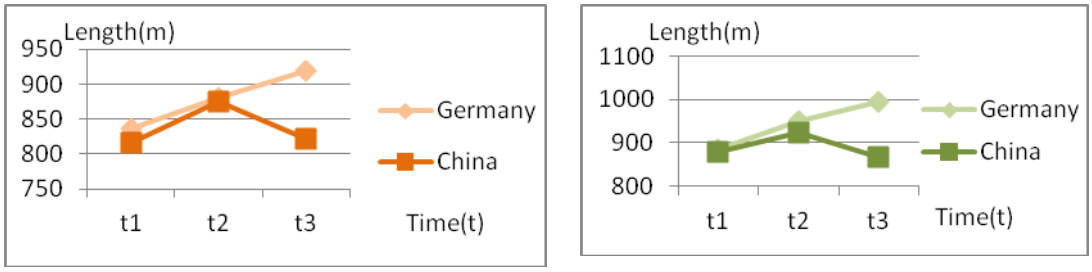


Figure 60 - Germany vs. China 6-minute run results (t1, t2, t3) (left: girls, right: boys)

6.4.4 Hypothesis eight, nine and ten

Hypothesis eight, nine and ten were tested. Hypothesis eight stated that Chinese girls show better endurance strength capacity compared to German girls at t1 to t3. Hypothesis nine stated that Chinese boys show better endurance strength capacity compared to German boys at t1 to t3, and hypothesis ten stated that both Chinese boys and girls improve their endurance strength capacity much more than German counterparts at t1 to t3.

There were 141 Chinese girls and 325 German girls participating in the motor test endurance strength capacity (sit-ups).From t1 to t3 (see Figure 61),there is a significant effect of sit-ups over time [China (t1 = 19.65 ± 4.87, t2 = 25.56 ± 6.37, t3 = 26.54 ± 6.07; Germany (t1 = 13.63 ± 5.26, t2 = 17.63 ± 4.92, t3 = 19.29 ± 4.85), F (2,463) = 271.476, $p<0.001$, $\eta^2=0.540$] of high effect size in girls, and there is significant interaction, but barely an effect size between the two countries' development: they had equal development in this item [F (2,463) =5.380, p=0.005, $\eta^2=0.023$], and Chinese girls had better results than German girls. Also, from t1 to t3, Chinese boys (150) had better sit-ups results than German boys (362), [China (t1 = 21.07±5.60, t2 = 24.73 ± 6.98, t3 = 26.49 ± 7.38; Germany (t1 = 13.53 ± 5.76, t2 = 17.99 ± 5.79, t3 = 19.67 ± 5.34), F (2,516) = 40.796, $p<0.001$,$\eta^2=0.443$] but no interaction [F (2,509) =1,124, p=0.326,$\eta^2=0.004$]. Also, both countries' girls and boys improved, but German girls and boys improved more than Chinese girls and boys (China vs. German: girls 35.06% vs. 40.79%, boys 25.72% vs. 45.38%). Therefore, hypothesis eight and nine are correct, have to be improved, however, hypothesis ten is incorrect, have to be rejected.

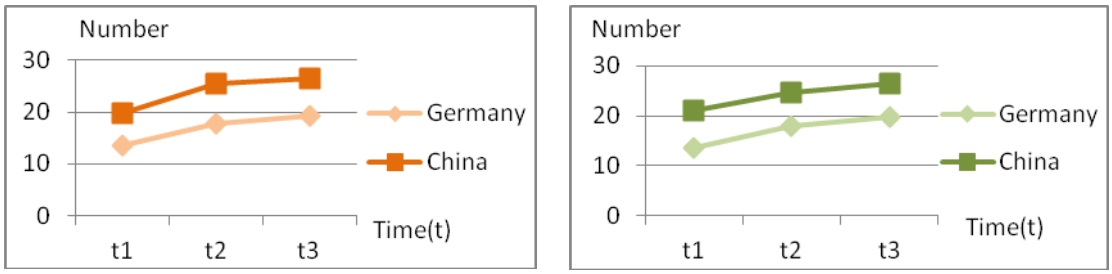


Figure 61 - Germany vs. China sit-ups results (t1, t2, t3) (left: girls, right: boys)

6.4.5 Hypothesis eleven, twelve and thirteen

Hypothesis eleven, twelve and thirteen were tested. Hypothesis eleven stated that German girls show better explosive strength capacity compared to Chinese girls at t1 to t3, hypothesis twelve stated that German boys show better explosive strength capacity compared to Chinese boys at t1 to t3, and hypothesis thirteen stated that both Chinese boys and girls improve their explosive strength capacity much more than German counterparts at t1 to t3.

There were 141 Chinese girls and 325 German girls participating in the motor test explosive strength capacity (standing broad jump).From t1 to t3(see Figure 62), there is significant effect of standing broad jump by time [China (t1 = 124.49 ± 16.45, t2 = 133.68 ± 14.50, t3 = 141.39 ± 15.20; Germany (t1 = 98.51 ± 18.31, t2 = 109.81 ± 16.19, t3 = 117.44 ± 16.59), F (2,463) = 260.678, $p<0.001$, $\eta^2=0.530$] of high effect size in girls, and there is no interaction in this item [F (2,463) =0.976, $p=0.378$,$\eta^2=0.004$], and Chinese girls had better results than German girls. Also, from t1 to t3, Chinese boys (148) had better standing broad jump results than German boys (364), [China (t1 = 135.05±16.53, t2 =141.96 ± 18.00, t3 = 148.06 ± 17.32; Germany (t1 = 103.78 ± 19.08, t2 = 115.52 ± 18.05, t3 = 123.12 ± 18.39), F (2,509) = 187.513, $p<0.001$,$\eta^2=0.424$], and also significant effect between two countries [F (2,509) = 7.581, $p=0.001$,$\eta^2=0.029$]. Both countries' girls and boys improved, but German girls and boys improved more than Chinese girls and boys (Germany vs. China: girls 19.22% vs. 13.58%, boys 18.64% vs. 9.6%). Therefore, hypothesis eleven and twelve are incorrect, have to be rejected, however, hypothesis thirteen is correct, and have to be proved.

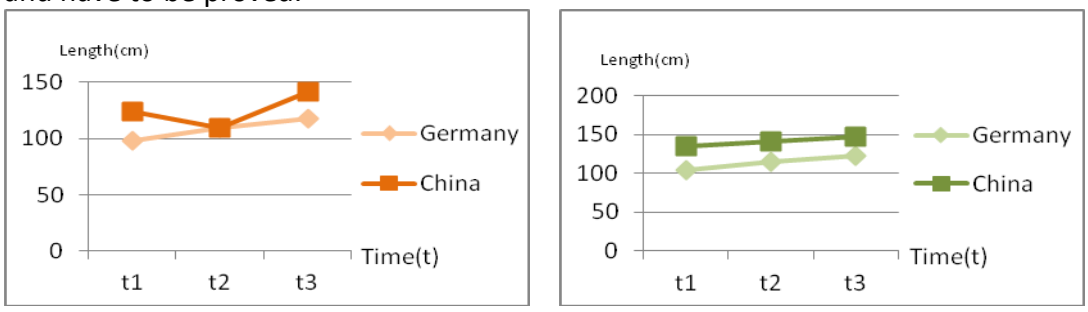


Figure 62 - Germany vs. China standing broad jump results (t1,t2,t3) (left: girls, right: boys)

6.5 Conclusion

In this chapter, we cited both BMI and motor test results, and compared HCSC-CN-DE hypotheses. We found that, the eight BMI hypotheses are unexpected, based on the literature, we realized that the number of Chinese who are overweight and obese has grown quickly in the past decade; however, we cannot imagine that China has more overweight and obese children than Germany. This result is very important because it is the first comparable study between these two countries. In the motor tests, with the exception of hypothesis ten, eleven and twelve, all the hypotheses are proved. We can see that Chinese children do have better coordination, endurance strength and explosive strength capacity than German children; however, German children had better aerobic endurance capacity, also were better at improving their endurance strength and explosive strength capacity than Chinese children.

Part D

7 Discussion and comparisons of German results

7.1 Comparisons of BMI

The mean BMI value of HCSC-CN-DE project in German cohort, girls have a significant increase [t1: BMI=16.07±2.02, t2: BMI=16.54± 2.31, t3: BMI=17.21±2.74, ($p<0.001$)] by years, and these results correspond with normal effects of growth. The BMI-Cole value of BMI development in girls can be seen in Figure 63. The number of overweight girls from t1 to t3 yearly increased annually by approximately 2%, but the number of obese girls from t1 to t2 decreased a little and then increased again in t3, and therefore the total number of overweight and obese children is growing. Meanwhile, the number of underweight girls 'is decreasing from 8.2% in t1 to 4.72% in t3.

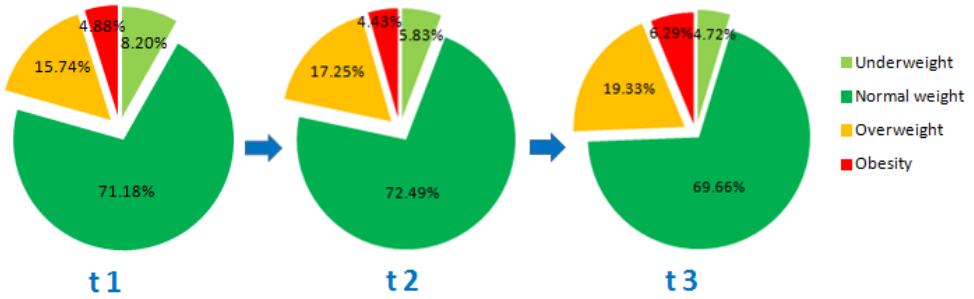


Figure 63 - German girls' BMI-Cole value from t1 to t3

The BMI in boys also has a significant increase [t1: BMI=16.53±2.32, t2: BMI=16.92± 2.57, t3: BMI=17.52±2.89, ($p<0.001$)] by years, and these results correspond with the normal effects of growth. The BMI-Cole value of BMI development in boys can be seen in Figure 64. The number of overweight boys from t1 to t3 yearly increased annually by approximately 2%, also, the number of obese increased annually by approximately 1%, but the underweight boys' number is decreasing.

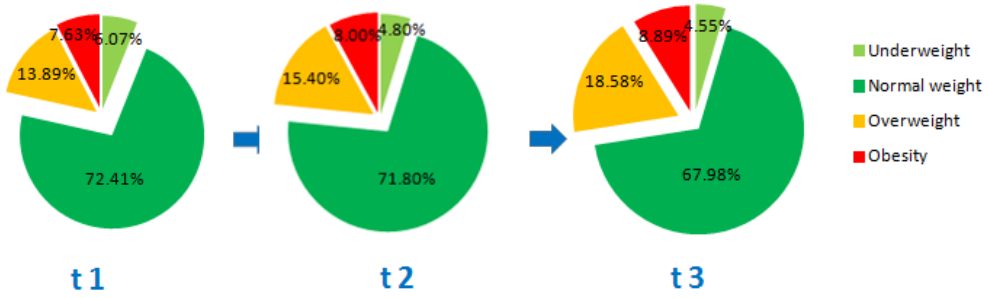


Figure 64 - German boys' BMI-Cole value from t1 to t3

German boys' BMI results are significantly higher than German girls ($p<0.001$), based on annual comparisons, more overweight girls than overweight boys, but there are more obese boys than obese girls. The total number of overweight and obese children is still growing.

7.2 Comparisons of Motor Tests

7.2.1 Coordination capacity

In the HCSC-CN-DE project coordination capacity (jump sideways), 326 girls and 365boys participated in Germany. We can see from Figure 65 that there is a significant development in both genders from t1 to t3: girls (t1 = 22.87 ± 6.34, t2 = 28.46 ± 6.02, t3 = 33.05 ± 6.04), boys (t1 = 22.02 ± 6.56, t2 = 27.84 ± 6.63, t3 = 32.29 ± 6.19) ($p<0.001$), with boys performing better than girls, and also improving more than girls (girls vs. boys: 44.51% vs. 46.64%).

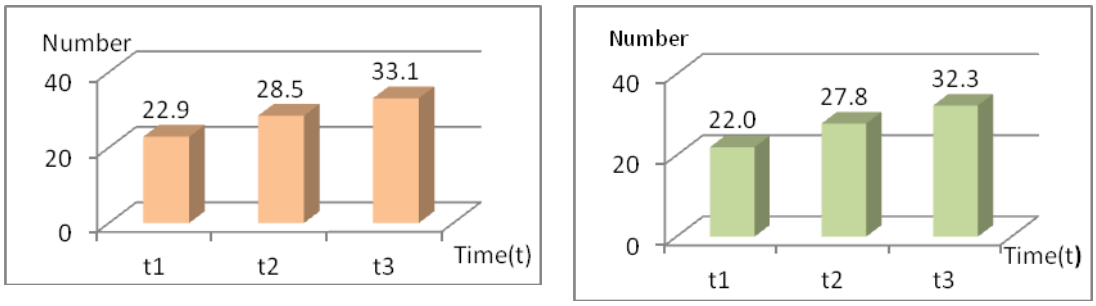


Figure 65 - German jump sideways results (t1, t2, t3) (left: girls; right: boys)

7.2.2 Aerobic capacity

In the HCSC-CN-DE project, aerobic capacity (6-minute run), 319 girls and 363boys participated in Germany. We can see from Figure 66, there is a significant development in both genders from t1 to t3: girls (t1 = 836.17 ± 103.15, t2 = 880.49 ± 108.42, t3 = 919.99 ± 119.38), boys (t1 = 886.29 ± 109.66, t2 = 951.58 ± 114.96, t3 = 993.78 ± 128.36) ($p<0.001$), with boys performing better than girls, and also improving more than girls (girls vs. boys: 10.02% vs. 14.72%).

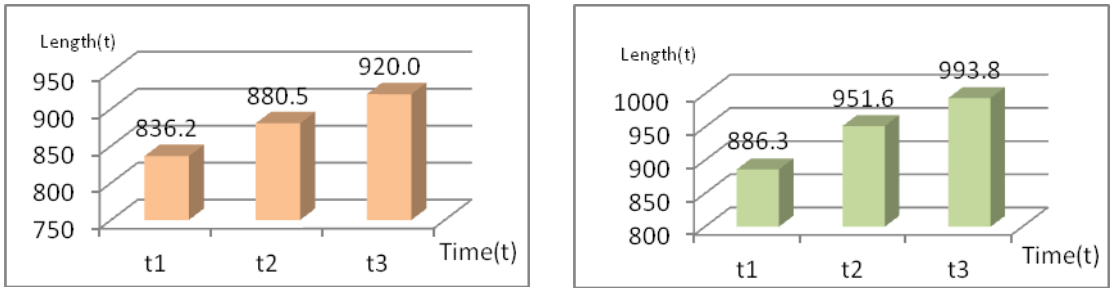
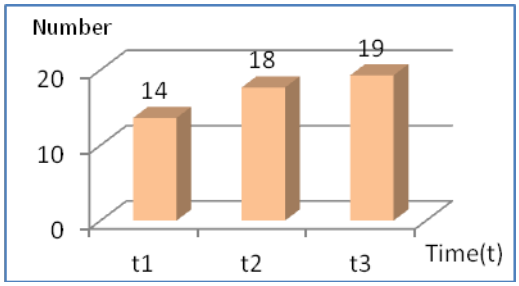


Figure 66 - German 6-minute run results (t1, t2, t3) (left: girls; right: boys)

7.2.3 Endurance strength capacity

In the HCSC-CN-DE project endurance strength capacity (sit-ups), 325 girls and 362boys participated in Germany. We can see from Figure 67 that there is a significant development in both genders from t1 to t3, girls (t1 = 13.63 ± 5.26, t2 = 17.63 ± 4.92, t3 = 19.29 ± 4.85), boys (t1 = 13.53 ± 5.76, t2 = 17.99 ± 5.79, t3 = 19.67 ± 5.34) ($p<0.001$), with boys performing better than girls, and also improving more than girls (girls vs. boys: 40.79% vs. 45.38%).



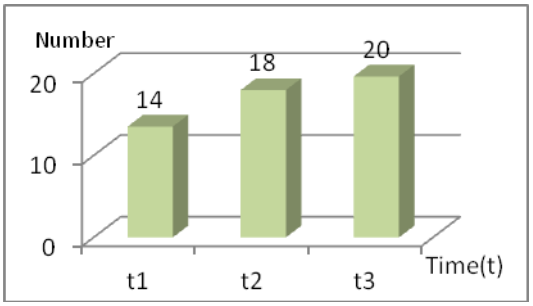
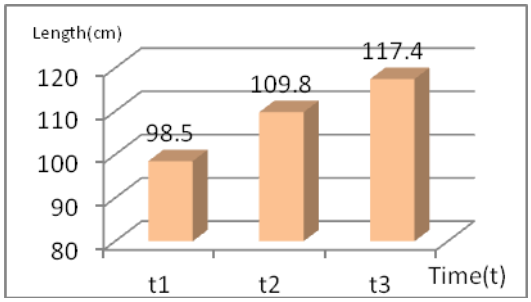


Figure 67 - German sit-ups results (t1, t2, t3) (left: girls; right: boys)

7.2.4 Explosive capacity

In the HCSC-CN-DE project explosive capacity (standing broad jump), 325 girls and 364boys participated in Germany. We can see from Figure 68 that there is a significant development in both genders from t1 to t3, girls (t1 = 98.51 ± 18.31, t2 = 109.81 ± 16.19, t3 = 117.44 ± 16.59), boys (t1 = 103.78 ± 19.08, t2 = 115.52 ± 18.05, t3 = 123.12 ± 18.39) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 19.22% vs. 18.64%).



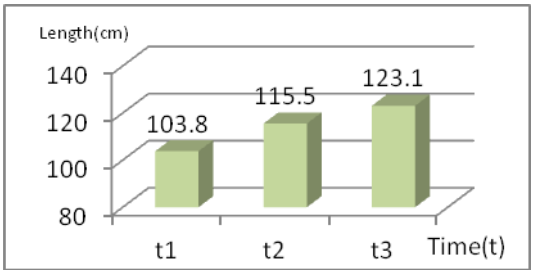
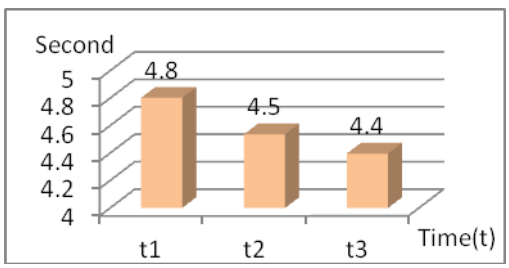


Figure 68 - German standing broad jump results (t1, t2, t3) (left: girls; right: boys)

7.2.5 Agility capacity

In the HCSC-CN-DE project agility capacity (20m run), 324 girls and 365boys participated in Germany. We can see from Figure 69,that there is a significant development in both genders from t1 to t3, girls (t1 = 4.80 ± 0.41, t2 =4.54 ± 0.36, t3 = 4.40 ± 0.31), boys (t1 = 4.66 ± 0.40, t2 = 4.44 ± 0.36, t3 = 4.31 ± 0.37) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 8.33% vs. 7.51%).



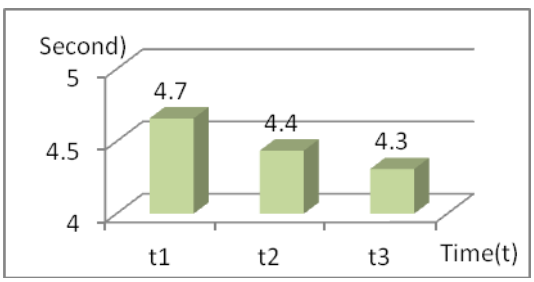


Figure 69 - German 20m run results (t1, t2, t3) (left: girls; right: boys)

7.2.6 Flexibility capacity

In the HCSC-CN-DE project flexibility capacity (sits& reach), 327 girls and 362boys participated in Germany. We can see from Figure 70, that there is no significant development in both genders from t1 to t3, boys (t1 = 2.33 ± 4.90, t2 = 2.03 ± 5.22, t3 = 1.29±5.81), girls (t1 = 4.99 ± 4.62, t2 =5.41 ± 5.14, t3 = 4.69 ± 5.71), ($p<0.001$); however, girls still perform better than boys.

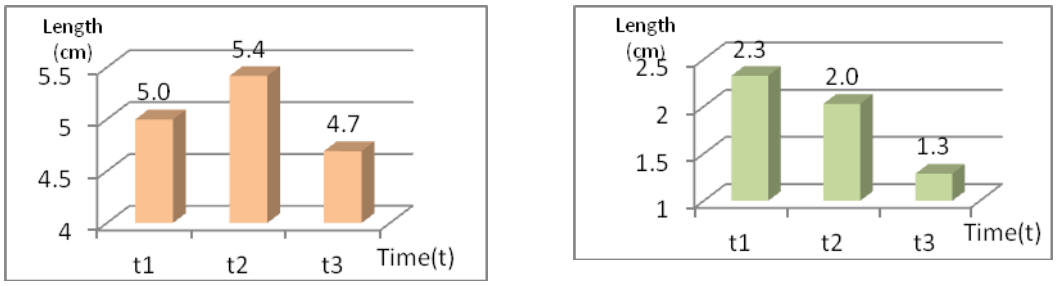


Figure 70 - German sit & reach (t1, t2, t3) (left: girls; right: boys)

7.2.7 Discussion

Both German girls and boys had significant increases in BMI, which corresponds with biological growth, the number of overweight and obese grow in both genders, (girls: t1 = 20.62%, t3 = 25.62%; boys: t1 =21.52%, t3 = 27.67%), girls have a higher overweight rate than boys (girls vs. boys: t1 15.74% vs. 13.89%, t3 19.33% vs. 18.58%), but boys have a higher obese rate than girls (girls vs. boys: t1 4.88% vs. 7.63%, t3 6.29% vs. 8.89%).

German girls and boys experienced significant development in all motor tests. The capacity of coordination increased most in both genders, girls from t1 to t3 increased 44.51% and boys from t1 to t3 increased 46.64%, endurance strength capacity also increased more, girls from t1 to t3 increased 40.79% and boys from t1 to t3 increased 45.38%, explosive capacity increased 19.22% in girls and 18.64% in boys from t1 to t3, aerobic capacity increased 10.02% in girls and 14.72% in boys from t1 to t3. In general, girls have better explosive capacity and endurance strength capacity than boys; boys have better coordination capacity and aerobic endurance capacity than girls.

The German overweight and obesity phenomena can be attributed to the flexible education system. Firstly, there are no formal physical education courses in Germany, which means that each school has its own curriculum designed by a PE teacher. There are no standard textbooks about teaching, even the same grade by the same teacher; the teacher has more autonomy, and physical education is more like an activity. Secondly, students also have more autonomy: students participate in sport by personal choice, which benefits the students who like sport, but is not conducive for the students who do not like sport. It is clear to see that good physical capacity students are more sport-likers and bad physical capacity students are more sport-unlikers. This system persuades the sport-likers, neglects sport-unlikers, and usually these sport-unlikers are overweight and obese children. In addition, sport-unlikers after school also won't join sport clubs to play sports.

7.2.8 Conclusion

Afterword years of intervention, German girls and boys had significant reductions in BMI-Cole, but the number of overweight and obese children still grows in both genders. Except flabbily capacity, all the other motor tests results had improved in both genders. Girls have better explosive capacity, flexibility capacity and endurance strength capacity than boys; boys have better coordination capacity, agility capacity and aerobic capacity than girls.

8 Discussion and comparisons of Chinese results

8.1 Comparisons of BMI

The mean BMI value of HCSC-CN-DE project in Chinese (Shanghai) cohort, girls had significantly increased [t1: BMI=16.58±2.65, t2: BMI=16.81±3.00, t3: BMI=17.25±2.79, ($p<0.001$)] by years, and these results correspond with the normal effects of growth. The BMI-Cole value of BMI development in girls can be seen in Figure 71. The number of overweight girls from t1 to t3 increased annually by approximately 1%, and the number of obesity girls from t1 to t2 decreased round 1.2%, and from t2 to t3 decreased round 2%. The total number of overweight and obesity from t1 to t3 decreased, five out of twelve children with obesity dropped out of the group (decrease from 8% to 4.83%). The underweight girls 'number is decreasing from 12% in t1 to 11.72% in t3.

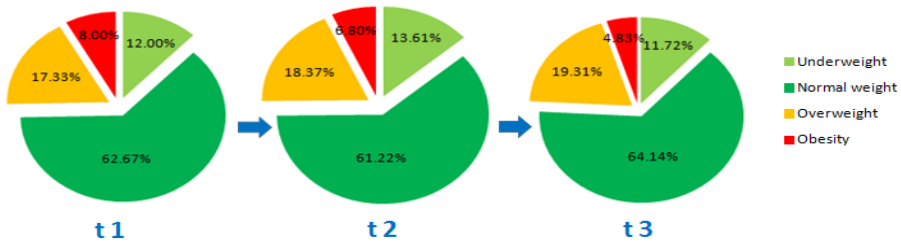


Figure 71 - Chinese girls' BMI-Cole value from t1 to t3

The BMI in boys also increased significantly [t1: BMI=16.81±2.31, t2: BMI=17.38± 2.74, t3: BMI=17.89±2.85, ($p<0.001$)] by years, and these results correspond with normal effects of growth. The BMI-Cole value of BMI development in boys can be seen in Figure 72. The number of overweight boys from t1 to t3 increased annually by approximately4%, but increasing by 2 % from t2 to t3, the number of obese increased by approximately1% from t1 to t2 but decreased from t2 to t3. The total number of overweight and obese boys is decreasing. From t1 to t3, two out of the thirteen children with obesity dropped out of the group (a decrease from 7.88% to 7.10%). However, the number of underweight boys is also increasing.

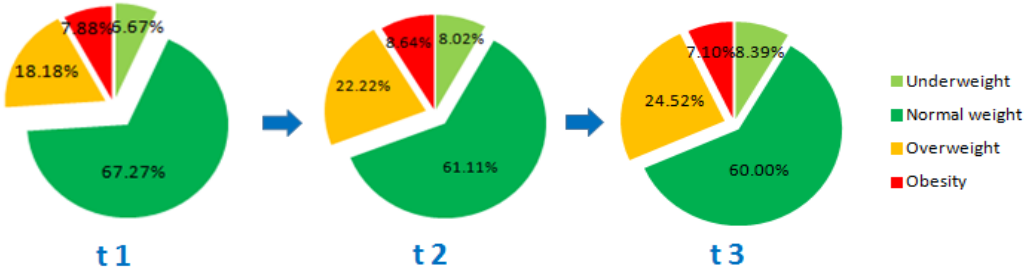


Figure 72 - Chinese boys' BMI-Cole value from t1 to t3

The Chinese (Shanghai) boys' BMIs are significantly higher than Chinese (Shanghai) girls' ($p<0.001$) through annual comparisons. The number of overweight boys are more than overweight girls, the number of obese boys are less than obese girls in t1, but increases more quickly to t3. The girls' overweight and obesity is under control, but the boys' overweight and obesity continue to grow.

8.2 Comparisons of Motor tests

8.2.1 Coordination capacity

In the HCSC-CN-DE project coordination capacity (jump sideways), 141girls and 150 boys participated. We can see from the Figure 73, that there is a significant development in both genders from t1 to t3, girls (t1 = 30.54 ± 5.97, t2 = 37.70 ± 6.98, t3 = 41.06 ± 7.46), boys (t1 = 31.17 ± 6.55, t2 = 39.27 ± 7.61, t3 = 41.76 ± 8.51) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 34.46% vs. 33.97%).

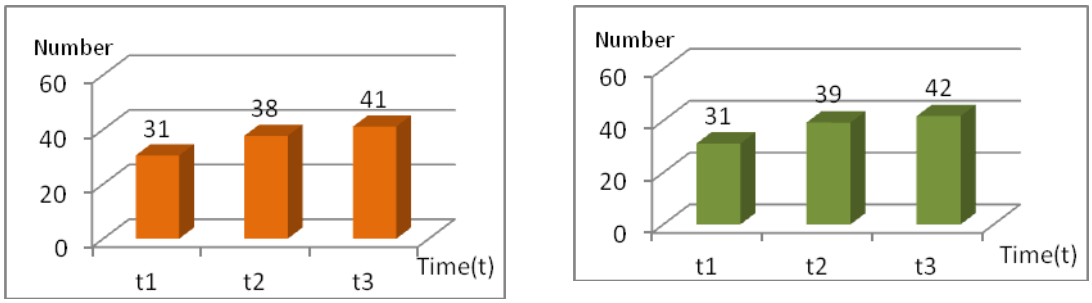


Figure 73 - Chinese jump sideways results (t1, t2, t3) (left: girls; right: boys)

8.2.2 Aerobic capacity

In the HCSC-CN-DE project aerobic capacity (6-minute run), 143 girls and 156boys participated. We can see from Figure 74, that there is a small development in both genders from t1 to t3, girls (t1 = 815.79 ± 127.34, t2 = 874.85 ± 153.28, t3 = 821.09 ± 162.31), boys (t1 = 878.53± 161.36, t2 = 922.51 ± 179.95, t3 = 866.12 ± 180.87) ($p<0.001$); however, both girls and boys had bad aerobic capacity, and the test results decreased corresponding with biological growth, especially from t2 to t3, it showed a tremendous drop in both genders.

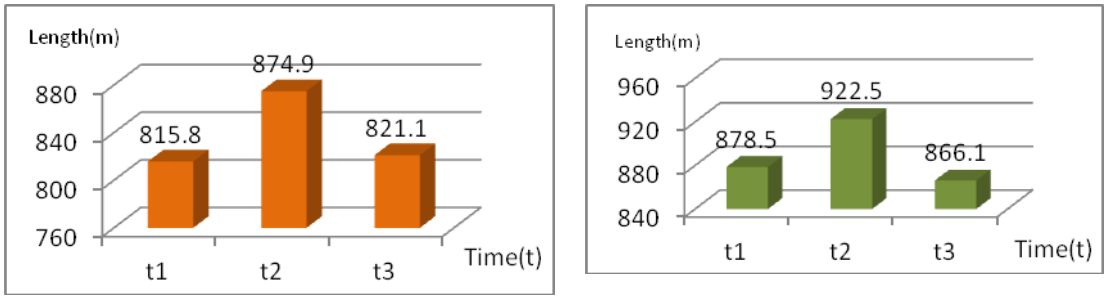


Figure 74 - Chinese 6-minute run results (t1, t2, t3) (left: girls; right: boys)

8.2.3 Endurance strength capacity

In the HCSC-CN-DE project endurance strength capacity (sit-ups), 141 girls and 150boys participated. We can see from Figure 75that there is a significant development in both genders from t1 to t3, girls (t1 = 19.65±4.87, t2 = 25.56 ± 6.37, t3 = 26.54 ± 6.07), boys (t1 = 21.07±5.60, t2 = 24.73 ± 6.98, t3 = 26.49 ± 7.38) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 35.06% vs. 25.72%).

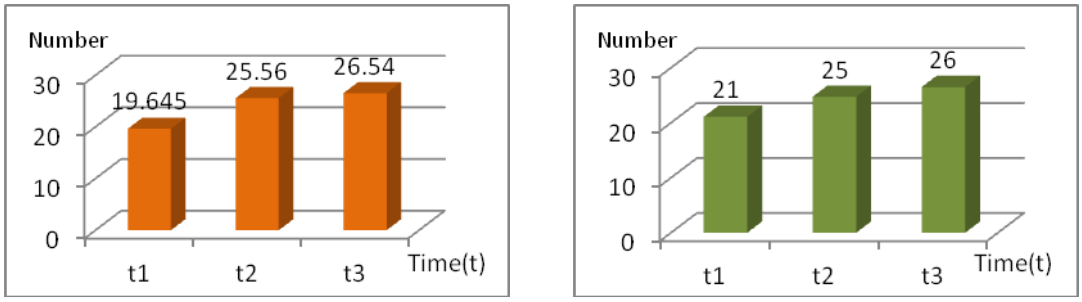


Figure 75 - Chinese sit-ups results (t1, t2, t3) (left: girls; right: boys)

8.2.4 Explosive capacity

In the HCSC-CN-DE project explosive capacity (standing broad jump), 141 girls and 148boys participated. We can see from Figure 76, that there is a significant development in both genders from t1 to t3, girls (t1 = 124.49±16.45, t2 = 133.68 ± 14.50, t3 = 141.39 ± 15.20), boys (t1 = 135.05±16.53, t2 = 141.96 ± 18.00, t3 = 148.06 ± 17.32) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 13.58% vs. 9.6%).

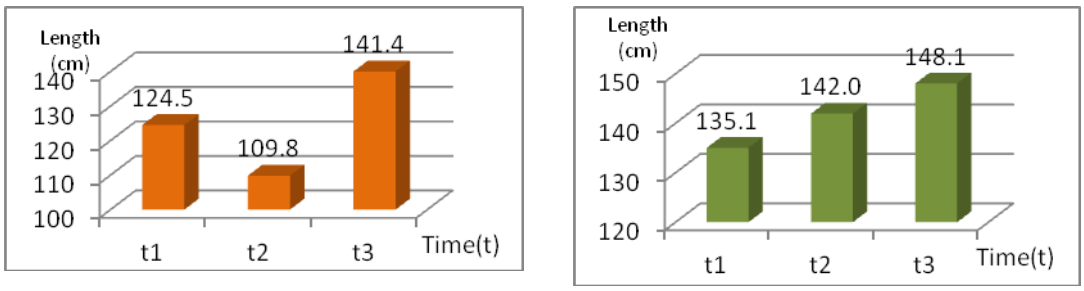


Figure 76 - Chinese standing broad jump results (t1, t2, t3) (left: girls; right: boys)

8.2.5 Agility capacity

In the HCSC-CN-DE project agility capacity (20-m run), 140 girls and 150boys participated. We can see from Figure 77, that there is a significant development in both genders from t1 to t3, girls (t1 = 4.82±0.42, t2 = 4.61 ± 0.39, t3 = 4.44 ± 0.37), boys (t1 = 4.61±0.42, t2 = 4.44 ± 0.47, t3 = 4.31 ± 0.39) ($p<0.001$), with boys performing better than girls, but girls improving more than boys (girls vs. boys: 7.88% vs. 6.50%).

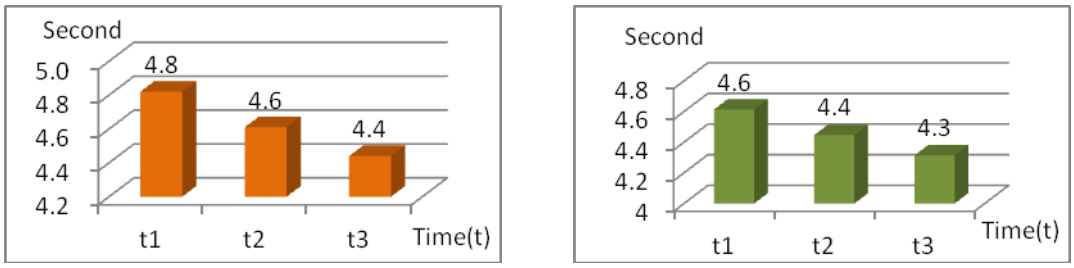


Figure 77 - Chinese 20m run results (t1, t2, t3) (left: girls; right: boys)

8.2.6 Flexibility capacity

In the HCSC-CN-DE project flexibility capacity (sit & reach), 141 girls and 150boys participated. We can see from Figure 78 that there is a significant development in

girls from t1 to t3 (t1 = 14.41±3.87, t2 = 14.44 ± 4.03, t3 = 14.58 ± 9.23), but boys' performance dropped slightly from t1 to t3 (t1 = 10.83±4.01, t2 = 10.18 ± 4.41, t3 = 9.14 ± 5.38) ($p<0.001$), and girls performed better than boys. Sit & reach result will not increase by age growth, and have even decreased slightly. This is also a normal biological growth phenomenon, but we can still see that Chinese children had very good flexibility capacity.

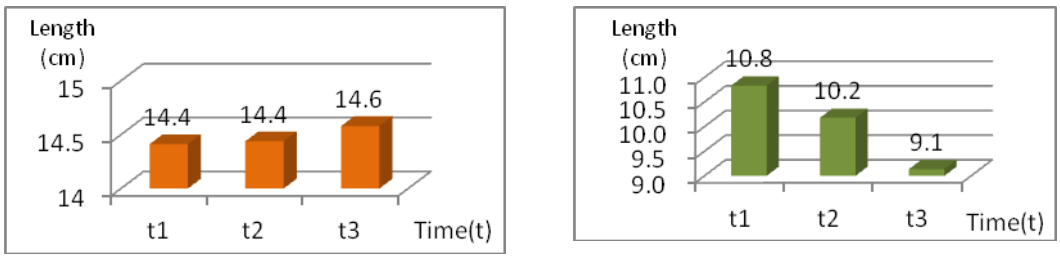


Figure 78 - Chinese sit& reach (t1, t2, t3) (left: girls; right: boys)

8.2.7 Discussion

Both Chinese girls and boys had significant increases in mean BMI, which corresponds with biological growth, the number of overweight and obese are under control in both genders, (girls: t1 = 25.33%, t3 = 24.14%; boys: t1 =31.62%, t3 = 26.06%), girls have a lower overweight rate than boys at beginning, but this increases more quickly than boys (girls vs. boys: t1 17.33% vs. 24.52%, t3 19.31% vs. 18.18%) However, girls have a higher obesity rate than boys at the beginning but had better control than boys (girls vs. boys: t1 8.00% vs. 7.10%, t3 4.83% vs. 7.88%).This reflects the situation. Traditional Chinese culture is that boys are better than girls, and that a fat figure is still being a sign of healthy and wealth; therefore, in families, boys would be more often overfed and spoiled with food. But modern aesthetic also emphasize the youth, and girls especially seek to be slim as a sign of beauty and fashion, so they are care more about their appearance than boys. That is why in China, there are more overweight and obese boys than girls.

Chinese girls and boys had significant development in three motor tests, but not in aerobic capacity. Capacity of coordination increased most in both gender (girls 34.46 % from t1 to t3 increased and boys increased 33.97%from t1 to t3), endurance strength capacity also improved (girls increased 35.06%from t1 to t3 and boys increased 25.72 % from t1 to t3), and explosive capacity also increased 13.58% in girls and 9.6% in boys from t1 to t3. In general, girls have better explosive capacity, endurance strength capacity, and coordination capacity than boys.

A two-year intervention in China influences the anthropometric modification obtained in children, and the significantly reduced BMI-Cole can also contribute to the intervention as well. This contrasts with previous studies showing that PA intervention, whether combined with dietary restrictions or not, leads to body composition improvements in children and adolescents (cf. Deforche et al. 2003; Korsten-Reck et al. 2007; Lazaar et al. 2007; Wong et al. 2008). Recent data have revealed that one-year intervention is more effective in anthropometric

modifications in school-based young children (cf. Lafortuna et al. 2002; Matvienkoet al. 2010; Flynn et al. 2005; Gorely et al. 2009; Dobbins et al. 2009; Harris et al. 2009)

The Chinese children had better development in motor test; these results are also found in a number of studies suggesting that schools introducing physical activity intervention has positive effects on physical capacity in young children (cf. Doréet al. 2000; Bovet et al 2007; Chen et al. 2008). However, our results also show a Chinese phenomenon. Firstly, when the same motor test in the Chinese National Physical Fitness Test (NPFT) is taken,, children have better results in tests such as sit-ups, standing broad jumps and sit & reach, whereas for tests that are not in the NPFT, such as the 6-minute run, students have bad test results. Chinese students are more test-dominated, which means that students used to training get a good score in test- if something is not included in a test, students will not pay more attention to learning or practicing it. Secondly, from t2 to t3, the aerobic endurance capacity falls down very deeply, this can be explained by the Chinese education system and environment. Physical education in China still does not receive the same attention as other subjects; schools have regular sport time, but students did not participate in intense sport, whereas showing up for roll call, an all day long study work load made students exhausted with no more energy for sport; therefore, after years, fewer and fewer students are really interested in sport. What is more, in the setting of Chinese sport curriculum there is a lack of an endurance capacity training item over 30 years but has not changed. Contrarily, some schools deducted physical tests in order to avoid the occurrence of sports accidents rather than increase physical activity. Even though our project has an endurance item, the schools took the motor test as a task not pay attention to on students' daily activity and endurance capacity development. Additionally, Shanghai has had a serious air pollution problem since 2012, and so to protect students' healthy schools have to reduce students' outdoor exercise time, but a limited indoor stadium impedes the sports development in school time. Lack of free time and expensive fitness center fees in China also hinder students in exercising outside schools. Thirdly, the traditional diet has changed into Western food or fast convenience foods that are high in calories and have more oil or salt. Children like these foods because of the good taste (normally had more addictives), and parents like these foods because of the convenience of not needing to cook; over time, fast foods have become more popular than traditional foods. Chinese parents imperceptibly influence the daily diet of children, and in pursuing a higher study score they ignore the physical development, which is are also resulting in more overweight and obese children in society.

8.2.8 Conclusion

During two years of intervention, Chinese girls and boys had a significant increase in BMI, but the number of overweight and obese children was under control in both genders. Except aerobic endurance capacity, all the other motor tests results had improved in both genders. Girls have better explosive capacity, endurance strength capacity, and coordination capacity than boys; but aerobic capacity decreased in both genders.

9 Conclusion

The Healthy Children in Sound Communities (HCSC-CN-DE) project had 990 students from two Chinese schools (girls143 and boys154) and 28 German schools (327 girls and 366 boys), with the start age 7.13±0.34 from China and 6.57±0.62 from Germany in 2012 (September), and finishing when they were 9.18±0.42 years old in Shanghai and 8.54±0.62 years old in 2014 (November). The whole interventions implement two years in two countries, which includes physical education, general and social studies, extracurricular school sport, active school route and sport during break times, healthy eating and food preparation five parts, and more than 100 project work members.

After the two-year intervention, all children had significant increases in BMI which are correspond with normal effects of growth (Chinese girlst1: BMI=16.58±2.65, t2: BMI=16.81±3.00, t3: BMI=17.25±2.79; Chinese boys t1: BMI=16.81±2.31, t2: BMI=17.38± 2.74, t3: BMI=17.89±2.85; German girls t1: BMI=16.07±2.02, t2: BMI=16.54± 2.31, t3: BMI=17.21±2.74; German boys t1: BMI=16.53±2.32, t2: BMI=16.92± 2.57, t3: BMI=17.52±2.89). However the BMI-Cole in both countries decreased (Chinese girls t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.1, t3:BMI-Cole = 2.8;Chinese boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 2.9, t3:BMI-Cole = 3.1;German girls t1: BMI-Cole = 3.2, t2: BMI-Cole = 3.1, t3:BMI-Cole = 3.1;German boys t1: BMI-Cole = 3.3, t2: BMI-Cole = 3.2, t3:BMI-Cole = 3.1). The hypotheses of BMI in my dissertation were not expected. The results shows that the Chinese children had a higher mean BMI value than German children in both genders; there are more overweight and obese Chinese children than German children (overweight and obese rate China vs. Germany t1: 51.39% vs. 42.14%, t2: 56.03% vs. 45.08%, t3: 55.76% vs. 53.09%); overweight and obese Chinese children did not lower their BMI from t1 to t3 significantly, overweight German children did not lower their BMI from t1 to t3, but obese German children did lower their BMI from t1 to t3.

In the motor test, we compared coordination (jump sideways), aerobic endurance (6-minute run), endurance strength (sit-ups) and explosive strength (standing broad jump) between Chinese children and German children. The results were very positive, and all the children in HCSC improved their sport capacity. Chinese children had better coordination, endurance strength and explosive strength capacity than German children in both genders, and they also improved more during these two intervention years; however, Chinese children had bad aerobic endurance capacity and during the intervention they did not improve the capacity, the test results even showed a decrease. Among all 13 hypotheses, ten are correct; the exceptions are number ten (the results showed that German children improved more in endurance strength than Chinese children), eleven (the results showed that Chinese girls had more explosive strength capacity then German girls) and twelve (the results showed that Chinese boys had better explosive strength capacity then German boys). However, Chinese students do have good flexibility capacity (sit & reach) and agility capacity (20m run), and they improved greatly during the intervention; German students' flexibility capacity was not as good as Chinese children's; during the intervention, but the agility capacity was better compared with the Chinese children.

According to the HCSC project results, we have to say this project achieved a lot and was very beneficial for the students. Even though the Chinese overweight and obesity situation are more seriously than we predicted, still at the end of the project, there were less overweight and obese children than before; German children also achieved a lot, the overweight and obese children had significantly lowered their BMI after the intervention. Also, in the motor test, both countries' children improved their physical abilities.

My research also shows the reasons for the differences in the overweight and obesity between the countries. The increasing number of overweight and obese Chinese children can be attributed to the Chinese chain reaction: The Chinese education system not paying enough attention to sport-schools having physical education but not being keen to encourage students' physical capacity development--parents under the education system pressure to only focus on children's study score and not on sport -- students' lack of physical activities and lack of sports interests. Therefore, no policy support, no facility guarantee, no interest maintains, an unhealthy diet and lack of exercise made Chinese children increasingly more overweight and obese. The increasing number of overweight and obese German children can be attributed to the flexible teaching methods in schools and autonomy by staff, which persuades sport-likers to be more active and discourage sport-unlikers from participating in sport.

In conclusion, I suggest that in both countries, strengthen the sport policy or rules in schools. In China, teachers pay more attention to teaching than to help students into sport; in Germany, teachers pay more attention to the sport-unlikers to persuade them into sport. I also suggest that parents take more responsibility to build healthy diets and guide children into physical activity, and establish a healthy family environment for children.

Part E

10 All the studies

10.1 Study of Angelopoulos(CHILDERN)

The name of this study is„ Changes in BMI and blood pressure after aschool based intervention: The CHILDREN study “. It is a one-year school-based Greece intervention study which wasdeveloped and implemented based on the Theory of Planned Behaviour (TPB), on obesityindices and blood pressure in primary school children. There are 646fifth grade pupils (321 intervention children and 325 control children) whoparticipated. BMI,BP,PA, fruits and vegetables consuming are reported. **Results:**Intervention group had higher consumption of fruits and lower consumption of fats/oils and sweets/beveragescompared with the control group. Intervention’s effect on BMI could be explained by the changes in fruit andfats/oils intake whereas the reduction of systolic and diastolic blood pressure could be explained by the reductionof BMI. Favourable changes in blood pressure and obesity indices afterthe implementation of a 1-year school-based intervention program based on the TPB. **Contribution:**systematic approachused as it was based on the results of the TPB questionnairesand could therefore address children’s actual needs, attitudesand perceived barriers.**Limitation:** Ioannina is considered asan economically disadvantaged region of Greece, an increase ofthe fruit and vegetable availability at home could be easierto be achieved.

10.2 Study of Brandstetter (URMEL-ICE)

The name of this study is„Overweight Prevention Implemented by Primary School Teachers: A Randomized Controlled Trial “. It is a one year German regioanl study among 945 grade 2 students, which based on URMEL-ICE program. In this stduy it contains 29 teaching units (each30-60 min), 2 short blocks of PAper day (each 5-7 min), 6 family homework lessons(tasks that cannot be accomplished by the child himself without the help of a parent) and materials for thetraining and information of the parents.**Results:** There were statistically significantdifferences between the age of the intervention and control group (7.53 vs. 7.61 years),percentage with migration background (36.8 vs. 28.9%), some parental characteristics andtime lag between t0 and t1 (463 vs. 427 days). In contrast, baseline values of anthropometricmeasures did not vary notably. WC,TST were reduced in a consistentmanner in intervention group compared to the control group, but BMI was not influenced. Also, the interventiongroup revealed a higher percentage of children with an improvement and a lower percentagewith a worsening of the health-relevant behaviours compared to the control group.**Contribution:** Measure the BMI, TST and WC, the activity-enhancingcomponents of the intervention would have been especially important and successful; second, the teacher training and involvement also made the intervention more successful too.**Limitation**: in spite of schools’ limited financial and personnel resources, it was only one year intervention,too short time for

children's body composition; second, the study should expanded in terms of intervention duration tomake it more effective.

10.3 Study of Caballero (Pathways)

The name of this study is„ Pathways: a school-based, randomized controlled trial for theprevention of obesity in American Indian schoolchildren ". It is a US randomized, controlled, school-basedtrial involving 1,704 children in 41 schools and was conducted over3 consecutive years, from 3rd to 5th grades, in schools servingAmerican Indian communities in Arizona, New Mexico, and SouthDakota. The intervention had 4 components: change in dietaryintake, increase in PA, a classroom curriculumfocused on healthy eating and lifestyle, and a family-involvementprogram. The main outcome was percentage body fat; otheroutcomes included dietary intake, PA, and knowledge,attitudes, and behaviors. **Results:** The intervention resulted in no significant reduction inpercentage body fat but significant reduction in the percentageof energy from fat in the interventionschools. Total energy intake was significantlyreduced in the intervention schools but energy intakewas not. Motion sensor data showed similaractivity levels in both the intervention and control schools. Severalcomponents of knowledge, attitudes, and behaviors were alsopositively and significantly changed by the intervention.**Contribution:** strong support from tribal,educational, and community authorities, dailysupport of teachers, parents, and principals, more involved in this programme.**Limitation:** it did not reach the primary aim of reducing the rate of bodyfat gain in intervention schools.

10.4 Study of Cao (Fudan)

The name of this study is "A randomized trial of multiple interventions for childhood obesity in China". It is a Chinese regional study from 26 primary schools in Shanghai, total of 1,287 students in intervention group and 1,159 in control group aged 7- to 10-year-old. It includes healthy education: 6-hour health education course per semester; dietary intervention: teacher control eating speed for lunch and some advices, reduce fat content of food, provide more fruits and vegetables; PA intervention: 20-m music shuttle run 2-3 times per week, regular PE course and extra PA to ensure 1-hour PA per day in school. **Results:** The overall prevalence of overweight/obesity declined from 28.92% in 2011 to 24.77% in2014, with a difference of 4.15% in the intervention group compared with a 0.03% decline (from30.71% to 30.68%) in the control group. The intervention group had significantly lower odds of developing obesity or overweight and had decreased average BMI z-scores compared with the control group, especially for obese or overweight students. **Contribution**: It involved the administrative departments of education to ensure intervention implementation and expand the intervention to all schools in the district; second, the intervention is relatively easy to implement could adapt to other schools with similar systems. **Limitation:** It did not evaluate childhood obesity related knowledge/attitude/behavior changes; second, the evaluation was conducted 1 month after the completion of the 3-year intervention.

10.5 Study of Chen (2011) (CNSSCAH)

The name of this study is„ Regional, socioeconomic and urban-rural disparities in child and adolescent obesity in China: a multilevel analysis ". It is a China-Sweden cooperation study based on the 2005 cycle of the Chinese National Survey on Student's Constitution and Health (CNSSCH). The sampled Han students aged 7–18 years by stratified clustered random sampling from 30 of the 31 mainland provinces, excluding Tibet, it was stratified by gender, age, the area of residence ('urban' and 'rural') and the socioeconomic level of the local school area ('high', 'intermediate' and 'low'). Five aspects were taken into consideration in defining the socioeconomic status (SES) of the local school area: regional gross domestic product, total yearly income per capita, average food consumption per capita, natural growth rate of population and the regional social welfare index. **Results:** it shows young people living in high socioeconomic and urban areas had higher body mass index (BMI) and higher odds of overweight and obesity than those living in lower socioeconomic and rural areas. Subjects living in provinces with a higher standard of living, as indicated by less prenatal mortality, lower Engel coefficient, and higher personal expenditure on health had higher BMI and higher odds of overweight and obesity than those living in less affluent provinces. An interaction between gender and urban city revealed that boys in urban areas were especially prone to obesity. **Contribution:** it is estimated the magnitude of these differences and is the first study in China to determine the influence of indicators at the individual, school and province level simultaneously. **Limitation:** first, the CNSSCH data collection was carried out in schools, so some 15- to 18-year-old adolescents who could not enter senior high school, mainly in rural areas, were excluded from our sample; second, lacking individual SES information probably underestimated the true effects of SES on obesity.

10.6 Study of Chen (2015) (No-profit)

The name of this study is„A national school-based health lifestyles interventions among Chinese children and adolescents against obesity: rationale, design and methodology of a randomized controlled trial in China". The study was designed as a national multi-centered cluster randomized controlled trial involving more than 70,000 children and adolescents aged 7-18 years from 7 provinces in China. **Results:** The outcome includes anthropometric: waist circumference (WC), hip circumference (HC), blood pressure (BP) and skin fold thickness(SFT); Behavioral outcomes: background information; food and diet; sports and PA; obesity related knowledge-attitude-practice; school obesity related environment; Blood chemical outcomes: fasting plasma glucose (G), fasting triglycerides (T), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C); Physical fitness outcomes: standing-board jump, 50 meters speed run, 50 meters × 8 shuttle run (primary students) and run 800/1000 meters. This article only demonstration the design and methodology, no intervention results. **Contribution:** This is the first and largest multi-centered school-based obesity intervention program with the consideration of geographical and social-demographic characteristics of the

rapidly increased obesity prevalence of Chinese children and adolescent; second, the intervention is based on Social Cognitive Theory and Social-Ecological Model of Health, and follows a stepwise approach guided by PRECEDE-PROCEED (P-P) Model and Intervention Map; third, the results of and lesson learned from this study will help guide future school-based national childhood obesity prevention programs in Mainland China. **Limitation:** It is a big scale of study especially in 7 different provinces, though is a random trail still with lots bias of city choose and school choose, but the study did not explain how it choose these implement cities.

10.7 Study of Coen (POP)

The name of this study is„Effects of a 2-year healthy eating and physical activityintervention for 3-6-year-olds in communities of high and lowsocio-economic status: the POP (Prevention of Overweightamong Pre-school and school children) project “. It is a Belgian2-year healthy eating and PA intervention, named POP (Prevention of Overweight among Pre-schooland school children) project for 3-6yearoldPre-school and school children, 1,102 children were perticipated. It includes nutrition control: increase daily consumption of water, milk, vegetables and fruits, decrease daily consumption ofsoft drinks, sweets and savoury snacks.PA control: increasing daily PA anddecreasing screen-time behavior.**Results:** No significant effects were found on BMI Z-scores for the total sample.But there was significant decrease in BMI Z-score of 0.11 in the low-SESintervention community compared with the low-SES control community, wherethe BMI Z-score increased by 0.04. There wasno significant interventioneffects in eating behaviour, PA or screen-time,and no significant interaction effects of age and gender of the children onthe outcome variables.**Contribution:**examined the effectsof an intervention in different communities regardingsocio-economic characteristics.It showed that the effectsof an intervention for prevention of childhood overweightmainly implemented through schools differedunder different local socio-economic characteristics. **Limitation:**the low-SES participants dropped out significantly more and influenced the outcomes; the study included a limited number ofcommunities; there was a larger sample availablefor the analyses on BMI compared with the questionnaires; although the BMI Z-score of one community showedsome changes, generally there were no changes inbehavior; theintervention allowed alterations by the schools, communityand partners of the project.

10.8 Study of Danielzik (KOPS)

The name of this study is„ School-based interventions to prevent overweight and obesity inprepubertal children: process and 4-years outcome evaluation of the KielObesity Prevention Study (KOPS)“. It is a German 4-year school-based health promotion on overweightamong 6⁄10-year-old children. It was startedin 1996 as a cross-sectional as well as longitudinal 8-yearfollow-up study, the effects of school-based and family-based interventionson overweight and obesity were/are followed.It has 4 parts: eat fruit and vegetables every day; reduce intakeof high fat foods; keep active for at least 1 h a day; decrease TV consumption to less than 1 h

per day.BMI,triceps skinfold (TSF) and waist circumference (WC) were tested in year 1996 and 2004. **Results:** after intervention,theprevalence of children with good nutritional knowledge before intervention doubled from 1996 to2004 but similar intervention-induced increases in knowledge,control schools increased remission of overweight with no significant effect on incidence, theeffect was most pronounced in girls, compared with parameters of fat mass (TSF and WC), BMI was showing a stronger effect. **Contribution:** using different parameters to characterize overweightaffected the prevalence of overweight as well as the effectof intervention. Suggest use BMI, skinfold thicknessandWC to fully characterize the outcome of preventivestudies.**Limitation:** children are more competent in nutrition than 8 years earlier.

10.9 Study of Dearth-Wesley (CNHNS)

The name of this study is„Longitudinal, cross-cohort comparison of physical activity patterns in Chinese mothers and children ". It is a longitudinal study based on the data from the China Health and Nutrition Survey (CHNS), examined Physical Activity (PA) behaviors in 2 separate cohorts of mother-child pairs (n = 353) followed over a 2-4 year time period (2000 Cohort: 2000-2004; 2004 Cohort: 2004-2006). Comparable mother-child PA behaviors included total metabolic equivalent hours per week (MET-hrs/wk) from active commuting, leisure-time sports, and sedentary behaviors. **Results:** it isa significant positive mother-child relationship for high leisure-time sports activity at baseline but no association at follow-up. Mother-child associations were positive for active commuting and leisure-time sports activities and negative for sedentary behavior ($P<0.05$). Maternal education was associated with a greater likelihood of high leisure-time sports activity and high sedentary behavior in mothers but not in children ($P<0.05$). While decrease mother-child associations with increasing child age may be consequent of more PA promotion efforts targeted at children, it also suggests that parental PA patterns may be less influential on child PA patterns with increasing child age.**Contribution:** it is unique in longitudinally comparing PA patterns of mothers versus children over time. Using the same data collection tools for the assessment of PA in mothers and children, and use of adult and child compendiums provided examination of PA measures in mothers versus children with improved accuracy; last, it is the first to systematically compare parent–child PA patterns and to investigate how PA evolves over periods of rapid socioeconomic growth in China **Limitation:**first, it was a self-reported physical activity data, parent-assisted self-report (children <10 years) and self-report (children ≥10 years); second, the inability of the MET-hrs/wk measurement to consider individual differences in energy expenditure associated with the same activities; third, 2-4 year time frame was a relatively short period of time to observe PA changes.

10.10 Study of Donnelly (PAAC)

The name of this study is„Physical Activity Across the Curriculum (PAAC): a randomizedcontrolled trial to promote physical activity and diminishoverweight and obesity in elementary school children". It is an American 3-year school-based health

promotion on overweightamong 7- to 9-year-old children. PAAC promoted 90 minutes/wkof moderate to vigorous physically active academic lessons (3.0 to 6.0 METS,~10 min each)delivered intermittently throughout the school day. 90-minwas chosen as the targetsince children were receiving 60min of physical education per week and combined withPAAC lessons and this would total 150 minutes of PA per week.**Results:** after intervention, change in BMI for PAAC was 2.0 ± 1.9 and control 1.9 ± 1.9, respectively. Schools with ≥75 minutes of PAAC/wk showed significantly less increase in BMI at threeyears compared to schools that had <75 minutes of PAAC (1.8 ± 1.8 vs. 2.4 ± 2.0, p=0.02). PAACschools had significantly greater changes in daily PA and academic achievement scores.**Contribution:** The PAAC is a sustain project, with the designof a low burden, minimalcost, not decrease academic instruction time, not increase teacherpreparation time, it was enjoyable for students, teachers, and staff.**Limitation:** First, teachers indicated use PAAC lessons and will continue to use, but all these report by self-report and should be objectively verified.Second, twentypercent of school days were not centered on academic instruction due to assembly, field trips, etc. and this diminished the exposure to PAAC.

10.11 Study of Drenowatz (2010) (SWITCH)

The name of this study is„ Influence of socio-economic status on habitualphysical activity and sedentary behavior in 8- to11-year old children “. It is a German study includes body shape, physical activity (PA), media consuming, and parents report of SES.**Results:**There are significant differ between lower SES group and higher SES group, in study 1, lower SES groups approximating10,500 steps/day compared to about 12,000 steps/day in the higher SES groups,and they also had higher body mass and BMI; in study 2, sedentary behavior in both cohorts (P<0.05) withhigher SES groups spending less time watching TV than lower SES group.**Contribution:**This study shows theimportance of targeting low SES youth in interventionprograms to enhance health behaviors, provides a better understandingof the causal relationship between SES, BMI, sedentarybehavior and PA during childhood. **Limitation:**The study have not consider biological aspects like the pre-natalenvironment and maternal behavior as well as post-natalinfluences on physical activity and inactivity; second, it did not have the denifition of sedentary behavior, two cohorts use different way to measure the PA level could difficult to explain.

10.12 Study of Drenowatz (MANCOVA) (2013)

The name of this study is„ Organized Sports, Overweight, and Physical Fitness in PrimarySchool Children in Germany“. It is a German study which examined the relationship betweenparticipation in organized sports and overweight as well as physical fitness in primary school with 995 aged 7 years old children. Multiple logistic regression as well as multivariate analysis of covariance (MANCOVA)was used to determine associations between physical fitness, participation in organized sports, and body weight. **Results:**Participation inorganized sports less than once a week was prevalent in 29.2%, once or twice in 60.2%, and more often in 10.6% of the children.Overweight was found in 12.4% of the children. Children participating in

organized sports more than once per week displayedhigher physical fitness and were less likely to be overweight.**Contribution:** a large sample size;using multivariate analysis of covariance (MANCOVA), controlling for gender, overweight,migration background, parental overweight, and parentalparticipation in organized sport, a significant main effect ofparticipation in organized sports on most physical fitnessparameters. **Limitation:**Relying on parentquestionnaires for children's participation in organized sportsmay have introduced potential bias, particularly as parentswere informed about the intention of the study due to thefollowing intervention.

10.13 Study of Feng (Guangzhou)

The name of this study is„Study of health intervention to children obesity". It is a 3-year Chinese school-based obesity children intervention in Guiyang city, China. The intervention has 106 obesity children aged 8-12-year-old, it include 3 parts: Physical activity 6 times per week, each time should be moderate-vigorous-intensity which means heart beat reach 145-150 beat/min, it last at least 20 minutes; diet control according to total energy intake balanced by height required energy which monitored by parents; behavior manage which implement with the help of teachers at school and parents at home. Results: The number of obesity children decreased, skin fold thickness, triglycerides and uric acid levels decreased as well, and vital capacity index increased, the total energy intake reduced, but no significant difference in diastolic blood pressure, blood sugar, cholesterol and carbohydrates and protein intake before and after the intervention. **Contribution:**The project supported by the province, school and parents which make it easier to implement; second, many physiological test which more proved the results of intervention. **Limitation:**Though the project is 3 year but the real intervention was only one year, too short to obeserve the long-term effects; second, it is a regional intervention and small sample involved, so chould not representitive of the province level.

10.14 Study of Foster (HWALTHY)

The name of this study is„A School-Based Intervention for DiabetesRisk Reduction". It is an American four integrated components intervention, which consists of nutrition, physical activity, behavioralknowledge and skills, communications andsocial marketing. A total of 42 schools participated in this study, 21 intervention schools with 2307 students and 21 control schools with 2296 students, the average age is11.3 ±0.6. The intervention targetedthe quantity and nutritional quality of foodsand beverages that were served throughout theschool environment in nutrition component; increase the amount of moderate-to-vigorous PA in physical-education , raise the heart rate to 130beats or more per minute as activity sufficient in PA component; self-awareness, knowledge, behavioralskills, peer involvement for behavioral change in behavioral knowledge and skills component;communicationstrategies and social marketing integratedand supported the intervention.**Results:**Bothintervention schools and control schools had increases in fasting insulin levels; a greater reductions in theBMI z score in the intervention

schools than inthe control schools (P = 0.06); a significantly lower percentageof students with waist circumferences at orabove the 90th percentile in interventionschools; but no significant differences between theintervention and control schools in mean plasmaglucose levels. **Contribution:** a decrease in childhood obesity among children whose race or ethnic group and family income placed them at high risk for obesity; the assessment of children in the control schools and the feedback to parents were responsible forthe decreased rates of obesity. **Limitation:**intentionally oversampled low-income black and Hispanic students, the sample is not nationally representative; it was facilitated by staff and funds provided, so cannot assess the feasibility, effectiveness, or sustainability of an intervention program outside a study setting, cannot determine whether these results can be generalized.

10.15 Study of Fung (Best Practice to Next Practice)

The name of this study is„ From “best practice” to “next practice”: theeffectiveness of school-based health promotionin improving healthy eating and physical activityand preventing childhood obesity “. It is a 3-year Canadian adoped from one former successful program recognized as “best practice” which Comprehensive School Health (CSH) in improving diets,activity levels, and body weights, into 10 Alberta Project Promoting active Living and healthy Eating (APPLE) Schools in 2008 and 2010. Grade 5 students from 150 randomly selected schools were perticipated. **Results:**students attending APPLE Schools were eating more fruits and vegetables,consuming fewer calories, were more physically active and were less likely obese. These changes contrastedchanges observed among students elsewhere in the province.**Contribution:** it has large representativesample, high response rate for school-basedresearch, pre-intervention measurements, and the use ofmeasured height and weight to assess body weight status.**Limitation:**the 10 APPLE Schools were selected byschool jurisdictions rather than randomly, which limitsthe generalizability of the results; questionnaires remain subjective and are prone to reporting error; self-report dietary intake are more likely to underreport energy intake.

10.16 Study of Hu (Learn to Think)

The name of this study is„Effects of a “Learn to Think” intervention program on primary school students“. It is a 4-year Chinese region based intervention among 6-to 8-year-old children in Shanxi province, it use “learn to think” theory to build curriculum, Raven standard progressive matrices test, elf-designed thinking-ability test, academic achievement test to evaluate the students. **Results:** After 4 years, the thinking abilities of all the experimental students were significantly higher than the control group ($p < 0.01$).The academic achievement test also show that a very small difference between two groups in age 6-year-old, but later yearly increased significantly. It is also show LTT achieved more effects in the middle-ability grouping all grades, but there were also some effects in the high-ability group and no effects at all on the low-ability group. **Contribution:** It is a consistent, long-term intervention program, it is a simple form of training; second, LTT pays attention to stimulating students’ interest and motivation from beginning to end; third, LTT influences

students' thinking ability directly through teaching students thinking methods. **Limitation:**It is difficult to adapt the demand levels within each lesson to meet the needs of a wide range of students, and failed to have a significant impact on the initially lower ability students.

10.17 Study of Golle (Brandenburg)

The name of this study is„Effect of living area and sports club participation on physical fitness in children: a 4 year longitudinal study". It is a 4-year German cross-sectional study among age 9- to 12-year-old children. It contains physical activity (PA) and motor test (endurance, speed, strength, flexibility, coordination). **Results:**The correlative analysis revealed that living in rural areas is more likely associated with not participating in a sports club (n=66, OR=2.7, 95%CI=0.87-8.33) compared to living in urban areas. The number of practiced sports significantly differed ($p<0.001$) between urban (27 different sports) and rural (13 different sports) children. Urban compared to rural children showed significantly better performance development for upper-($p=0.009$) and lower-extremity strength ($p<0.001$) significant better performance development in endurance and lower-extremity strength for children continuously participating in sports clubs compared to their non-participating peers.**Contribution:**First study investigated the effects of living area and sports club participation on physical fitness development in healthy children from classes 3 to 6.**Limitation:** It is a cross-sectional study; second, use the quesionnaire to assess the PA would be over report or under report.

10.18 Study of Graf (CHILT)

The name of this study is„Effects of a school-based intervention on BMI and motor abilities in childhood". It is a German 22 months intervention for aged 5- to 9-year-old children in 12 randomly selected primary schools and 5 randomly selectedcontrol schools.It based on Children's Health InterventionaL Trial (CHILT) project which includes health education: 20 to 30 minutes per week; PA intervention: PA per day and various combinations of 5-min morning exercises, 10 PE gym examples and 35 motor skills games; Motor test: lateral jump and 6-min-run. **Results:**No difference in the prevalence ofoverweight and obesity between the intervention (IS) and control schools (CS) either at baselineor following intervention (each $p>0.05$). Lateral jumps was significantlyhigher in the IS than in the CS ($p<0.001$). 6-min-run wassignificantly improved in IS ($p=0.020$)and overweight andobese children in both IS and CS produced significantly lower scores in motor test than normal and underweight children (each $p\leq0.001$).**Contribution:** it theorized that to improve motor skills inchildhood and to break through the vicious circle of physical inactivity-motor deficits-frustration-increasing inactivity possibly combined with an excess energy intake and weight gain. To preventoverweight and obesity these measures have to be intensified.**Limitation:** this studyincludes health knowledge, nutrition habits, ethnic and socioeconomicaspects of the children and their familiesat the beginning but not examine after theintervention; second, motoric ability notusingVO_2max measurements to compare with exercise testing.

10.19 Study of James (2004) (CHOPPS)

The name of this study is„Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomized controlled trial“. It is a one year England intervention based on Christchurch obesity prevention project in schools(CHOPPS) among 644 children aged 7- to 11-year-old. There are four sessions nutrition education in all class: first initial session focused on the balance of good health and promotion of drinking water; second and third sessions comprised a music competition; the final session involved presentations of art and a classroom quiz based on a popular television game show. **Results:**Consumption of carbonated drinks over three days decreased by 0.6 glasses (average glass size 250 ml) in the intervention group but increased by 0.2 glasses in the control group (mean difference 0.7, 95% confidence interval 0.1 to 1.3).At 12 months the percentage of overweight and obese children increased in the control group by 7.5%, compared with a decrease in the intervention group of 0.2% (mean difference7.7%, 2.2% to 13.1%).**Contribution:** school based educational program aimed at reducing the consumption of carbonated drinks to prevent excessive weight gain in children aged 7-11 year olds is a good quality evidence on the effectiveness of nutrition interventions, also would be a base for national strategies or to inform clinical practice.**Limitation:** the randomisation was according to classes and not schools; second, only two clusters, the low return rate of drink diaries may have response bias; third, diaries to report three days energy intake also would have bias, particularly those overweight or obese children would less report their intake.

10.20 Study of James (2007) (CHOPPS)

The name of this study is„Preventing childhood obesity: Two year follow-up results from the Christchurch obesity prevention program in schools (CHOPPS) “. It is a three-year England intervention based on Christchurch obesity prevention project in schools (CHOPPS) among 644 children aged 7- to 11-year-old, this is the follow-up results after the intervention conducted over one year.**Results:** BMI Z-scores had increased in the control group by 0.10 (SD=0.53) but decreased in the intervention group by −0.01 (SD=0.58), with a mean difference of 0.10 (95% confidence interval −0.00 to 0.21, P=0.06). The prevalence of overweight increased in both the intervention and control group, BMI increased in the control group by 2.14 (SD=1.64) and the intervention group by 1.88 (SD=1.71), mean difference of 0.26(−0.07 to 0.58, P=0.12). The waist circumference increased in both groups after three years with a mean difference of 0.09 (−0.06 to 0.26, P=0.25).**Contribution:** The intervention was specific and promoted a healthy diet based on the balance of good health.**Limitation:** Only 67% of the original cohort follow-up; second, because of financial and time limitations the consumption of carbonated drinks, or the socioeconomic status and pubertal status haven not report in this article.

10.21 Study of Jansen (Lekker Fit!)

The name of this study is„Effectiveness of a primary school-based intervention toreduce overweight “. It is a Dutch school-based study has 2,622 students from multi-ethnic, low income inner-city neighbourhoods in Rotterdam Netherlands.The interventionnamedLekker Fit! (Enjoy being fit!) was a multi-component intervention based on behavioural and ecological models, which including three physical education (PE) sessions a week by a professionalPE teacher, additional sport and play activities outside school hours and an educational program. Weight status, body mass index (BMI), waist circumference (WC) and fitness (20 m shuttle run) were measured. **Results:**It shows significant positive intervention effects for overweight children, WC and 20 m shuttle runamongpupils 6-9yearolds. The prevalence of overweight in this group increased by 4.3% in the control groupand by 1.3% in the intervention group. No significant effects were found for BMI or for grades 9-12yearolds group.**Contribution:** A cluster randomized controlled studydesign; second, the size of the study; third, the trained staff and theobjectively measurements.**Limitation:**Due to the pragmaticsetting unableto conduct the study double-blinded;second,randomization afterbaseline measurements was not possible because ofthe necessary time intervention schools needed toprepare for the change in curriculum; third, illness of staffcaused missing data on specific measurements (WC and20m shuttle run) in two schools.

10.22 Study of Kain (2-year)

The name of this study is„ Two-year controlled effectiveness trial of a school-based intervention to prevent obesity in Chilean children“. It is a non-randomized controlled Chile study with 2430 students from 4 schools(1759 intervention students in 3schools, 671 control students in 1 school) from year 2003-2004 in Chile. The intervention included activities innutrition and physical activity,BMI Z-score (BMIZ) and obesity prevalence, waist circumference and triceps skinfold thickness were meassured. **Results:**obesity prevalence and BMIZ declined significantly inthe intervention group; the controlgroup, obesity remained stable and BMIZ increased significantlyin the second year. BMIZ declined in both genders and all age categories.**Contribution:** There was agreater effect in terms of BMI changes in younger agegroups, while the impact was minimal in children over12 years of age.**Limitation:**in the second year the intervention could not bemaintained in its integrity, and additional PE classes are difficult to implement.

10.23 Study of Kettner (Baden-Württemberg)

The name of this study is„Objectively determined physical activity levels of primary school children in south-west Germany“. It is a German study which based on one south-west project named “Baden-Württemberg” study, using the sub-cohort to analysis the PA level. **Results:**The average wear time was 1403±94 min/day, Less than half of the children (48%) met current PA recommendations, but boys better than girls (68% vs. 28%). Together spent 808 ± 97min/day being

sedentary(56.1%);497±72min/day in light (34.5%); 128±54min/day in moderate (9.4%), and 8±10 min/day in vigorous intensity (8.9%). Girls spent more time in sedentary activities (841±97min/day vs. 775±86min/day p<0.001), while boys were more active than girls in MVPA (164±57min/dayvs.106±50min/day, p<0.001). There was a difference between activity behavior during the week and weekend, higher PA levels during the week [FMVPA (1,317) =91.6; p<0.001] whilst more sedentary during the weekend [FSED (1,317) =134.3; p<0.001]. **Contribution:** The studyreveals overweight/obese children spent more time in MVPA compared to normal weight children; second, different measurement tools and discrepancies in sample size of overweight/obese children may have contributed to these ambiguous findings.**Limitation:**The utilization of METs to differentiate between PA intensity levels might have led to a misrepresentation of PA; second, an interval of 15 second might be too long to accurately display children's activity patterns.

10.24 Study of Kleiser (KiGGS)

The name of this study is„Potential determinants of obesity among children and adolescents in Germany: results from the cross-sectional KiGGS study". KiGGS is one of the biggest German projects, here are the results of potential determinants of obesity and risk groups among 3-to 17-year-old children and adolescents. **Results:** There are strongest association with obesity which was observed for parental overweight and low SES, also children and adolescents with a two-parent migration background, whose parents smoke, mother smoked, gained weight more than 20 kg during pregnancy, ever predominantly breastfed, with high birth weight, post pubertal status, a low level of PA, high media consumption, eat most energy-providing food and beverages and symptoms of eating disorders are more often overweight and more often obese than their respective counterparts. There is also significant positive association between overweight (including obesity) as well as obesity and the total beverage intake, the consumption of water (including tea), of meat and sausages, the total food and beverage intake, and the intake of energy-providing food and beverages. Long sleep time was negatively associated with obesity among 3- to 10-year olds. Determinants of obesity occurred more often among children and adolescents with low SES.**Contribution:** It is one of the biggest projects in Germany, so has a large sample; it is the first time of representative the nationaldata including comprehensive information about healthstatus and health behaviour over the entire age range ofchildren and adolescents. **Limitation:**It is across-sectional study; second, a relatively rough instrument to measure food consumption (FFQ); third, it only gives limited information on PA during leisure time, but not on total PA including transport, physical activity classes at school.

10.25 Study of Kreuser (FITOC)

The name of this study is„ ''Obese Equals Lazy?'' Analysis of the Association betweenWeight Status and Physical Activity in Children ". It is a German 1-year study with 92 children aged 8-11 years old from south Germany. They participated in

FITOC-Freiburg Intervention Trial for Obese children programme which focused on physical activity (PA) enhancement. Participantsreceived medical examinations, nutritional and behavioralsupport and attend three physical education classes aweek. Height and weightwere measured and characterized by BMI (BMI-percentile, BMI-SDS); Daily PA (physical activity) was measured by direct accelerometry; Sparetime and screen time entertainment were obtained by questionnaires.**Results:**The amount of time spent ”passive” was significantlyhigher in overweight children, while non-overweight children were more ”active.”Themultiple regressionmodel shows a significantassociation between weight status (BMI-SDS) and activity parameters. Additionally, screen time entertainment was significantlyrelated to BMI-SDS.**Contribution:**Combines PAmeasured by objective accelerometryand by proxy report of parents who gave additional informationabout PA time and spare time activity. This leads toa significant quantitative and qualitative analysis of PA andsedentary behavior.**Limitation:**Quantifying and measuring PA in the complexbehavior of children is a difficulty, Children'sPA is characterized as spontaneous and irregularbecause they have a short attention span, in contrast to aconsistently distributed PA in adults.

10.26 Study of Kurokawa

The name of this study is„Recent trends of body mass index distribution among school children in Sendai, Japan: Decrease of the prevalence of overweight and obesity,2003-2009 “. It is a Japanese school based overweight prevalence study which examine trends in the body mass index (BMI) and prevalence of obesity in 6th grade primary schoolchildren (6thPS) and 3rd year junior high school students (3rdJHS) in Sendai, Japan. **Results:** The mean BMI and BMI percentile significantly decreased during the study period in all groups. The mean prevalence rates of overweight and obese children as defined by international reference values during the observation period were 19.5% and 4.1% for boys in 6thPS, 13.6% and 2.2% for girls in 6thPS,13.6% and 3.0% for boys in 3rdJHS and 12.2% and 1.9% for girls in 3rdJHS, respectively. There was a significant decreasing trend in the proportion of overweight and obese children from 2003 to 2009.**Contribution:** It is a 7 year long longitudinal study which can show the continuous change for research group. **Limitation:** This study only provided BMI and BMI percentile to analysis the overweight and obesity could be not so accurate; second, the reasons for the observed decreases in BMI percentiles in Sendai schoolchildren are unclear; third, it only investigate in one Japanese city.

10.27 Study of Li (2011) (11-5 Plan)

The name of this study is„ Evaluation of school based physical activity interventions for obesity in elementary students“. It is a Chinese one year intervention in Beijing Haidian district, there are 5 schools participated with 1,077 aged 7- to 11-year-old. It contains healthy education, physical activity implement by “happy 10 minutes” 1-2 times per day, healthy relative activities. **Results:** The score of knowledge related to PA in intervention group increased more than control group; the time of main school

activities in intervention group increased more than the control group; compared to the control group, the intervention group had greater reduction of sedentary activities in both learning days and weekends (P<0.05). For girls, waist circumference (WC) decreased more in intervention group than control group, with adjusted difference of -0. 88 cm (95% CI: -1.45 to -0.31). The proportion of boys being thinner was higher in intervention group compared with control group (P<0.05).**Contribution:** It is use covariance analysis method, corrected the change between two groups before and after intervention, compared with the other similar intervention studies this one is more accurate. **Limitation:** The study only listed the data did not explain the reasons, lack of data analysis.

10.28 Study of Li (2007) (CNHNS)

The name of this study is„Determinants of childhood overweight and obesity in China“. It is a Chinese study which based on 2002 China National Health and Nutrition Survey (CNHNS), including 6826 children aged 7-17 years, dietary intake was collected using three consecutive24-h recalls by trained interviewers; amounts of cooking oil and condiments consumed were weighed; an interview-administered1-year PA questionnaire was used to collect PA information. **Results:** The results showed that the heavier the parental bodyweight, the higher the overweight prevalence in children. The prevalence ratio increased if parent(s) were overweight and/or obese; up to 12.2if both parents were obese. Overweight children consumed significantly more dietary energy, protein and fat, but less carbohydrate than normal weight counterparts. Overweight children spent 0.5 h less on moderate/vigorous activities and 2.3 h more on low intensity activities per week. The following prevalence ratios were statistically significant: walking to and from school (0.6); moderate/vigorous activities≥45 min/d (0.8); low intensity PA>2 h/d (1.3); the consumption of≥25 g/d cooking oil (1.4); ≥200 g/d meat and meat products consumption (1.5); ≥100 g/d dairy products (1.8).**Contribution:** It is based on CNNHS so it is nationally representative; second, it comprised both diet and physical activity information and parental information could be more accurate data. **Limitation:** The study based on cross-sectional observation. Therefore, it is not possible to demonstrate a cause-and-effect relationship.

10.29 Study of Li (2010) (Chinese Clinic)

The name of this study is„The nutrition-based comprehensive intervention study on childhood obesity in China (NISCOC): a randomized cluster controlled trial “. It is a multi-centered randomized controlled trial, which included 6 centers located in Beijing, Shanghai, Chongqing, Shandong province, Heilongjiang province and Guangdong province, together 9,750 primary students aged 7- to 13-year-old participated. **Results:** The whole project contains nutrition education (special developed cartoon style nutrition education handbook) and PA intervention (Happy 10 min program) in all intervention schools of 5 cities, but in Beijing, nutrition education intervention in 3 schools and PA intervention among another 3 schools. It measured weight, height, waist circumference (WC), body composition (BC), physical

fitness, 3days dietary record, PA questionnaire, blood pressure (BP), total cholesterol (TC), triglycerides (T), LDL cholesterol (LDL-C) and HDL cholesterol (HDL-C). **Contribution:** It is the first and biggest multi-center comprehensive childhood obesity intervention study in China. **Limitation:** The intervention strategies should justify a national school-based program to prevent childhood obesity in China; second, it measured both changes in BC and chronic diseases risk factors, which provides sufficient power to study the intervention benefit for chronic diseases; third, there is no very accurate diet and PA measurements; forth, many schools refused the staff members enter the schools for supervising the intervention implementation; fifth, Happy 10 min activity per school day do not absolutely add to the normal PA in schools.

10.30 Study of Lim

The name of this study is„Association between obesity and metabolic co-morbidities among children and adolescents in South Korea based on national data ". It is a Korea public health study, which based on 2007-2008 Korea National Health and Nutrition Examination Surveys, 1,526 children aged 10-19 years were involved, there are more Physiological parameters measured. **Results:** Boys had higher means BMI,WC, and BP than girls, while girls had higher means of total blood cholesterol and HDL-cholesterol($P<0.05$).There are more risk of metabolic co-morbidities in obese children than normal-weight children ($P<0.05$),91.1% for central obesity and 29.6% for high total glucose (TG)(OR: 6.87; 95% CI: 4.05-11.64), high blood pressure(BP) (adjusted odds ratio (OR): 1.90; 95%CI: 1.05-3.45), dyslipidemia(D) (OR: 6.21; 95% CI: 3.59-10.75), low HDL (OR: 4.46; 95%CI: 2.23-8.89), and $\geq$2 co-morbidities (OR: 26.97; 95% CI: 14.95-48.65).Also the associations between weight status and metabolic outcomes were stronger in boys. **Contribution:** It is the supplement knowledge of Korean children metabolic co-morbidities, it is important for the public health education in Korea; second, this study based on national sample so would easier to provide representative estimates; Third, because of the base survey it includes more national Korean overweight children and provide national children metabolic problem. **Limitation:** It could not employ longitudinal models due to data limitation; second, subjects were excluded in the analysis if weight or metabolic comorbidities were not measured, which limited the sample size and could potentially introduce selection bias.

10.31 Study of Llargués (2011) (IVAC)

The name of this study is„ Assessment of a school-based intervention in eating habits and physical activity in school children: the AVall study ". It is a Spanish school based 2-year intervention on food habits and physical activity in school children aged 5-6 years old from 2006-2008.The intervention consisted of the promotion of healthy eating habits and physical activity by means of the educational methodology Investigation, Vision, Action and Change (IVAC).Weight and height were measured, families were given a self-report physical activity questionnaire and the Krece Plus quick test. **Results:**the body mass index of the children in the control group was 0.89

kg/m2 higher than that of the intervention schools. The intervention reduced by 62% the prevalence of overweight children; the proportion of a second piece of fruit and took part in an after-school physical activity increased in the intervention group. In the control group, the weekly consumption of fish was reduced.**Contribution:**A school-based intervention, using investigation, vision, action and change methodology, in children of 6-8 years, improves eating habits and increases physical activity; the decrease in weight excess does not depend on sex, previous body mass index or ethnical background; lower mothers' education background ifluent the intervention, however less effective. **Limitation:** use parent report, physical activity more or less reported.

10.32 Study of Llargués (2012) (IVAC)

The name of this study is„Medium-term evaluation of an educational intervention on dietary and physical exercise habits in schoolchildren: The Avall 2 study ". The Intervention consisted of promoting healthy dietary habits and increasing PAthrough the educational pedagogyInvestigation, Vision, Action and Change (IVAC). **Results:** Dietary habits were similar in both groups, only the control group showed a trend to a higher consumption ofpastries as afternoon snacks (p = 0.062)). A higherproportion of control schoolchildren walked to school andhad no lunch there, while a trend was seen for a greaterproportion of children in the intervention group to performphysical activity outside the school (p = 0.055).There were no differences in the daily time of sedentaryactivity between the two groups.The prevalence of overweight andobesity increased by 8% and 0.5% in the controlgroup, while in the intervention group the prevalence ofoverweight increased by 5.3%, while obesity prevalencedecreased by 3.6%.**Contribution:**This study showed the improvement in dietary habitsseen just after educational intervention was not maintainedover time.**Limitation:**Percent losses were high in both groups;second, walking toschool has a much lesser impact upon dailyenergy expenditure than out-of-school PA.

10.33 Study of Magnusson (Cardio respiratory)

The name of this study is„ Limited effects of a 2-year school-based physical activity intervention on body composition and cardiorespiratory fitness in 7-year-old children". It is a 2-year Iceland intervention study on 7-year-old children in elementary schools with 321 students (151 in 3 intervention schools and 170 in 3 control schools). The intervention included increasing physical activity during school hours and promoting healthy dietary habits and nutrition education, both at school and at home. **Results:**Children in the intervention group increased their fitness by an average of 0.37 z score units more than the controls, representing an improvement of 0.286 W/kg. Boys had higher fitness than girls. The results of this intervention are inconclusive as regards to the effects on fitness, but the inter intervention did not have any statistically significant effect on body composition. **Contribution:** 2 years intervention via a dual energy x-ray (DEXA)DEXA scan to measure cardio respiratory fitness and body composition, and all measurements were conducted by the same

trained personnel pre- and post-intervention. **Limitation:** relatively high teacher turnover rate in two of three intervention schools.

10.34 Study of Maier (Brandenburg)

The name of this study is “Dietary pattern and leisure time activity of overweight and normal weight children in Germany: sex-specific differences “. It is an 18-month German study which focuses on sex-specific in normal weight and overweight children aged 5- to 8-year-old, nutritional intake, anthropometric parameters, leisure time activities and socio-demographical factors were assessed. **Results:** boys ate more cheese while girls consumed more vegetables and spent more time with sedentary activities. Regardless of sex, total energy and macronutrient intake did not differ between normal weight and overweight children, also no difference in time spent with sportive activities between groups. Overweight boys only spent significantly more leisure time with sedentary activities than normal weight boys, cannot see difference in girls. Only BMI of mothers ($p<0.05$) and time spent with sedentary activities ($p<0.05$) were found to be independent risk factors for BMI-SDS. **Contribution:** This study not only focus on the sex-specific also consider the leisure time activity; second, the study also target on age is 5-to 8-year-old which could be more clearly to show the age specific compare with the other studies only on adolescents and adults. **Limitation:** Nutritional intake was self-reported and might be influenced by recording errors or under-reporting, second, leisure time activities were also self-reported and not assessed by objective measurements such as accelerometers; third, the results are not representative for the whole population, as the study sample consists mainly of Caucasian children and parents with an educational level higher than 10 years and it was a rather small sample; forth, data of this cross-sectional study only represent a short view at the moment.

10.35 Study of Meij (JUMP-In)

The name of this study is„Effectiveness of JUMP-in, a Dutch primary schoolbasedcommunity intervention aimed at thepromotion of physical activity “. It is a 3-year dutch study from the year 2006-2008 to investigatethe effect of the JUMP-in programme on sportsparticipation, overall physical activity (PA), shuttle runscore and body composition in 6-12-year-old children. JUMP-in is a school-based strategy combiningenvironmental policy, neighbourhood, parents- andpersonal components which includes 6 parts: 1. PFS (pupil follow-up system): A monitoring instrument yearly assessing and registering children’s level of PA, BMI and motor skills; 2. School sport clubs: In or near the school premises, structural and easily accessible school sports activities are offered on a daily basis. 3. ‘The Class Moves!’ : offering recurrent breaks for PA, relaxation and posture exercises; 4. ‘This is your way to Move!’: Personal workbooks for children and their parents, with assignments to perform in class and at home, and an instruction-book for theschool staff; 5. Parental information services: information meetings, courses and sports activities for parents; 6. Extra care for children: at risk Children who have motor and movement disabilities or who experience hampering factors in their PA behavior, receive additional adapted

physical education lessons or motor remedial teaching, given by a qualifiedteacher. **Results:**A significant beneficial intervention effect on organized sports participation. Effects were stronger for girls, and for Moroccan and Turkishchildren. Participation in organizedsports was associated with increased shuttle run score.No significant intervention effects on overall daily PArates and body composition were observed.**Contribution:** the interventionwas implemented by the school staff, city district andlocal partners in healthcare and sports themselves, espacially applicable in real-world settings and ethnicallydiverse and socio-economically deprived schools; the objective measurement of PA by accelerometers, sports participation was assessed in personal interviews by trained testers, It can be more reliable andprevents response bias and over-reporting of PA levels.**Limitation:** it was not a randomization trail, children and parentswere not aware of the existence of the other condition,which could have biased the results; modifiedthe SRT by setting the lines at 18 m instead of the usual20 m; the accelerometers for PA measurementwere used in a very small portion of the sample; not all testers could be blinded to group assignmentof the children.

10.36 Study of Meng (Chinese Clinic)

The name of this study is„ The Costs and Cost-Effectiveness of a School-Based Comprehensive Intervention Study on Childhood Obesity in China“. It is a multi-center randomized controlled Chinese big cities trial, total of 9,750 primary school students (aged 6- to 13-year-old) participated, 114 of 5,250 as intervention group and 309 of 4,500 as control group. The whole project contains nutrition intervention and PA intervention, this study focus on the BMI or BAZ change in both interventions and the cost and cost-effectiveness. **Results:** BMI and BAZ increment was 0.65 kg/m^2 (SE 0.09) and 0.01 (SE 0.11) in the combined intervention respectively, significantly lower than that in its control group (0.82 ± 0.09 for BMI, 0.10 ± 0.11 for BAZ). No significant difference were found neither in BMI nor in BAZ change between the PA intervention and its' control, which is the same case in the nutrition intervention. The single intervention has a relative lower intervention costs compared with the combined intervention. Labor costs in Guangzhou, Shanghai and Jinan was higher compared to other cities. The cost-effectiveness ratio was $120.3 for BMI and $249.3 for BAZ in combined intervention, respectively. **Contribution:** The program was standardized through the development, intervention and evaluation; second, Happy 10 program is a recreational and non-competition program in PA intervention; third, parents, instructors, health workers, school canteen managers all involved in both in nutrition education PA intervention; Forth, the follow-up rates were high (85%) and similar rates among control schools; sixth, first cost-effectiveness of interventions in China. **Limitation:** long-term effects and cost-effectiveness of the intervention cannot be assessed; second, real intervention implemented time is only 8.9 months interrupted by 2 holiday; third, because of different economical level, salary income and expenditure level the combined intervention cannot implemented in the same center with the individual intervention; forth, the sample size in single intervention group in Beijing is small and is not sufficient enough to detect the difference of changes.

10.37 Study of Nagel (URMEL-ICE)

The name of this study is„Determinants of obesity in the Ulm Research on Metabolism, Exercise and Lifestyle in Children (URMEL-ICE) ". It is a German study among 1,079 children aged 6- to 9-year-old, physical examination, height, weight, skin fold thickness, and upper arm and waist circumferences measured; parents questionnaire including migration background, body shape and education. Physical inactivity behavior, nutrition also record. **Results:** The prevalence of overweight was 16.5% in boys and17.3% in girls and of obesity 3.5% and 3.6%, respectively. Migration (29.4 %) was correlated with overweight and obesity. In particular, among boys with migration background, overweight (24.0%) and obesity (6.6%) were highly prevalent. Higher obesity prevalence was associated with maternal smoking during pregnancy, parental overweight and low parental education. Indicators for physical inactivity such as watching television more than 1 h per weekday, participation in club sports less than once a week, consumption of sweetened drinks (≥3 times per week), and skipping breakfast before school were associated with childhood obesity.**Contribution:**It is a population-based approach to measure the anthropometric according to a standardized protocol in one clinic. **Limitation:** It is a cross-sectional study; second, dietary and lifestyle with self-report which would under report by overweight children.

10.38 Study of Naul (HCSC/GKGK)

The name of this study is„Healthy children in sound communities"(HCSC/gkgk) – a Dutch-German community based network project to counteract obesity and physical inactivity ". It is a 4-year longitudinal Dutch-German border integration community based network project named„ Healthy children in sound communities" (HCSC/gkgk).It contains physical activity, nutrition, public health, improvement ofthe physical environment as a multicomponent to enhance an active lifestyle, it had been implemented in 39 primaryschools with 557 children age 6-10 years old. This programme including 3 hours of health enhanced physical education and 2 additional hours of physical activities offered by sport clubs to balance motor deficits andto reduce overweight and obesity. **Results:**Original values of Motor Ability tests show significant increase in endurance, coordination,velocity and force tasks. And German childrenwere significantly better in push-ups, 20-m sprint,standing broad jump, rapid alternations jumps andbalance backwards and Dutch children were significantlybetter at sit-ups and sit and reach. Also first changes for BMI distribution are explored in only one yearintervention.**Contribution:**It is a poilet of multi-component programme anda multi-sector approach of intervention.**Limitation:**it is a 1 years intervention so in the next 2-5 years, the analysis should be expanded.

10.39 Study of Nakamura

The name of this study is„Combined influence of media use on subjective health in elementary school children in Japan: a population-based study". It is Japanese

school-based cross-sectional study among 3,464 elementary schools students aged 10 to 12-year-old. Self-reported health, lifestyle habits, and time spent using media were assessed. **Results:** The use of games, television, and personal computers was significantly associated with lifestyle ($p<0.05$) and subjective health ($p<0.05$).The greater the number of media used for more than 1 hour was, the higher the odds ratio of the association of media use with unhealthy lifestyle and subjective health complaints was. The plural use of these media had stronger associations with unhealthy lifestyle and subjective health complaints. **Contribution:** It compared children play more than 1 hour of different media devices with the subjective health complains in detail; second, it is a big scale of sample of elementary school in Japan. **Limitation:** a cross-sectional study; second, he samples were collected from a limited area in Japan; third, the questionnaire in the present study has not been sufficiently validated, and the link between subjective health and objectively assessed health indices has not been established; forth, the games are not separate sedentary gaming from active gaming.

10.40 Study of Ochiai (2010)

The name of this study is„Relationship of body mass index to percent body fat and waist circumference among schoolchildren in Japan - the influence of gender and obesity: a population-based cross-sectional study. “. It is a Japanese anthropometric measurement among 3,750 children from grade four and grade seven. Height, weight, BMI, waist circumference (WC), percentage of body fat (BF %) were calculated. **Results:** The correlation coefficients between BMI and BF% were 0.74 for boys and 0.97 for girls, between BMI and WC were 0.94 for boys and 0.90 for girls. Similar results were observed in the analysis of seventh graders. The correlation coefficient between BMI and BF% varied by physique (obese or non-obese), with weaker correlations among the obese regardless of the definition of obesity; most correlation coefficients among obese boys were less than 0.5, whereas girls were more than0.7. Regardless of physique, the correlation coefficients between BMI and WC were more than 0.8 among boys and more than 0.7 among girls, respectively. **Contribution:** It consider gender to address the relationship betweenBMI and %BF or WC; second , choose two age group with sex to analysis is very importantbecause sexual dimorphism in human body composition emerges primarily during puberty. **Limitation:** %BF was measured by BIA not dual-energy X-ray absorptiometry (DEXA); second, use Pearson’s correlation coefficient could affect the correlation coefficient by outliers; third, in only investigated in one Japanese town.

10.41 Study of Ochiai (2015)

The name of this study is„Waist-to-height ratio is more closely associated with alanine aminotransferase levels than body mass index and waist circumference among population-based children: a cross-sectional study in Japan“. It is a Japanese anthropometric measurement among 2,499 children aged 9or 10-year-old. It measured height, weight, BMI, waist circumference (WC), waist-to-height ratio (WHtR) and alanine aminotransferase (ALT) to investigate the association between

anthropometric measurements and ALT level. **Results:** BMI, WC, and WHtR were significantly positively correlated with ALT levels; the correlation coefficient of ALT levels with WHtR was higher than that with BMI and WC in boys and girls. In the analysis stratified by physique (non-overweight/obesity, overweight, or obesity), all anthropometric measurements were significantly positively correlated with ALT levels among boys, while only WHtR was significantly positively correlated with ALT levels among girls. The correlation coefficient of ALT levels with WHtR was more pronounced than that with BMI and WC in the non-overweight/obesity group, overweight group and obesity group for each sex. **Contribution:** all anthropometric variables (height, weight, and WC) and ALT were conducted among more than 2000population-based elementary schoolchildren in Japan which is really rare. **Limitation:** It is a cross-sectional study; second, the obesity group were based in one town, relatively small sample size; third, still some other risk factor have not consider to analysis the association between anthropometric and ALT level.

10.42 Study of Pei (GINIplus and LISAplus)

The name of this study is„Food Intake and Overweight in School-Aged Children in Germany: Results of the GINIplus and LISAplus Studies“. It is a German study which based on GINIplus and LISAplus Studies using 11 categories to document intake of nutrition variety and intensity among 2,565 aged 10-year-old school children. **Results:** Compared to low intake, high intakes of meat, fish, beverages and bakery products were associated with greater BMI z-scores [β (95% CI)=0.32 (0.21,0.42), 0.13 (0.03,0.24), 0.23(0.11,0.35) and 0.10 (-0.01,0.20)] and increased risk of being overweight [odds ratio (OR) (95% CI)=2.08 (1.58,2.73), 1.39(1.08,1.80), 1.36 (1.01,1.84) and 1.62 (1.24,2.11)]. Conversely, medium and high intakes of confectionery were associated with smaller BMI z-scores [β=-0.18(-0.28,-0.07) and-0.22(-0.33,-0.12)] and decreased risk of being overweight[OR=0.64 (0.50, 0.83) and 0.53(0.40, 0.68)].**Contribution:** It based on two large population-based cohorts with measured anthropometric data with a big sample; second, the food groups are defined according to the WHO food category system, which can compare to future studies; third, sensitivity analyses conducted using different models as multivariate standard model and multivariate density model. **Limitation:** It is a cross-sectional study; second, lack of fat mass and body composition data; third, use questionnaires to assess the nutrition would had bias the results of study.

10.43 Study of Ravens-Sieberer (BELLA/KiGGS)

The name of this study is„The mental health module (BELLA study)within the German Health Interview and Examination Survey of Children and Adolescents (KiGGS): study design and methods“. It is a Germen mental health and well-being study in children and adolescents is the mental health module of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS), it selected 2,863 children aged 7- to 11-year-old. **Results:** No difference was observed for the children’s self-reported mental health, all children took 25-item SDQ to assess emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems

and prosaically behavior; attention deficit-/hyperacid depressive symptoms use the Centre for Epidemiological Studies Depression Scale for Children (CES-DC); depression Inventory for Children and Adolescents(DIKJ); anxiety use the Screen for Child Anxiety Related Emotional Disorders(SCARED) instrument; problematic eating behavior was assessed use the SCOFF questionnaire; alcohol, tobacco and drug consumption use single questions on whether these substances are/were consumed. **Contribution:** BELLA study provides a comprehensive health report on children and adolescents in Germany and furthermore supply information that was previously missing; second, KiGGS and BELLA strengthen epidemiology in Germany by providing data for epi-demiological research and by helping to advance its methods; third, it provides the foundations for establishing priorities in health policies with regard to prevention, intervention and health promotion in children and adolescents; forth, it offers the general public information about important aspects of children's and adolescents 'general and specific mental health problems, psychosocial risks and resources as well as the consequences for the individual. **Limitation:** This study is a sub study of KIGGS, so based on a previous cluster analysisof data collected via self-administered questionnaires not directly by research, so statements on mental health can be affected by the reporters.

10.44 Study of Reed (Action Schools)

The name of this study is„Action Schools! BC: A school-based physical activity intervention designedto decrease cardiovascular disease risk factors in children". Itis a cluster-randomized controlled school-based trial with 8 elementary schools,268 aged 9-11years old student participated from year 2003-2004 in Canada. Cardiovascular fitness (20-m Shuttle Run), blood pressure(BP), and body mass index (BMI, wt/ht2)total cholesterol (TC), totalhigh-density cholesterol (TC:HDL-C), low-densitylipoprotein, apolipoprotein B, C-reactive protein and fibrinogen are assessed. **Results:** intervention children had a 20% greater increase in fitness and a 5.7% smaller increase in BP, no significant differencesbetween groups for change in BMI or in any of the blood variables, Overall intervention children had a higher average physical activity score than control children .**Contribution:** The AS! BC intervention provided children with more opportunitiess for daily physical activity without disruptingthe academic curriculum. It is a feasible andeffective model which could potentially benefit the cardiovascularhealth of a large number of children. **Limitation:** no clinical significance of findingsrelate to CVD in adulthood; no quantify physicalactivity undertaken within the AS;9 months is too short time for the cardiovascular health impact ; 77 volunteeredprovide blood samples a relatively small number .

10.45 Study of Resaland (Cardiovascular)

The name of this study is„Effects of a 2-year school-based daily physical activity interventionon cardiovascular disease risk factors: the Sogndalschool-intervention study". Itis a2yearschool-based physical activity (PA) intervention in 9-yearoldchildren on cardiovascular disease (CVD) risk factors.There are 256 students participated, 125

in intervention school with 60 min of PA daily and PA lessonswere planned, organized and led by expert physical educationteachers; 131 in control school with normal 45 min of PE twice weekly. were tested.**Results:** there is a benificial development in blood pressure(BP), triglyceride (T), totalcholesterol-to-high-density lipoprotein cholesterol ratio (TC:HDL-C) and peak oxygenuptake (VO_2 max) in intervention children than control children. No significant differences were observed in waistcircumference (WC), body mass index (BMI) and the homeostasis modelassessment for insulin resistance between the two groups.**Contribution:**the length (19months) and the daily volume (60min) of the intervention,the intervention was thoroughlymonitored by expert PE teachers; accuracy and high quality of theCVD risk factor measurements; this study was the mandatory nature ofthe intervention. **Limitation:**this physical activity intervention was not a randomized-controlled trial, the intervention was not measured objectively neitherat the intervention school nor at the control school.

10.46 Study of Rush (Energize)

The name of this study is„A school-based obesity control programme: Project Energize. Two-year outcomes“. It is a 2-year longitudinal randomised study with 124schools 1,352 students(926 in 5-year-old,426 in 10-year-old) from year 2004-2006 in the Waikato Region of New Zealand. This study was assigned an ‘Energizer’ as a trained physical activity and nutrition change agent for intervention schools , who worked with the school to achieve goals based on healthier eating and quality physical activity. height, weight, body fat (BF)and resting blood pressure (BP) measured. **Results:**the intervention was associated with a reduced accumulation of body fat in younger children and a reduced rate of rise in systolic BP in older children. There was some evidence that the pattern of change within an age group varied with rurality, ethnicity and sex. There is no important changes or differences between control and intervention were seen in their basic food pattern over time.**Contribution:** positive changes in the right direction for BP and %BF SDS still took place in the schools that received the services of an Energizer to help them plan, implement and drive new initiatives. **Limitation:**Children’s behaviours outside of the school environment could not be accounted; control schools attended nationwide Healthy Eating Healthy Action Strategy which alsomonitored food regulations and supplied fruit.

10.47 Study of Sanigorski (BAEW)

The name of this study is„ Reducing unhealthy weight gain in children throughcommunity capacity-building: results of a quasiexperimentalintervention program, Be Active Eat Well “. It is a 4-year Australia study named Be Active Eat Well (BAEW), which was a multifaceted community capacity-building program promoting healthy eatingand physical activity for children (aged 4-12 years) in the Australian town of Colac. The programme includes 10 objectives:3 capacitybuilding, (broadactions around governance, partnerships, coordination,training and resource allocation),5 evidence-based behavior changes (reducing television viewing,reducing

sugar drinks and increasing water consumption,reducing energy dense snacks and increasing fruitintake, increasing active play after school and weekends,increasing active transport to school), 2 innovative(a small parent support andeducation program and a project to improve the deep-fryingpractices in food outlets). There are 1,001 children were perticipated. **Results:**Colac children had significantly lower increases in body weight, waist, waist/height, and BMI z-scorethan comparation children.The anthropometric changes were not related to 4 indicators of SES, whereas inthe comparison group 19/20 showed significantly greater gains in anthropometry in children from lower SESfamilies. Changes in underweight and attempted weight loss were no different between the groups.**Contribution:** The first obesity prevention program toshow significant reductions in the social gradient in weightgain, the approach are valuable forreducing obesity-related health inequalities in children;second,project employed a community capacitybuildingapproach to the intervention, rather than using apredeveloped program to apply to the community. **Limitation:**It is fairly homogeneous in terms of ethnicity, applying the intervention activities to communities with high levels of ethnic diversity; second, a quasi-experimental design has more risk of bias than individual or setting-based randomization;third, the nonblinding of groupallocation during testing; forth, response rates of about 50%,pretty low.

10.48 Study of Shi (Beijing)

The name of this study is„An Analysis of Intervention on Obese Students in Primary Schools in Beijing". It is a 2-year Chinese youth obesity intervention program launched in Dongcheng, Haidian and Shunyi three district of Beijing city, the target age from 9-to 10-year-old, it has special curriculum for obesity students, increase PE course, set up new obesity and health lecture and training courses, build obesity student self-management-handbook, monitor the lunch at school days, ask parents monitor at home. **Results:** There is no significant overweight and obesity difference between intervention school and control school, in intervention school, there are 34.55% and 21.82% children from overweight into normal and obesity, respectively; 4.72% and 16.04% from obesity into normal and overweight, respectively; in the control school, there are 24.04% and 25.96% children from overweight into normal and obesity, respectively; 14.61% and 22.47% from obesity into normal and overweight, respectively. The knowledge of overweight and healthy, healthy behavior questionnaire answers in both schools improved, but intervention school did more higher score. **Contribution:** The healthy theory in intervention school had improved much. **Limitation:** It did not mention the PA intervention, and the outside school activity.

10.49 Study of Sigmund (2-year)

The name of this study is„Does school-based physical activity decrease overweight and obesity in children aged6-9 years? A two-year non-randomized longitudinal intervention study in the Czech Republic". It is two-year physical activity intervention study in Czech Republic among 176 students age 6- to 9-year-old. The PA containstwo

45-min physical education (PE) lessons per week as normal PA programme and intervention school will have extra program: one 20-min recess with PA content; PA (playing) during after-school nursery (≈40-min to ≤ 90-min);an average of 2-3 short breaks per day(lasting 3-5-min each between lessons).**Results:** There was a significant increase of school-based PA during schooldays in intervention. Increased school-based PA of intervention children during schooldays contributed to them achieving>10,500 steps and >10.5 Kcal/Kg per school day across the 2 years of the study, and resulted in a stop of thedecline in PA levels that is known to be associated with the increasing age of children. It had also positive impact on leisure time PA of schooldays and on PA at weekends of intervention children. Oneyear after the start of the PA intervention, the odds of being overweight or obese in the intervention children wasalmost three times lower than that of control children ($p<0.005$), and these odds steadily decreased with theduration of the intervention.**Contribution:**The study is longitudinal,repetitive, objectively-monitored PA intervention; second, it simultaneouslymeasured by two devices (pedometer andaccelerometer) provides support to the internal validityof the study.**Limitation:** it is not a randomized study; second, the assessment ofbody weight level using age-differentiated percentileBMI graphs does not consider issues of body compositionor actual biological age of the child; third, the nutritional habits are not monitored.

10.50 Study of Spengler (2012) (MoMo/KiGGS)

The name of this study is„A cluster-analytic approach towards multidimensional health-related behaviors in adolescents: the MoMo-Study“. It is a German study within the framework of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS) and the “Motorik-Modul” (MoMo), 1,643 German adolescents (11-to 17-year-old) completed a questionnaire assessing the amount and type of weekly physical activity in sports clubs and during leisure time, weekly use of television, computer and console games and the frequency and amount of food consumption. **Results:** Four stable clusters representing typical health-related behavior patterns were identified: Cluster 1(16.2%)-high scores in physical activity index and average scores in media use index and healthy nutrition index; cluster2 (34.6%)-high healthy nutrition score and below average scores in the other two indices; cluster 3 (18.4%)-low physical activity score, low healthy nutrition score and very high media use score; cluster 4 (30.5%)-below average scores on all three indices. Boys were overrepresented in the clusters 1 and 3, and the relative number of adolescents with low socio-economic status as well as overweight was significantly higher than average in cluster 3. Contribution: It identified typical health-related behavior patterns in German adolescents; second, health related behavior patterns and their correlates gained in this study makes a considerable contribution for the precise characterization of target groups for primary prevention of lifestyle diseases. **Limitation:** The clusters identified in this study represent rather health-related behavior patterns than health-related lifestyles; second, it is use self-administered questionnaires to finish all the PA level, media use and diet could be less report or over report.

10.51 Study of Spengler (2014) (MoMo/KiGGS)

The name of this study is„Longitudinal associations of health-related behavior patterns in adolescence with change ofweight status and self-rated health over a periodof 6 years: results of the MoMo longitudinal study“. It is a longitudinal German Health Interview and Examination Survey for Childrenand Adolescents (KiGGS) and the Motorik-Modul (MoMo), from the year 2003-2006(4,529 in 4-17year old), and year 2009-2012 (2,169 in 10-24 year old) two period, 4clusters of typical health-related behavior patterns, 'physical activity', 'media use' and 'healthynutrition' were included. **Results:** The prevalence of overweight increased in all 4 clusters. The health-related behavior pattern of lowactivity level with high media use and low diet quality had the strongest increase in prevalence of overweight,the smallest and non-significant increase was found with the behavior pattern of a high physical activity leveland average media use and diet quality. Only some significant relationships between health-related behaviorpatterns and change in self-rated health were observed.**Contribution:** it provides information on the change of health parameters in adolescents and young adults, identifiedhigh-risk patterns of health-related behavior, as well as compensatory effects of differenthealth-related behaviors on each other emphasizes theimportance of multiple health behavior research.**Limitation:**This study was based on a previous cluster analysisof data collected via self-administered questionnaires not directly by research, so statements on diet behavior can be affected by the subjectiverating of portion sizes and by the difficulty of recallingthe frequency and amount of food intake; second PA level and media use can beaffected by the difficulty of remembering the duration ofactivities and summarizing this information.

10.52 Study of Stenevi-Lundgren (Sweden)

The name of this study is„Effects of a daily school based physical activity intervention program on muscle development in prepubertal girls“. It is a swedish 12-month prospective controlled intervention evaluated the effect of a general school based PA program on muscle strength, physical performance and body composition in prepubertal girls. 53 aged 7-9 years girls involved in a school based exercise program(40 min/day of general PA per school day, 200 min/week), were compared with 50 age-matched girls who participated in the general Swedish PE curriculum (mean60 min/week). Body composition (DXA), isokinetic peak torque (PT) of the knee extensors and flexors at 60 and 180°/s, and vertical jump height (VJH) were assessed. **Results:**The annual gain in weight was similar between the groups, but there was a greater increase in total body and regional lean mass and fat mass in the exercise group. Mean gains in knee extensor PT at 60 and 180°/s were 7.0-7.6% greater in the exercise group. No significant differences were detected in VJH.**Contribution:** this study provides a feasible strategy to increase overall physical activity levels and enhance muscle strength and lean tissue mass in prepubertal girls; designed to enable ordinary school teachers to lead the physical education classes, which did not require any additional resources or external support.**Limitation:** the trial was not a randomized controlled study, lack of resources control group girls

were remeasured after 2 years; the estimate of lean tissue mass and fat mass was made using DXA.

10.53 Study of Taylor (APPLE)

The name of this study is„APPLE Project: 2-y findings of a community-based obesity prevention program in primary school age children “. It is a 2-year New Zealand intervention project named “A Pilot Programme for Lifestyle and Exercise (APPLE)” among 5- to 12-year-old children. Encourage healthy eating with science lessons highlightingadverse health effects of sugary drinks and fatty foods. Cooledwater filters installed in schools to promote drinking water.Initiatives were set to promote more PA activity as well as sportsequipment were provided for free time.**Results:** BMI z-score was significantlylower in intervention children than in control children by a mean of0.09 (95% CI: 0.01, 0.18) after 1 year and 0.26 (95% CI: 0.21, 0.32) after 2 years, but the prevalence of overweight did not differ. WC was significantly lower at 2 year (-1 cm), also systolic bloodpressure reduced after 1 year (-2.9 mm Hg). An interaction existedbetween intervention group and overweight status (P=0.029), mean BMI z-score was reduced in normal-weight (-0.29; 95%CI:-0.38,-0.21) but not overweight(-0.02;95%CI:-0.16,0.12). And intervention children consumedfewer carbonated beverages (67% of control intake; P=0.04) and fruit juice or drinks (70%; P=0.03) and more fruit (0.8servings/3 d; P<0.01).**Contribution:**APPLE project shows high response rates in bothcontrol and intervention schools at each time point by wider school community. **Limitation:**control and intervention communities werenot randomly selected.

10.54 Study of Valdimarsson(Exercise)

The name of this study is„Daily Physical Education in the School Curriculum in Prepubertal Girlsduring 1 Year is Followed by an Increase in Bone Mineral Accrual andBone Width-Data from the Prospective Controlled MalmöPediatricOsteoporosis Prevention Study “. It is a Swedish1-yearschool-based exercise intervention programin age 7-9 year old girls,103 participated. Intervention school has 40 minutes/school day andcontrolschool has 60 minutes physical activity/week . Bone mineral content (BMC) and areal bone mineraldensity (aBMD) were measured with dual X-rayabsorptiometry (DXA) of the total body (TB), lumbarspine (L2-L4 vertebrae), third lumbar vertebra (L3),femoral neck (FN), and leg. Volumetric bone mineraldensity and bone width were calculated at L3and FN. Total lean body mass and total fat mass wereestimated from the TB scan.**Results:** No differences at baselinewere found in age, anthropometrics, or bone parameterswhen the groups were compared. The annual gain inBMC was 4.7 percentage points higher in the lumbarspine and 9.5 percentage points higher in L3 in casesthan in controls. The annual gain inaBMD was 2.8 percentage points higher in the lumbarspine and 3.1 percentage points higher in L3 in casesthan in controls. The annual gain inbone width was 2.9 percentage points higher in L3 incases than in controls. A general schoolbasedexercise program in girls aged 7-9 years enhancesthe accrual of BMC and aBMD and increases bonewidth.**Contribution:**physical activity could be a

cost-effectivestrategy to increase aBMD and bone width as this studyconfirms that exercise could be increased in the schoolcurriculum with no extra costs; the evaluation ofbone width. **Limitation:** it is not arandomized study; neitherthe parents nor the pupils accepted;somechildren were sent to physical activity during compulsoryschool hours while others were not; in the controlschools they did not achieve such an attendance rate thatthe controls could be regarded as a population-basedcohort.

10.55 Study of Vizcaíno (After School)

The name of this study is„Assessment of an after-school physical activity program to prevent obesity among 9- to 10-year-oldchildren: a cluster randomized trial". It is a 2-year spanish intervention in 20 schools. Normal PE (3-h per week of PA at low-to-moderate intensity) continued in both schools; add extra three 90-min sessions per week, for 24 weeks in intervention schools. **Results:**There were no differences in BMI between the intervention and control groups. Compared with controls, intervention children showed a decrease in TST in both boys (-1.14mm; 95% confidence interval (CI) -1.71 to -057; P<0.001) and girls(-1.55mm; 95% CI -2.38 to -0.73; P<0.001), as well as a reduction in the percentage of body fat in girls (-0.58%;95%CI-1.04to-0.11;P=0.02). Intervention boys exhibited a decrease in apolipoprotein (apo) B levels (-4.59;95%CI -8.81 to-0.37; P=0.03) and an increase in apo A-I levels (13.57; 95% CI 7.95–19.20; P<0.001).No changes in total cholesterol, triglycerides or blood pressure were associated with the intervention ineither sex, except for an increase in diastolic blood pressure (1.55mmHg;95%CI0.19-2.91; P=0.03) in the intervention versus control boys.**Contribution: T**he program was standardized through structured training of the sports instructors and a written plan of the activities undertaken in each session; Second, PA was recreational and non-competitive; third, follow-up rates were similar or even better among children in the control schools; forth, only one school in each town entered the study, thereby limiting the spread of intervention to the control schools.**Limitation:**it was conducted in rural schools so the findings should be confirmed in urban settings; second, the impact of the intervention should be examined over a more prolonged time, not only 9-month;third, anthropometric and blood pressure determinations were not blinded to intervention allocation.

10.56 Study of Wijtzes (Generation R)

The name of this study is„ Sedentary behaviors, physical activity behaviors, and body fat in 6-year-old children: the Generation R Study". It is a Dutch cross-sectional study on 5913 6-year-oldchildren, it measured the BMI, fat mass(FM) and percentage of body fat(BF%), and parent-reported questionnaires in sedentary and PA behaviors, sedentary behavior includes television viewing and computer game use with both of variables, frequency and duration; PA behavior includes outdoor play, sports participation active transport to/from school with frequency and duration.**Results:**Nearly 20% of all children were overweight (including obesity), one quarter of overweight were obese. Overweight children were older (p<0.001), more

often girls (p<0.001), more often of Non-Western ethnicity (p<0.001), and more often of low family SES (all p<0.001). Compared with normal weight children. Television viewing was significantly positively associated with all three outcomes in the crude models; computer game use was positively associated with BMI SDS in the crude model only (p<0.05); outdoor play was significantly inversely associated with BMI SDS and weight status (both p<0.001) and fat mass (p<0.01) in the crude models. **Contribution:**Big sample size of the study; second, use percent fat mass as indicator of body fat as measurement of overweight and obesity in young children; third, the young age of the study population allowed to modifiable risk factors of overweight and body fatness. **Limitation:**It is a cross-sectional study; Second, extended exposure to unfavorable lifestyle behaviors may be necessary before any effects on adiposity become measurable; third, sedentary behaviors and physical activity behaviors were measured by parent reported questionnaires would under report.

10.57 Study of Williamson (Louisiana Healthy)

The name of this study is„Effect of an Environmental School-based Obesity PreventionProgram On Changes in Body Fat and Body Weight: ARandomized Trial“. It is a US 28 months school-based programs for prevention of body weight/fatin age 10 year old children, 2,060 perticipated in this three prevention programmes: Primary Prevention (PP), anenvironmental modification program; Primary+ Secondary Prevention (PP+SP), theenvironmental program with an added classroom and internet education component; and Control(C). Percent body fat and BMI z- scores, changes in behaviors related to energy balance were tested. **Results:** there is no differences between PP, PP+SP, and C on changes in body fat and BMI z scores; but environmental modification in P and PP+SP decreased bodyfat for boys and attenuated fat gain for girls, but standardized effect sizes were relatively small. **Contribution:**only a few studies that included measures of percent bodyfat and BMI, which enables a comparison of these two endpoints as sensitive outcomemeasures in childhood obesity prevention studies.**Limitation:** parental involvement was not optimal; 28 months of intervention may have beeninsufficient; recidivism during summer breaks may have weakened the results.

10.58 Study of Woll (KiGGS)

The name of this study is„ The ‘Motorik-Modul’ (MoMo): physical fitness and physical activity in German children and adolescents“. It is a Germen national motor test, involved 4,529 children and adolescents between the ages of 4-17 years from 167 cities across the country. It is a part of Germen Child and Adolescent Health Survey (KIGGS) conducted by the Robert-Koch-Institute in Berlin. The test contains endurance, strength, agility, coordination and flexibility. **Results:**87%children and adults tested reached the threshold heart rate. 13%t terminated the test prematurely because of subjective exhaustion or lack of motivation. For 208 (5.7%) of subjects, PWC170could not be determined. The mean values of absolute and relative endurance performance, coordination, strength were greater in older subjects of both genders (P<0.001). In all age groups, male subjects performed better than

female subjects. On average, children and adolescents participated in 2.2±0.9 h per week on 1.6±0.9 days per week of PA; younger children participated in outdoor PA on more days per week than older children andadolescents did, and boys were more frequently active outside than girls of the same age.60% of boys and girls participated in non-club PA with an average of almost 2.5 h per week while 63% of boys and52% of girls are members in a sports club, time spent on club sports and the percentage of children participating in competitions was greater in older subjects and greater for boys than for girls. **Contribution:**This is a large-scale cross-sectional study, nationwide representative the prevalence data on physical fitness and physical activity.**Limitation:**The physical fitness measured by questionnaire which would over-report by the students, and also it is difficult to distinguish the intense of PA.

10.59 Study of Xu (2007) (Nanjing)

The name of this study is„Associations of television viewing time with excess body weight among urban and rural high-school students in regional mainland China". It is a Chinese Population-based cross-sectional study which conducted in 2004, on a sample of enrolled high-school students aged 12-18-year-old. **Results:** The proportion of overweight was 6.6%, boys higher than girls (8.9% vs.4.4%) and lower in rural students than urban students (4.5% vs. 8.9%; OR0.49, 95% CI 0.40, 0.60). Students who watched TV for more than 7 h/week had a 1.5 times greater odds of being overweight relative to their counterparts who watched TV for 7 h/week or less. There was a positive linear relationship between TV viewing time and BMI. **Contribution:** The first study to show positive, but weak, links between TV viewing time and body weight among high school students in mainland China; second, it adds strong evidence in the international literature on the relationship between TV viewing and overweight. **Limitation:** Because of cross-sectional study no causality can be inferred or implied; second, self-report of body weight and height may result in possible error; third, all of our categories of sedentary and active time (TV viewing time, study time, sleeping time and physical activity time) were self-reported, and this may have resulted in some potential bias.

10.60 Study of Xu (2012) (CLICK-Obesity)

The name of this study is„A school-based comprehensive lifestyle intervention among Chinese kids against obesity (CLICK-Obesity) rationale, design and methodology of a randomized controlled trial in Nanjing city, China ". It is a Chinese study which based on health-kids study (Chicago, USA) implement in Nanjing city. It contains school environment enrichment with school support, curriculum, and events; and family involvement with parents' class and home-based student-parents activity. **Results:** CLICK-Obesity study was developed based on health-kids study with related changes according to Chinese system, with all the support by local authorities and administrators, conducted in Nanjing city in China. It was a success American adapted Chinese trail. **Contribution:** Gain good support from educational authorities, school administrators, teachers and parents, and to integrate intervention components into schools' regular academic programs; second, the results of and

lesson learned from this study will help guide future school-based childhood obesity prevention programs in Mainland China. **Limitation:** It did not mention the difference between American project and Chinese trail; second, theoretical and methodology way have not explain.

10.61 Study of Xu (2014)(CLICK-Obesity)

The name of this study is„A school-based comprehensive lifestyle intervention among Chinese kids against obesity(CLICK-Obesity) inNanjing city, China: the baseline data ". It contains BMI, diet intake, PA and sedentary behavior, obesity relatived knowledge. **Results:** The prevalence of excess body weight was 26.8%, with 27.4% in the intervention group and 26.1% in the control group (p=0.61). The mean BMI and WC was 18.7and 63.0 for participants in intervention schools, and 18.5 and 63.6for students in control group, separately (p=0.24 and 0.41, respectively). Students who were aware of the unhealthy lifestyle/behavior factors consumed fewer fried snacks (0.46±0.76 serves/week vs 0.65±0.91 serves/week; p<0.01), soft drinks (160±194 ml/week vs 199±227 ml/week; p<0.01), but larger amount of meat (502±429 g/week vs 449±344 g/week; p=0.03), and reported less screen time (214±232 minutes/week vs 252±264 minutes/week; p<0.01). But, there was no difference within PA time between two groups (257±341 minutes/week vs 218±324 minutes/week; p=0.13).**Contribution:** The intervention program emphasized the need for multilevel interventions, including multiple intervention components that target the classroom curriculum (both healthy dieting and physical activity), school environmental support, family involvement (including parent's health class education) and fun programs/events; second, school administrators, teachers, and students and their parents/guardians all involved; third, not disturb the normal schedule, just integrate the school schedule. **Limitation:** The knowledge of awareness of obesity risk factors by self-report which might have bias; second, PA time calculation not with exact measurement by MVPA, just assess ball game time and swimming as double workload as jogging into calculate.

10.62 Study of Xu (2010) (Shanghai)

The name of this study is„Study on an integrated school-family-community intervention on Obesity-related behaviors of primary school pupils". It is a one year Chinese regional study in Shanghai Qingpu district, there are 466 7- to 11-year-old students participated in a knowledge, attitude and practice (KAP) questionnaire, also diet investigation and physical fitness. **Results:** The rate of obesity was reported a slight decrease in the intervention group, and was slightly lower than that of the control group, but there was no statistic significance of difference between two groups (P>0.05); the blood biochemical parameters reported no obvious change except the decreases in the abnormality and low-density lipoprotein (LDL) in the intervention group. Except for cholesterol, all blood fat parameters reported obvious increases in the control group; the awareness rate of KAP showed a clear increase in intervention group. **Contribution:** School-family-community intervention supported by these three different parts, showed positive change of students' attitudes on

obesity and healthy diet. **Limitation:** It is a cross-sectional survey; second one year intervention still too short time to see more differences especially behavior change; third, it did not mention the physical fitness results.

10.63 Study of Yamauchi

The name of this study is„Age and Gender Differences in the Physical Activity Patterns of Urban Schoolchildren in Korea and China“. It is a Korea-China comparable study which focus on BMI, physical activity levels (PALs) and daily step-counts (STPs) in grade 5 (10-11-year-old) and grade 8 (13-14-year-old) group. **Results:** The mean height, weight, and BMI for both gender in both countries exceeded the US national reference median. Pals were significantly higher in grade 5 group and in girls than in boys for both grades. No significant difference in PALs or STPs between ‘normal’ and ‘overweight’ subgroups based on BMI, but negative correlations between weight, BMI, or %body fat vs. PAL or STP among Korean girls and Chinese boys ($r=0.32$-0.38, all $p<0.05$). Daily variation in PA was observed in Korean children but was less in weekend. There is no difference between weekday and weekend in Chinese children. **Contribution:** It is a big sample comparable study between China and Korea, and it also could be pilot study in Asian; second, use acceleration devices provides a more complex and accurate understanding of the differences in activity patterns among children. **Limitation:** This study had many research premise didn’t tell very clear, like how many students involved for each country, and which year did this survey, who calculate the data etc.

10.64 Study of Zahner (KISS)

The name of this study is„ A school-based physical activity program to improve health and fitness in children aged 6-13 years ("Kinder-Sport studie KISS"): study design of a randomized controlled trial “. It is a one academic year Swiss intervention among 6- to 13-year-old children in schools. The study contains PA, fitness test, anthropometry, Bone health, cardiovascular risk factors, general health and psychosocial health.**Results:**School is an ideal setting in which environmental changes to increase PA and decrease sedentary behavior in children; second, socioeconomically deprived children are those who experience the greatest reduction of PA and some of its consequences and are also most difficult to reach.**Contribution:** Theintervention increased in PA, fitness and overall health, it could be a PA promotion program throughout Switzerland and another countries will help to improve health and fitness of our school children with the obvious potential of reduced direct (health care) and indirect (work absenteeism and productivity) costs later in life. **Limitation:** It is a cross-sectional study; second, the intervention groups had to be adapted several months before the school year started; third, some of the investigators were not blinded to group assignment of the children because of the extensive need of manpower for testing and the financial restraints to recruit additional, blinded personnel.

10.65 Study of Zhang (Medical & Healthy)

The name of this study is„ The role of 1-h physical activity every day in preventing obesity in adolescents in Shandong, China“. It is a Chinese regional study among 29,030 students aged 10- to18-year-old in Shandong province China. It compares the BMI, waist circumference (WC), skin-fold thickness (SFT) to verify whether 1 h/day PA could prevalent of childhood overweight and obesity. **Results:** The overall percentages of students in intervention groupware 34.29 % in boys and 30.15 % in girls. The prevalence of overweight and obesity for both boys and girls were all significantly lower in intervention group than in control group in all age categories ($P<0.01$). Also the percentage of students in intervention group declined with age, from 47.12 % (boys) and 43.89 %(girls) at the age of 10 years to 26.81 % (boys) and21.50 % (girls) by the age of 18 years. **Contribution:** It is a large sample in Shandong; second, it examines the implement of 1-h PA every day in Shandong schools. **Limitation:** PA time was evaluated by a questionnaire, not directly measured; second, only use BMI, WC and SFT these three parameters to identify the overweight and obesity, not address the dietary intake and vigorous of PA to state the accurate energy expenditure; third, the investigation on in Shandong province, could not represent the whole China.

10.66 Study of Zhang (2015) (Master thesis)

The name of this study is„ The research on the implementation of ‘National Students Health Standard’ impact on the PE teaching in elementary school of Ba Li Zhuang School district in Beijing“. It is a three-year Chinese intervention which based on the National Students Health Standard Test during the Chinese NSHS implement in primary schools, it involved 6,699 students from grade 1 to grade 6, PE teachers pay more attention on PE class, courage students more active in sport, and also offer more sports skills during teaching semester. **Results:** Compare three-year results, there are more students in normal weight in 2011 (46.9%) than 2013 (42.6%), overweight students are decreased from 8% in 2011 to 7.4% in 2013; but obesity is rising from 23.9% in 2011 to 24.9% in 2013. Motor test, standing long jump both girls and boys improved by age, boys better than girls at the same age, only when girls in grade 4 and grade 5 (10-11-year-old) grows faster and also improved more in this test; sit and reach increased along with the age, but after 11-year-olds had a small decrease, but yearly still increased; step test yearly increased in both gender. **Contribution:** Based on NSHS, so all Chinese school implement it, and this study show three years NSHS test results which had continuous results. **Limitation:** About the implement in schools this study did not tell more, only simplify to say school involved and teachers are active than before; second, not all the NSHS results demonstrate to us.

10.67 Study of Zhang (2013) (CNSHT)

The name of this study is„A cross-section study on physical fitness level among Chinese primary and middle school students in 2010“. It is a Chinese study which

based on National Student Healthy Standard Test (NSHST), it involved 30 provinces /autonomous regions /municipalities(except Tibet)total of 215 319 students aged 7- to 18-year-old,univariable analysis and Logistic regression were used to analyze the association between physical fitness and individual factors, school factors and social factors. **Results:** The overall pass rate was 71.3% and the rates of boys and girls were 74.2% and68.4%, respectively. The pass rate decreasing with the growth of age, urban areas was lower than rural areas; developed and moderate areas had higher pass rates than low areas; students who took sufficient PE classes had a higher pass rate than those insufficient PE classes students. Students who are overweight and obese had a lower pass rate; who spent more than 2 hours on homework had a lower pass rate than who spent less than 2 hours on homework; who spent more than 2 hours on TV, computer or electronic games had a lower pass rate; who did exercises more than 1 hours per day had a higher compliance rate. **Contribution:** This study based on NSHST so it had big sample; second it use the univariable analysis and Logistic regression, even student from different grade had different test still can compare the pass rate. **Limitation:** It only uses the NSHST to analysis students' healthy, diet and behavior not included, so the result would be incomplete; second, it did not mentioned the intervention.

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12 Appendix

All-China Federation of Labor = ACFL
AmericanNational Center for Health Statistics= ANCHS
Beijing Academy of Physical Education = BACPE
Beijing Association of Physical Education = BASPE
Body Composition = BC
Better Life Index = BLI
Body Mass Index = BMI
Blood Pressure = BP
Body Shape = BS
Bavarian State Office of Health and Food Safety = BSOHFS
Chinese Academy of Press and Publication = CAPP
Chinese Adolescent Internet Behavior Survey = CAIBS
Central Committee =CC
Central Committee and Chinese State Council = CCCSC
China Center for Disease Control and Prevention = CCDCP
Chinese Environmental Exposure-Related Human Activity Patterns Survey on Adults = CEERHAPSA
China Health andNutrition Survey =CHNS
China Internet Network Information Center = CINIC
Chronic Non-communicable Disease and Risk Factor Surveillance = CNDRFS
China National Knowledge Infrastructure =CNKI
Chinese Ministry of Education = CME
Chinese Ministry of Health = CMH
Chinese Ministry of Sport = CMS
Chinese National Reading Survey = CNRS
Chinese National Survey on Students Constitution and Health = CNSSCH
Chinese Overweigh and Obesity Criteria = COOC
Chinese State Council = CSC
Chinese Urban Teenage Access Television Time Survey = CUTATTS
Chinese Youth Network Entertainment Investigation = CYNEI
Department of Physical Education, Health and Art =DPEHA
Elite Sport System = ESS
Fat Mass = FM
General Administration of Sport of China = GASC
Group of China Obesity Task Force = GCOTF
Heart Beats = HB
Health Behavior in School-Aged Children = HBSC
Interdisciplinary Obesity Research Center = IORC
International Obesity Task Force =IOTF
Ministry of Agriculture of the People's Republic of China = MAC
Ministry of Civil Affairs of the People's Republic of China = MCAC
Metabolic Equivalent of Task = MET
Ministry of Finance of the People's Republic of China = MFC
Mass Sport System = MSS
Ministry of Science and Technology of the People's Republic of China = MSTC

Ministry of Science and Technology of the People's Republic of China = MSTC
Moderate to Vigorous Physical Activity = MVPA
National Bureau of Statistics of the People's Republic of China = NBSC
None Communicate Disease = NCD
National Games = NG
National Health and Family Planning Commission of the China = NHFPCC
National Physical Fitness Test = NPFT
National Physical Fitness Test Standard = NPFTS
National Sport Commission= NSC[1]
National Sport Commit= NSC[2]
National Student Fitness Investigation = NSFI
National Student Physical and Health Monitoring Network =NSPHMN
National Student Physical and Health Standard = NSPHS
National Student Physical and Health Test = NSPHT
National Sport Tourments = NST
Office of the State Council =OSC
Physical Activity = PA
Physical Activity and Sedentary Leisure Time = PASLT
Political Bureau of Central Committee=PBCC
Physical Education and Health Curriculum Standard =PEHCS
State Ethnic Affairs Commission = SEAC
Socioeconomic Status= SES
Students' Fitness Network =SFN
State Key Laboratory of Environmental Criteria and Risk Assessment = SKLECRA
Sedentary Leisure Time= SLT
Soviet Labor and Defense System = SLDS
State Sport General Administration = SSGA
Shanghai Student Physical and Health Test = SSPHT
Taylor Nelson Sofres=TNS
Triceps Skin fold Thickness = TST
Waist Circumference = WC
World Health Organization= WHO

13 Standards of Chinese National Student Physical Health

Table 50 - Boys' BMI standards (kg/m^2)

Grade	Score	G1,A6	G2,A7	G3,A8	G4,A9	G5,A10	G6,A11	J1,A12	J2,A13	J3,A14	S1,A15	S2,A16	S3,A17	College
Normal	**100**	13.5~18.1	13.7~18.4	13.9~19.4	14.2~20.1	14.4~21.4	14.7~21.8	15.5~22.1	15.7~22.5	15.8~22.8	16.5~23.2	16.8~23.7	17.3~23.8	17.9~23.9
Under	**80**	≤13.4	≤13.6	≤13.8	≤14.1	≤14.3	≤14.6	≤15.4	≤15.6	≤15.7	≤16.4	≤16.7	≤17.2	≤17.8
Over		18.2~20.3	18.5~20.4	19.5~22.1	20.2~22.6	21.5~24.1	21.9~24.5	22.2~24.9	22.6~25.2	22.9~26.0	23.3~26.3	23.8~26.5	23.9~27.3	24.0~27.9
Obesity	**60**	≥20.4	≥20.5	≥22.2	≥22.7	≥24.2	≥24.6	≥25.0	≥25.3	≥26.1	≥26.4	≥26.6	≥27.4	≥28.0

Remark: G=Grade; A=Age; J=Junior high school; S=Senior high school; Normal= Normal weight; Under =Under the normal weight; Over=Overweight;

Table 51 - Girls' BMI standards (kg/m^2)

Grade	Score	G1,A6	G2,A7	G3,A8	G4,A9	G5,A10	G6,A11	J1,A12	J2,A13	J3,A14	S1,A15	S2,A16	S3,A17	College
Normal	**100**	13.3~17.3	13.5~17.8	13.6~18.6	13.7~19.4	13.8~20.5	14.2~20.8	14.8~21.7	15.3~22.2	16.0~22.6	16.5~22.7	16.9~23.2	17.1~23.3	17.2~23.9
Under	**80**	≤13.2	≤13.4	≤13.5	≤13.6	≤13.7	≤14.1	≤14.7	≤15.2	≤15.9	≤16.4	≤16.8	≤17.0	≤17.1
Over		17.4~19.2	17.9~20.2	18.7~21.1	19.5~22.0	20.6~22.9	20.9~23.6	21.8~24.4	22.3~24.8	22.7~25.1	22.8~25.2	23.3~25.4	23.4~25.7	24.0~27.9
Obesity	**60**	≥19.3	≥20.3	≥21.2	≥22.1	≥23.0	≥23.7	≥24.5	≥24.9	≥25.2	≥25.3	≥25.5	≥25.8	≥28.0

Remark: G=Grade; A=Age; J=Junior high school; S=Senior high school; Normal= Normal weight; Under =Under the normal weight; Over=Overweight;

Table 52 - Boys' vital capacity (ml)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	1700	2000	2300	2600	2900	3200	3640	3940	4240	4540	4740	4940	5040	5140
	95	1600	1900	2200	2500	2800	3100	3520	3820	4120	4420	4620	4820	4920	5020
	90	1500	1800	2100	2400	2700	3000	3400	3700	4000	4300	4500	4700	4800	4900
Good	**85**	1400	1650	1900	2150	2450	2750	3150	3450	3750	4050	4250	4450	4550	4650
	80	1300	1500	1700	1900	2200	2500	2900	3200	3500	3800	4000	4200	4300	4400
Pass	**78**	1240	1430	1620	1820	2110	2400	2780	3080	3380	3680	3880	4080	4180	4280
	76	1180	1360	1540	1740	2020	2300	2660	2960	3260	3560	3760	3960	4060	4160
	74	1120	1290	1460	1660	1930	2200	2540	2840	3140	3440	3640	3840	3940	4040
	72	1060	1220	1380	1580	1840	2100	2420	2720	3020	3320	3520	3720	3820	3920
	70	1000	1150	1300	1500	1750	2000	2300	2600	2900	3200	3400	3600	3700	3800
	68	940	1080	1220	1420	1660	1900	2180	2480	2780	3080	3280	3480	3580	3680
	66	880	1010	1140	1340	1570	1800	2060	2360	2660	2960	3160	3360	3460	3560
	64	820	940	1060	1260	1480	1700	1940	2240	2540	2840	3040	3240	3340	3440
	62	760	870	980	1180	1390	1600	1820	2120	2420	2720	2920	3120	3220	3320
	60	700	800	900	1100	1300	1500	1700	2000	2300	2600	2800	3000	3100	3200
Fail	**50**	660	750	840	1030	1220	1410	1600	1890	2180	2470	2660	2850	2940	3030
	40	620	700	780	960	1140	1320	1500	1780	2060	2340	2520	2700	2780	2860
	30	580	650	720	890	1060	1230	1400	1670	1940	2210	2380	2550	2620	2690
	20	540	600	660	820	980	1140	1300	1560	1820	2080	2240	2400	2460	2520
	10	500	550	600	750	900	1050	1200	1450	1700	1950	2100	2250	2300	2350

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 53 - Girls' vital capacity (ml)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	1400	1600	1800	2000	2250	2500	2750	2900	3050	3150	3250	3350	3400	3450
	95	1300	1500	1700	1900	2150	2400	2650	2850	3000	3100	3200	3300	3350	3400
	90	1200	1400	1600	1800	2050	2300	2550	2800	2950	3050	3150	3250	3300	3350
Good	**85**	1100	1300	1500	1700	1950	2200	2450	2650	2800	2900	3000	3100	3150	3200
	80	1000	1200	1400	1600	1850	2100	2350	2500	2650	2750	2850	2950	3000	3050
Pass	**78**	960	1150	1340	1530	1770	2010	2250	2400	2550	2650	2750	2850	2900	2950
	76	920	1100	1280	1460	1690	1920	2150	2300	2450	2550	2650	2750	2800	2850
	74	880	1050	1220	1390	1610	1830	2050	2200	2350	2450	2550	2650	2700	2750
	72	840	1000	1160	1320	1530	1740	1950	2100	2250	2350	2450	2550	2600	2650
	70	800	950	1100	1250	1450	1650	1850	2000	2150	2250	2350	2450	2500	2550
	68	760	900	1040	1180	1370	1560	1750	1900	2050	2150	2250	2350	2400	2450
	66	720	850	980	1110	1290	1470	1650	1800	1950	2050	2150	2250	2300	2350
	64	680	800	920	1040	1210	1380	1550	1700	1850	1950	2050	2150	2200	2250
	62	640	750	860	970	1130	1290	1450	1600	1750	1850	1950	2050	2100	2150
	60	600	700	800	900	1050	1200	1350	1500	1650	1750	1850	1950	2000	2050
Fail	**50**	580	680	780	880	1020	1170	1310	1460	1610	1710	1810	1910	1960	2010
	40	560	660	760	860	990	1140	1270	1420	1570	1670	1770	1870	1920	1970
	30	540	640	740	840	960	1110	1230	1380	1530	1630	1730	1830	1880	1930
	20	520	620	720	820	930	1080	1190	1340	1490	1590	1690	1790	1840	1890
	10	500	600	700	800	900	1050	1150	1300	1450	1550	1650	1750	1800	1850

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 54 - Boys' 50mrun (s)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	10.2	9.6	9.1	8.7	8.4	8.2	7.8	7.5	7.3	7.1	7.0	6.8	6.7	6.6
	95	10.3	9.7	9.2	8.8	8.5	8.3	7.9	7.6	7.4	7.2	7.1	6.9	6.8	6.7
	90	10.4	9.8	9.3	8.9	8.6	8.4	8.0	7.7	7.5	7.3	7.2	7.0	6.9	6.8
Good	**85**	10.5	9.9	9.4	9.0	8.7	8.5	8.1	7.8	7.6	7.4	7.3	7.1	7.0	6.9
	80	10.6	10.0	9.5	9.1	8.8	8.6	8.2	7.9	7.7	7.5	7.4	7.2	7.1	7.0
Pass	**78**	10.8	10.2	9.7	9.3	9.0	8.8	8.4	8.1	7.9	7.7	7.6	7.4	7.3	7.2
	76	11.0	10.4	9.9	9.5	9.2	9.0	8.6	8.3	8.1	7.9	7.8	7.6	7.5	7.4
	74	11.2	10.6	10.1	9.7	9.4	9.2	8.8	8.5	8.3	8.1	8.0	7.8	7.7	7.6
	72	11.4	10.8	10.3	9.9	9.6	9.4	9.0	8.7	8.5	8.3	8.2	8.0	7.9	7.8
	70	11.6	11.0	10.5	10.1	9.8	9.6	9.2	8.9	8.7	8.5	8.4	8.2	8.1	8.0
	68	11.8	11.2	10.7	10.3	10.0	9.8	9.4	9.1	8.9	8.7	8.6	8.4	8.3	8.2
	66	12.0	11.4	10.9	10.5	10.2	10.0	9.6	9.3	9.1	8.9	8.8	8.6	8.5	8.4
	64	12.2	11.6	11.1	10.7	10.4	10.2	9.8	9.5	9.3	9.1	9.0	8.8	8.7	8.6
	62	12.4	11.8	11.3	10.9	10.6	10.4	10.0	9.7	9.5	9.3	9.2	9.0	8.9	8.8
	60	12.6	12.0	11.5	11.1	10.8	10.6	10.2	9.9	9.7	9.5	9.4	9.2	9.1	9.0
Fail	**50**	12.8	12.2	11.7	11.3	11.0	10.8	10.4	10.1	9.9	9.7	9.6	9.4	9.3	9.2
	40	13.0	12.4	11.9	11.5	11.2	11.0	10.6	10.3	10.1	9.9	9.8	9.6	9.5	9.4
	30	13.2	12.6	12.1	11.7	11.4	11.2	10.8	10.5	10.3	10.1	10.0	9.8	9.7	9.6
	20	13.4	12.8	12.3	11.9	11.6	11.4	11.0	10.7	10.5	10.3	10.2	10.0	9.9	9.8
	10	13.6	13.0	12.5	12.1	11.8	11.6	11.2	10.9	10.7	10.5	10.4	10.2	10.1	10.0

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 55 - Girls' 50mrun (s)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	100	11.0	10.0	9.2	8.7	8.3	8.2	8.1	8.0	7.9	7.8	7.7	7.6	7.5	7.4
	95	11.1	10.1	9.3	8.8	8.4	8.3	8.2	8.1	8.0	7.9	7.8	7.7	7.6	7.5
	90	11.2	10.2	9.4	8.9	8.5	8.4	8.3	8.2	8.1	8.0	7.9	7.8	7.7	7.6
Good	85	11.5	10.5	9.7	9.2	8.8	8.7	8.6	8.5	8.4	8.3	8.2	8.1	8.0	7.9
	80	11.8	10.8	10.0	9.5	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4	8.3	8.2
Pass	78	12.0	11.0	10.2	9.7	9.3	9.2	9.1	9.0	8.9	8.8	8.7	8.6	8.5	8.4
	76	12.2	11.2	10.4	9.9	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.8	8.7	8.6
	74	12.4	11.4	10.6	10.1	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.8
	72	12.6	11.6	10.8	10.3	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0
	70	12.8	11.8	11.0	10.5	10.1	10.0	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2
	68	13.0	12.0	11.2	10.7	10.3	10.2	10.1	10.0	9.9	9.8	9.7	9.6	9.5	9.4
	66	13.2	12.2	11.4	10.9	10.5	10.4	10.3	10.2	10.1	10.0	9.9	9.8	9.7	9.6
	64	13.4	12.4	11.6	11.1	10.7	10.6	10.5	10.4	10.3	10.2	10.1	10.0	9.9	9.8
	62	13.6	12.6	11.8	11.3	10.9	10.8	10.7	10.6	10.5	10.4	10.3	10.2	10.1	10.0
	60	13.8	12.8	12.0	11.5	11.1	11.0	10.9	10.8	10.7	10.6	10.5	10.4	10.3	10.2
Fail	50	14.0	13.0	12.2	11.7	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.6	10.5	10.4
	40	14.2	13.2	12.4	11.9	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.6
	30	14.4	13.4	12.6	12.1	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8
	20	14.6	13.6	12.8	12.3	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0
	10	14.8	13.8	13.0	12.5	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 56 - Boys' sit &reach (cm)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	16.1	16.2	16.3	16.4	16.5	16.6	17.6	19.6	21.6	23.6	24.3	24.6	24.9	25.1
	95	14.6	14.7	14.9	15.0	15.2	15.3	15.9	17.7	19.7	21.5	22.4	22.8	23.1	23.3
	90	13.0	13.2	13.4	13.6	13.8	14.0	14.2	15.8	17.8	19.4	20.5	21.0	21.3	21.5
Good	**85**	12.0	11.9	11.8	11.7	11.6	11.5	12.3	13.7	15.8	17.2	18.3	19.1	19.5	19.9
	80	11.0	10.6	10.2	9.8	9.4	9.0	10.4	11.6	13.8	15.0	16.1	17.2	17.7	18.2
Pass	**78**	9.9	9.5	9.1	8.6	8.2	7.7	9.1	10.3	12.4	13.6	14.7	15.8	16.3	16.8
	76	8.8	8.4	8.0	7.4	7.0	6.4	7.8	9.0	11.0	12.2	13.3	14.4	14.9	15.4
	74	7.7	7.3	6.9	6.2	5.8	5.1	6.5	7.7	9.6	10.8	11.9	13.0	13.5	14.0
	72	6.6	6.2	5.8	5.0	4.6	3.8	5.2	6.4	8.2	9.4	10.5	11.6	12.1	12.6
	70	5.5	5.1	4.7	3.8	3.4	2.5	3.9	5.1	6.8	8.0	9.1	10.2	10.7	11.2
	68	4.4	4.0	3.6	2.6	2.2	1.2	2.6	3.8	5.4	6.6	7.7	8.8	9.3	9.8
	66	3.3	2.9	2.5	1.4	1.0	-0.1	1.3	2.5	4.0	5.2	6.3	7.4	7.9	8.4
	64	2.2	1.8	1.4	0.2	-0.2	-1.4	0.0	1.2	2.6	3.8	4.9	6.0	6.5	7.0
	62	1.1	0.7	0.3	-1.0	-1.4	-2.7	-1.3	-0.1	1.2	2.4	3.5	4.6	5.1	5.6
	60	0.0	-0.4	-0.8	-2.2	-2.6	-4.0	-2.6	-1.4	-0.2	1.0	2.1	3.2	3.7	4.2
Fail	**50**	-0.8	-1.2	-1.6	-3.2	-3.6	-5.0	-3.8	-2.6	-1.4	0.0	1.1	2.2	2.7	3.2
	40	-1.6	-2.0	-2.4	-4.2	-4.6	-6.0	-5.0	-3.8	-2.6	-1.0	0.1	1.2	1.7	2.2
	30	-2.4	-2.8	-3.2	-5.2	-5.6	-7.0	-6.2	-5.0	-3.8	-2.0	-0.9	0.2	0.7	1.2
	20	-3.2	-3.6	-4.0	-6.2	-6.6	-8.0	-7.4	-6.2	-5.0	-3.0	-1.9	-0.8	-0.3	0.2
	10	-4.0	-4.4	-4.8	-7.2	-7.6	-9.0	-8.6	-7.4	-6.2	-4.0	-2.9	-1.8	-1.3	-0.8

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 57 - Girls' sit&reach (cm)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	18.6	18.9	19.2	19.5	19.8	19.9	21.8	22.7	23.5	24.2	24.8	25.3	25.8	26.3
	95	17.3	17.6	17.9	18.1	18.5	18.7	20.1	21.0	21.8	22.5	23.1	23.6	24.0	24.4
	90	16.0	16.3	16.6	16.9	17.2	17.5	18.4	19.3	20.1	20.8	21.4	21.9	22.2	22.4
Good	**85**	14.7	14.8	14.9	15.0	15.1	15.2	16.7	17.6	18.4	19.1	19.7	20.2	20.6	21.0
	80	13.4	13.3	13.2	13.1	13.0	12.9	15.0	15.9	16.7	17.4	18.0	18.5	19.0	19.5
Pass	**78**	12.3	12.2	12.1	12.0	11.9	11.8	13.7	14.6	15.4	16.1	16.7	17.2	17.7	18.2
	76	11.2	11.1	11.0	10.9	10.8	10.7	12.4	13.3	14.1	14.8	15.4	15.9	16.4	16.9
	74	10.1	10.0	9.9	9.8	9.7	9.6	11.1	12.0	12.8	13.5	14.1	14.6	15.1	15.6
	72	9.0	8.9	8.8	8.7	8.6	8.5	9.8	10.7	11.5	12.2	12.8	13.3	13.8	14.3
	70	7.9	7.8	7.7	7.6	7.5	7.4	8.5	9.4	10.2	10.9	11.5	12.0	12.5	13.0
	68	6.8	6.7	6.6	6.5	6.4	6.3	7.2	8.1	8.9	9.6	10.2	10.7	11.2	11.7
	66	5.7	5.6	5.5	5.4	5.3	5.2	5.9	6.8	7.6	8.3	8.9	9.4	9.9	10.4
	64	4.6	4.5	4.4	4.3	4.2	4.1	4.6	5.5	6.3	7.0	7.6	8.1	8.6	9.1
	62	3.5	3.4	3.3	3.2	3.1	3.0	3.3	4.2	5.0	5.7	6.3	6.8	7.3	7.8
	60	2.4	2.3	2.2	2.1	2.0	1.9	2.0	2.9	3.7	4.4	5.0	5.5	6.0	6.5
Fail	**50**	1.6	1.5	1.4	1.3	1.2	1.1	1.2	2.1	2.9	3.6	4.2	4.7	5.2	5.7
	40	0.8	0.7	0.6	0.5	0.4	0.3	0.4	1.3	2.1	2.8	3.4	3.9	4.4	4.9
	30	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.4	0.5	1.3	2.0	2.6	3.1	3.6	4.1
	20	-0.8	-0.9	-1.0	-1.1	-1.2	-1.3	-1.2	-0.3	0.5	1.2	1.8	2.3	2.8	3.3
	10	-1.6	-1.7	-1.8	-1.9	-2.0	-2.1	-2.0	-1.1	-0.3	0.4	1.0	1.5	2.0	2.5

Remark: G=Grade; J=Junior high school; S=Senior high school; C=College

Table 58 - Boys' 1-minute rope grade one to grade 6 (times)

Level	Score	G1	G2	G3	G4	G5	G6
Excellent	**100**	109	117	126	137	148	157
	95	104	112	121	132	143	152
	90	99	107	116	127	138	147
Good	**85**	93	101	110	121	132	141
	80	87	95	104	115	126	135
Pass	**78**	80	88	97	108	119	128
	76	73	81	90	101	112	121
	74	66	74	83	94	105	114
	72	59	67	76	87	98	107
	70	52	60	69	80	91	100
	68	45	53	62	73	84	93
	66	38	46	55	66	77	86
	64	31	39	48	59	70	79
	62	24	32	41	52	63	72
	60	17	25	34	45	56	65
Fail	**50**	14	22	31	42	53	62
	40	11	19	28	39	50	59
	30	8	16	25	36	47	56
	20	5	13	22	33	44	53
	10	2	10	19	30	41	50

Table 59 - Girls' 1-minute rope grade one to grade 6 (times)

Level	Score	G1	G2	G3	G4	G5	G6
Excellent	**100**	117	127	139	149	158	166
	95	110	120	132	142	151	159
	90	103	113	125	135	144	152
Good	**85**	95	105	117	127	136	144
	80	87	97	109	119	128	136
Pass	**78**	80	90	102	112	121	129
	76	73	83	95	105	114	122
	74	66	76	88	98	107	115
	72	59	69	81	91	100	108
	70	52	62	74	84	93	101
	68	45	55	67	77	86	94
	66	38	48	60	70	79	87
	64	31	41	53	63	72	80
	62	24	34	46	56	65	73
	60	17	27	39	49	58	66
Fail	**50**	14	24	36	46	55	63
	40	11	21	33	43	52	60
	30	8	18	30	40	49	57
	20	5	15	27	37	46	54
	10	2	12	24	34	43	51

Table 60 - Boys' broad standing jump (cm)

Level	Score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	225	240	250	260	265	270	273	275
	95	218	233	245	255	260	265	268	270
	90	211	226	240	250	255	260	263	265
Good	**85**	203	218	233	243	248	253	256	258
	80	195	210	225	235	240	245	248	250
Pass	**78**	191	206	221	231	236	241	244	246
	76	187	202	217	227	232	237	240	242
	74	183	198	213	223	228	233	236	238
	72	179	194	209	219	224	229	232	234
	70	175	190	205	215	220	225	228	230
	68	171	186	201	211	216	221	224	226
	66	167	182	197	207	212	217	220	222
	64	163	178	193	203	208	213	216	218
	62	159	174	189	199	204	209	212	214
	60	155	170	185	195	200	205	208	210
Fail	**50**	150	165	180	190	195	200	203	205
	40	145	160	175	185	190	195	198	200
	30	140	155	170	180	185	190	193	195
	20	135	150	165	175	180	185	188	190
	10	130	145	160	170	175	180	183	185

Table 61 - Girls' broad standing jump (cm)

Level	Score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	**100**	196	200	202	204	205	206	207	208
	95	190	194	196	198	199	200	201	202
	90	184	188	190	192	193	194	195	196
Good	**85**	177	181	183	185	186	187	188	189
	80	170	174	176	178	179	180	181	182
Pass	**78**	167	171	173	175	176	177	178	179
	76	164	168	170	172	173	174	175	176
	74	161	165	167	169	170	171	172	173
	72	158	162	164	166	167	168	169	170
	70	155	159	161	163	164	165	166	167
	68	152	156	158	160	161	162	163	164
	66	149	153	155	157	158	159	160	161
	64	146	150	152	154	155	156	157	158
	62	143	147	149	151	152	153	154	155
	60	140	144	146	148	149	150	151	152
Fail	**50**	135	139	141	143	144	145	146	147
	40	130	134	136	138	139	140	141	142
	30	125	129	131	133	134	135	136	137
	20	120	124	126	128	129	130	131	132
	10	115	119	121	123	124	125	126	127

Table 62 - Boys' 1-minute sit-ups and chin-up (times)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3
Excellent	**100**	48	49	50	51	13	14	15	16	17	18	19	20
	95	45	46	47	48	12	13	14	15	16	17	18	19
	90	42	43	44	45	11	12	13	14	15	16	17	18
Good	**85**	39	40	41	42	10	11	12	13	14	15	16	17
	80	36	37	38	39	9	10	11	12	13	14	15	16
Pass	**78**	34	35	36	37								
	76	32	33	34	35	8	9	10	11	12	13	14	15
	74	30	31	32	33								
	72	28	29	30	31	7	8	9	10	11	12	13	14
	70	26	27	28	29								
	68	24	25	26	27	6	7	8	9	10	11	12	13
	66	22	23	24	25								
	64	20	21	22	23	5	6	7	8	9	10	11	12
	62	18	19	20	21								
	60	16	17	18	19	4	5	6	7	8	9	10	11
Fail	**50**	14	15	16	17	3	4	5	6	7	8	9	10
	40	12	13	14	15	2	3	4	5	6	7	8	9
	30	10	11	12	13	1	2	3	4	5	6	7	8
	20	8	9	10	11		1	2	3	4	5	6	7
	10	6	7	8	9			1	2	3	4	5	6

Remark： Primary school grade3 to 6 have 1 minute Sit-ups, Junior high school, senior high school and college have chin-up

Table 63 - Girls' 1-minute sit-ups (times)

Level	Score	G1	G2	G3	G4	G5	G6	J1	J2	J3	S1	S2	S3
Excellent	**100**	46	47	48	49	50	51	52	53	54	55	56	57
	95	44	45	46	47	48	49	50	51	52	53	54	55
	90	42	43	44	45	46	47	48	49	50	51	52	53
Good	**85**	39	40	41	42	43	44	45	46	47	48	49	50
	80	36	37	38	39	40	41	42	43	44	45	46	47
Pass	**78**	34	35	36	37	38	39	40	41	42	43	44	45
	76	32	33	34	35	36	37	38	39	40	41	42	43
	74	30	31	32	33	34	35	36	37	38	39	40	41
	72	28	29	30	31	32	33	34	35	36	37	38	39
	70	26	27	28	29	30	31	32	33	34	35	36	37
	68	24	25	26	27	28	29	30	31	32	33	34	35
	66	22	23	24	25	26	27	28	29	30	31	32	33
	64	20	21	22	23	24	25	26	27	28	29	30	31
	62	18	19	20	21	22	23	24	25	26	27	28	29
	60	16	17	18	19	20	21	22	23	24	25	26	27
Fail	**50**	14	15	16	17	18	19	20	21	22	23	24	25
	40	12	13	14	15	16	17	18	19	20	21	22	23
	30	10	11	12	13	14	15	16	17	18	19	20	21
	20	8	9	10	11	12	13	14	15	16	17	18	19
	10	6	7	8	9	10	11	12	13	14	15	16	17

Table 64 - Boys' endurance run 50m× 8 shuttle run (m·s)

Level	Score	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	100	1'36"	1'30"	3'55"	3'50"	3'40"	3'30"	3'25"	3'20"	3'17"	3'15"
	95	1'39"	1'33"	4'05"	3'55"	3'45"	3'35"	3'30"	3'25"	3'22"	3'20"
	90	1'42"	1'36"	4'15"	4'00"	3'50"	3'40"	3'35"	3'30"	3'27"	3'25"
Good	85	1'45"	1'39"	4'22"	4'07"	3'57"	3'47"	3'42"	3'37"	3'34"	3'32"
	80	1'48"	1'42"	4'30"	4'15"	4'05"	3'55"	3'50"	3'45"	3'42"	3'40"
Pass	78	1'51"	1'45"	4'35"	4'20"	4'10"	4'00"	3'55"	3'50"	3'47"	3'45"
	76	1'54"	1'48"	4'40"	4'25"	4'15"	4'05"	4'00"	3'55"	3'52"	3'50"
	74	1'57"	1'51"	4'45"	4'30"	4'20"	4'10"	4'05"	4'00"	3'57"	3'55"
	72	2'00"	1'54"	4'50"	4'35"	4'25"	4'15"	4'10"	4'05"	4'02"	4'00"
	70	2'03"	1'57"	4'55"	4'40"	4'30"	4'20"	4'15"	4'10"	4'07"	4'05"
	68	2'06"	2'00"	5'00"	4'45"	4'35"	4'25"	4'20"	4'15"	4'12"	4'10"
	66	2'09"	2'03"	5'05"	4'50"	4'40"	4'30"	4'25"	4'20"	4'17"	4'15"
	64	2'12"	2'06"	5'10"	4'55"	4'45"	4'35"	4'30"	4'25"	4'22"	4'20"
	62	2'15"	2'09"	5'15"	5'00"	4'50"	4'40"	4'35"	4'30"	4'27"	4'25"
	60	2'18"	2'12"	5'20"	5'05"	4'55"	4'45"	4'40"	4'35"	4'32"	4'30"
Fail	50	2'22"	2'16"	5'40"	5'25"	5'15"	5'05"	5'00"	4'55"	4'52"	4'50"
	40	2'26"	2'20"	6'00"	5'45"	5'35"	5'25"	5'20"	5'15"	5'12"	5'10"
	30	2'30"	2'24"	6'20"	6'05"	5'55"	5'45"	5'40"	5'35"	5'32"	5'30"
	20	2'34"	2'28"	6'40"	6'25"	6'15"	6'05"	6'00"	5'55"	5'52"	5'50"
	10	2'38"	2'32"	7'00"	6'45"	6'35"	6'25"	6'20"	6'15"	6'12"	6'10"

Remark： Primary school grade5 to 6 have 50M×8 shuttle Run, Junior high school, senior high school and college have 1000M Run

Table 65 - Girls' endurance run 50m×8 shuttle run (m·s)

Level	Score	G5	G6	J1	J2	J3	S1	S2	S3	C1,2	C3,4
Excellent	100	1'41"	1'37"	3'35"	3'30"	3'25"	3'24"	3'22"	3'20"	3'18"	3'16"
	95	1'44"	1'40"	3'42"	3'37"	3'32"	3'30"	3'28"	3'26"	3'24"	3'22"
	90	1'47"	1'43"	3'49"	3'44"	3'39"	3'36"	3'34"	3'32"	3'30"	3'28"
Good	85	1'50"	1'46"	3'57"	3'52"	3'47"	3'43"	3'41"	3'39"	3'37"	3'35"
	80	1'53"	1'49"	4'05"	4'00"	3'55"	3'50"	3'48"	3'46"	3'44"	3'42"
Pass	78	1'56"	1'52"	4'10"	4'05"	4'00"	3'55"	3'53"	3'51"	3'49"	3'47"
	76	1'59"	1'55"	4'15"	4'10"	4'05"	4'00"	3'58"	3'56"	3'54"	3'52"
	74	2'02"	1'58"	4'20"	4'15"	4'10"	4'05"	4'03"	4'01"	3'59"	3'57"
	72	2'05"	2'01"	4'25"	4'20"	4'15"	4'10"	4'08"	4'06"	4'04"	4'02"
	70	2'08"	2'04"	4'30"	4'25"	4'20"	4'15"	4'13"	4'11"	4'09"	4'07"
	68	2'11"	2'07"	4'35"	4'30"	4'25"	4'20"	4'18"	4'16"	4'14"	4'12"
	66	2'14"	2'10"	4'40"	4'35"	4'30"	4'25"	4'23"	4'21"	4'19"	4'17"
	64	2'17"	2'13"	4'45"	4'40"	4'35"	4'30"	4'28"	4'26"	4'24"	4'22"
	62	2'20"	2'16"	4'50"	4'45"	4'40"	4'35"	4'33"	4'31"	4'29"	4'27"
	60	2'23"	2'19"	4'55"	4'50"	4'45"	4'40"	4'38"	4'36"	4'34"	4'32"
Fail	50	2'27"	2'23"	5'05"	5'00"	4'55"	4'50"	4'48"	4'46"	4'44"	4'42"
	40	2'31"	2'27"	5'15"	5'10"	5'05"	5'00"	4'58"	4'56"	4'54"	4'52"
	30	2'35"	2'31"	5'25"	5'20"	5'15"	5'10"	5'08"	5'06"	5'04"	5'02"
	20	2'39"	2'35"	5'35"	5'30"	5'25"	5'20"	5'18"	5'16"	5'14"	5'12"
	10	2'43"	2'39"	5'45"	5'40"	5'35"	5'30"	5'28"	5'26"	5'24"	5'22"

Remark： Primary school grade5 to 6 have 50M×8 Shuttle Run, Junior high school, senior high school and college have 800M Run

Table 66 - Additional test boys' 1-minute rope (times)

Extra Score	G1	G2	G3	G4	G5	G6
20	40	40	40	40	40	40
19	38	38	38	38	38	38
18	36	36	36	36	36	36
17	34	34	34	34	34	34
16	32	32	32	32	32	32
15	30	30	30	30	30	30
14	28	28	28	28	28	28
13	26	26	26	26	26	26
12	24	24	24	24	24	24
11	22	22	22	22	22	22
10	20	20	20	20	20	20
9	18	18	18	18	18	18
8	16	16	16	16	16	16
7	14	14	14	14	14	14
6	12	12	12	12	12	12
5	10	10	10	10	10	10
4	8	8	8	8	8	8
3	6	6	6	6	6	6
2	4	4	4	4	4	4
1	2	2	2	2	2	2

Remark：1 Minute rope test, when students over 100 points, then counting the times to add points.

Table 67 - Additional test girls' 1-minute rope (times)

Extra Score	G1	G2	G3	G4	G5	G6
20	40	40	40	40	40	40
19	38	38	38	38	38	38
18	36	36	36	36	36	36
17	34	34	34	34	34	34
16	32	32	32	32	32	32
15	30	30	30	30	30	30
14	28	28	28	28	28	28
13	26	26	26	26	26	26
12	24	24	24	24	24	24
11	22	22	22	22	22	22
10	20	20	20	20	20	20
9	18	18	18	18	18	18
8	16	16	16	16	16	16
7	14	14	14	14	14	14
6	12	12	12	12	12	12
5	10	10	10	10	10	10
4	8	8	8	8	8	8
3	6	6	6	6	6	6
2	4	4	4	4	4	4
1	2	2	2	2	2	2

Remark：1 Minute rope test, when students over 100 points, then counting the times to add points

Table 68 - Additional test boys' chin-up (times)

Extra score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
10	10	10	10	10	10	10	10	10
9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8
7	7	7	7	7	7	7	7	7
6	6	6	6	6	6	6	6	6
5	5	5	5	5	5	5	5	5
4	4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1

Table 69 - Additional test girls' 1-minute sit-ups (times)

Extra score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
10	13	13	13	13	13	13	13	13
9	12	12	12	12	12	12	12	12
8	11	11	11	11	11	11	11	11
7	10	10	10	10	10	10	10	10
6	9	9	9	9	9	9	9	9
5	8	8	8	8	8	8	8	8
4	7	7	7	7	7	7	7	7
3	6	6	6	6	6	6	6	6
2	4	4	4	4	4	4	4	4
1	2	2	2	2	2	2	2	2

Remark： Chin-up for boys and 1 Minute Sit-ups for girls, when students over 100 points, then counting the times to add points

Table 70 - Additional test boys' 1000mrun (m·s)

Extra score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
10	-35"	-35"	-35"	-35"	-35"	-35"	-35"	-35"
9	-32"	-32"	-32"	-32"	-32"	-32"	-32"	-32"
8	-29"	-29"	-29"	-29"	-29"	-29"	-29"	-29"
7	-26"	-26"	-26"	-26"	-26"	-26"	-26"	-26"
6	-23"	-23"	-23"	-23"	-23"	-23"	-23"	-23"
5	-20"	-20"	-20"	-20"	-20"	-20"	-20"	-20"
4	-16"	-16"	-16"	-16"	-16"	-16"	-16"	-16"
3	-12"	-12"	-12"	-12"	-12"	-12"	-12"	-12"
2	-8"	-8"	-8"	-8"	-8"	-8"	-8"	-8"
1	-4"	-4"	-4"	-4"	-4"	-4"	-4"	-4"

Table 71 - Additional test girls' 800mrun (m·s)

Extra score	J1	J2	J3	S1	S2	S3	C1,2	C3,4
10	-50"	-50"	-50"	-50"	-50"	-50"	-50"	-50"
9	-45"	-45"	-45"	-45"	-45"	-45"	-45"	-45"
8	-40"	-40"	-40"	-40"	-40"	-40"	-40"	-40"
7	-35"	-35"	-35"	-35"	-35"	-35"	-35"	-35"
6	-30"	-30"	-30"	-30"	-30"	-30"	-30"	-30"
5	-25"	-25"	-25"	-25"	-25"	-25"	-25"	-25"
4	-20"	-20"	-20"	-20"	-20"	-20"	-20"	-20"
3	-15"	-15"	-15"	-15"	-15"	-15"	-15"	-15"
2	-10"	-10"	-10"	-10"	-10"	-10"	-10"	-10"
1	-5"	-5"	-5"	-5"	-5"	-5"	-5"	-5"

Remark： 1000M for boys and 800M for girls, when students lower 100 points, then counting the second to add point